

Policy on the Media Platform Industry

- The Analysis of Pricing Policies of Internet Media
with Two-sided Market Theory -

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● Background

- **The proliferation of smart devices is changing media industry.**
 - Internet connected and platform-centric structure
 - Platform based media service markets such as internet portals, OTT, smartTV, VoDs markets are growing fast
- **The tipping effects of network externality makes some global media platform providers dominate the markets.**
 - Huge positive network externalities from a huge global platform operator
 - Hard to regulate the huge global platform operator
- **Depend on the technology and business strategies of a monopoly platform operator, allocation of the wealth and the social welfare would be decided.**

● Purpose of this paper

- **Analyze the efficiency of the monopoly media platform**
- **Suggest what government need to do to regulate the industry and how to promote the media industry**

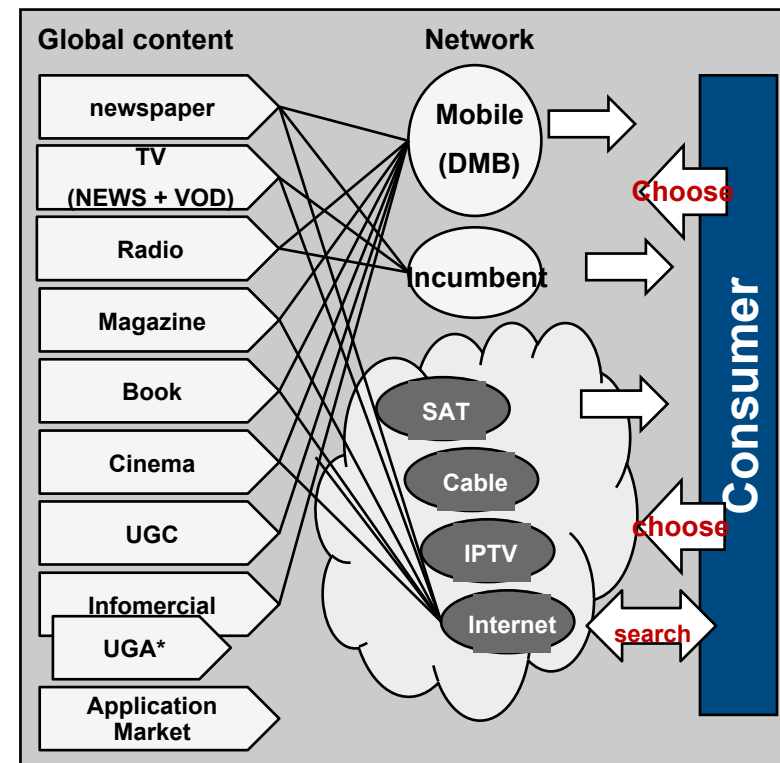
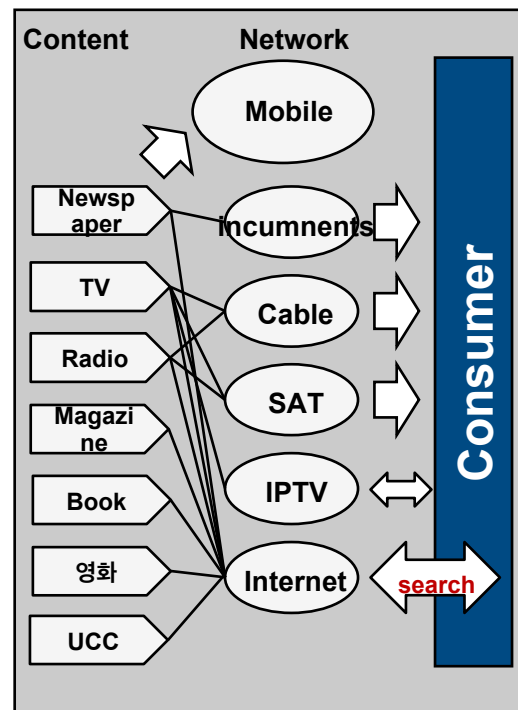
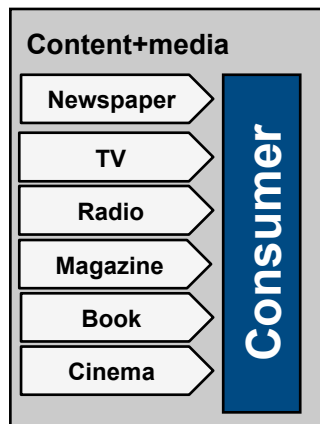
I. Introduction

- The proliferation of smart devices is changing media industry.

1st stage

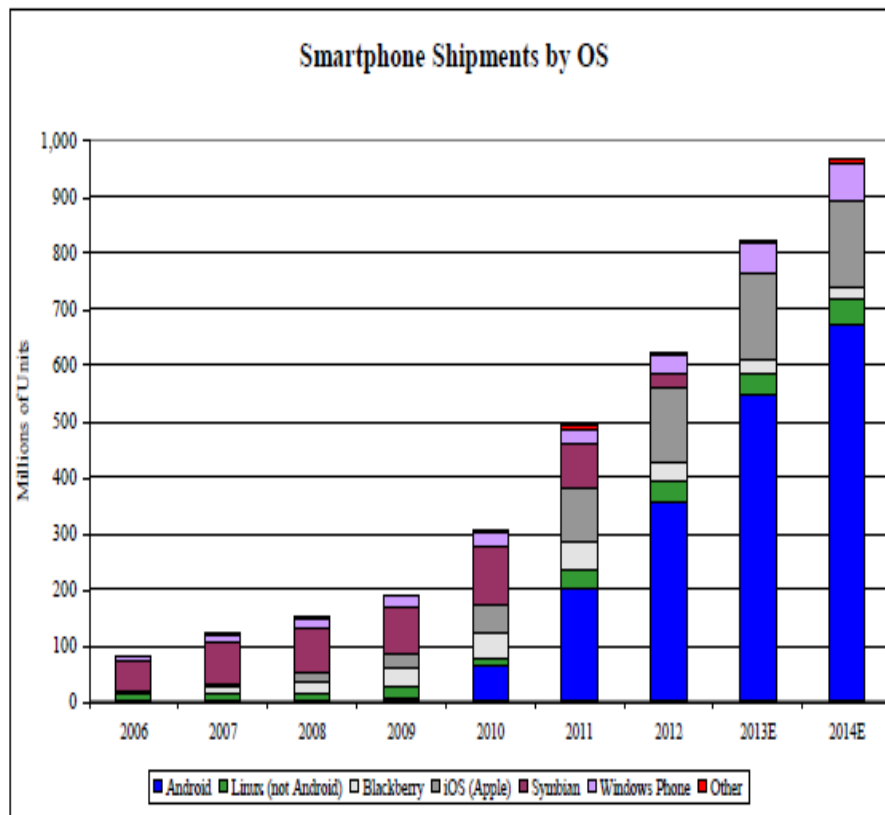
2nd Stage

3rd stage

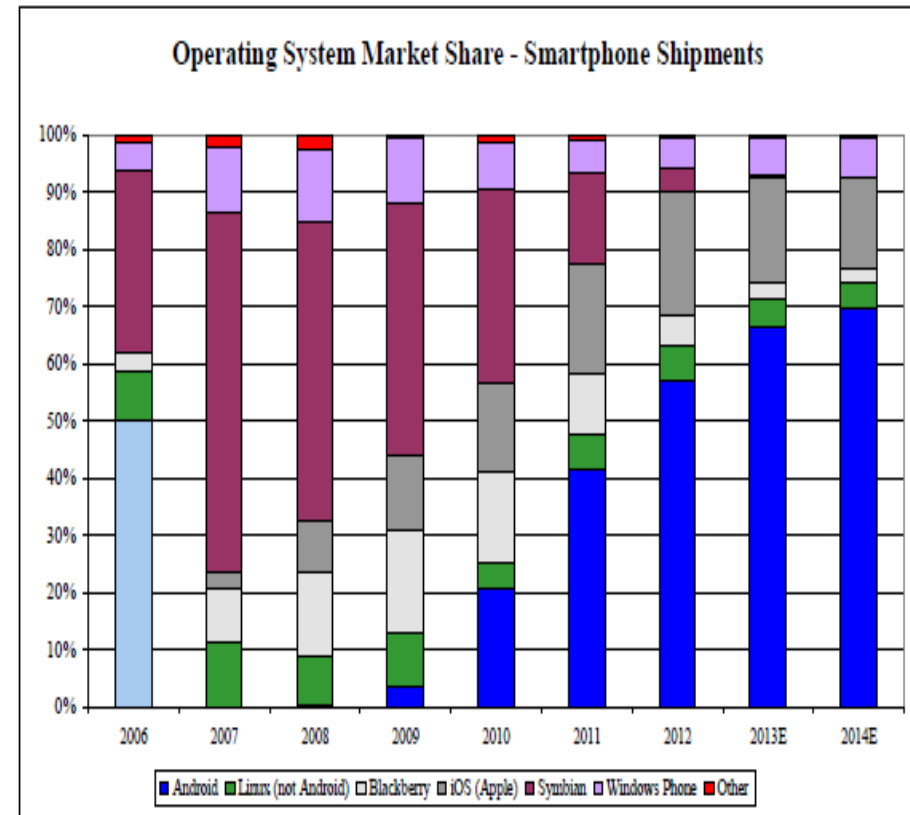


I. Introduction

- The tipping effects of network externality makes some global media platform providers dominate the markets.



Source: Oppenheimer & Co. Inc. Estimates



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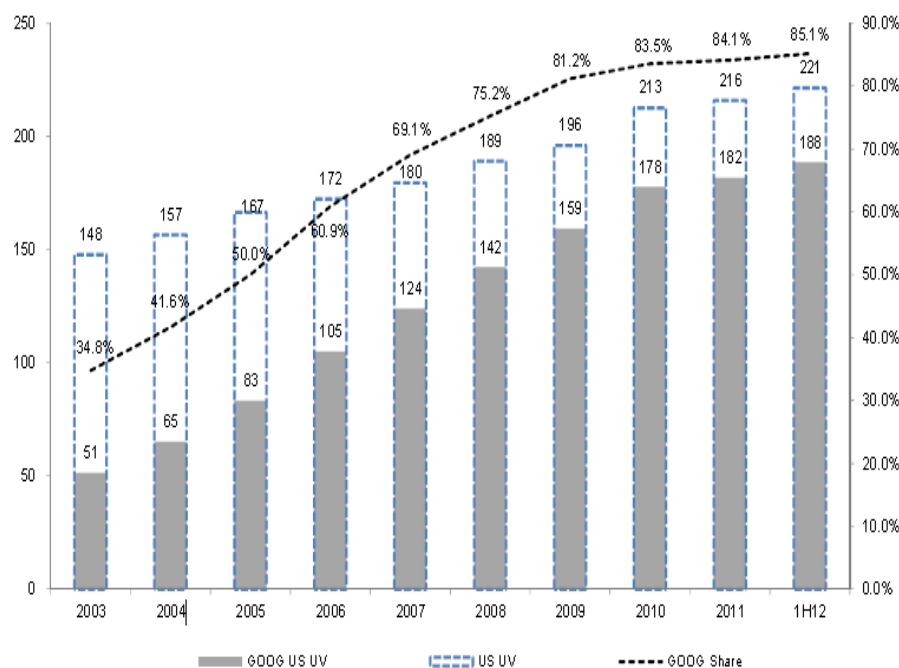
Source : Oppenheimer (2013)

I. Introduction

- Google is dominating in the world and Naver is dominating Korean market

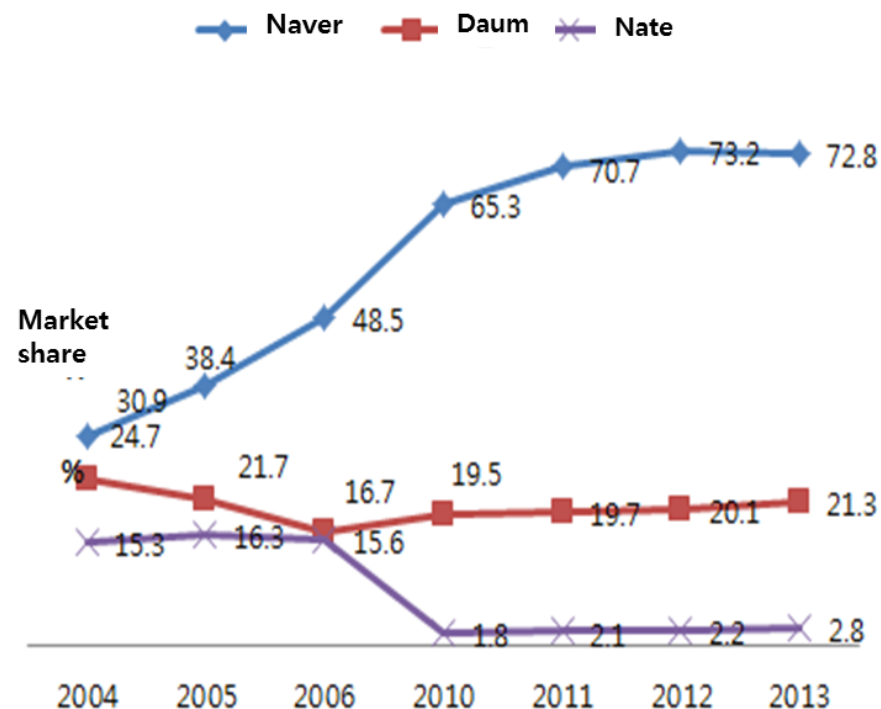
US search market (visitors)

GOOG Share of US Unique Visitors 2003—1H12 (Visitors, MM, %)



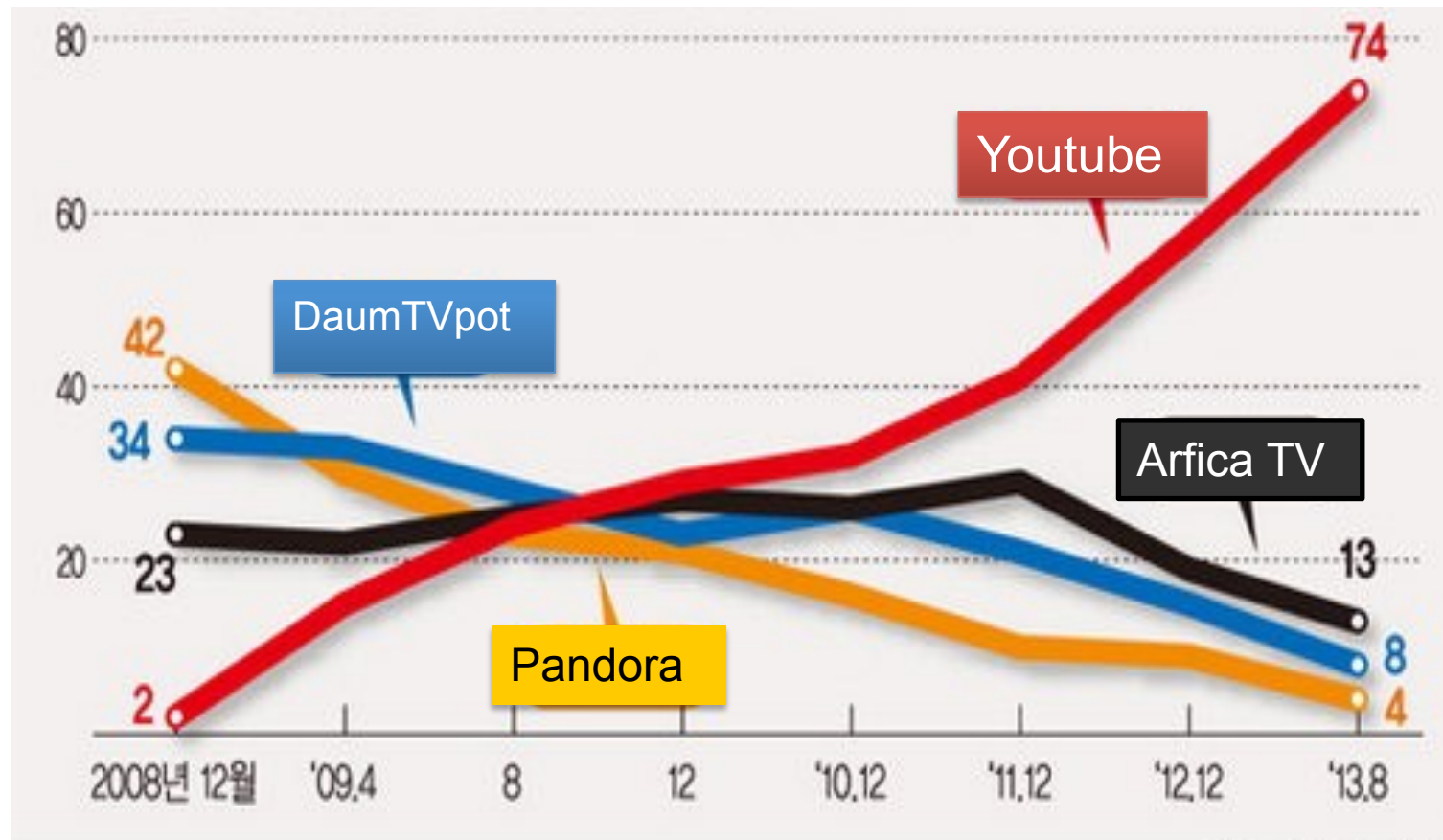
Source : Cowen & Company (2012)

Korean search market (# of clicks)



Reorganized the Korean click data of FTC(2006)&e-today(2013)

Korean OTT market (# of clicks)



Source : etoday (2013. 10. 8)

2. Literature Review

Rochet&Tirole (2003) : Focused on markets where transaction itself yields utility such as credit card market,

- Imposing a lower price than marginal cost (MC) can attract more agents (users, providers) , which is called cross-subsidization effect

Armstrong(2006) : The equilibrium price is determined by (1) the size of externality between groups, (2) whether lump-sum fee or based on the usage, (3) whether users participate in a single platform or in multiple platforms

Caillaud&Jullien (2003) : Focused on the information intermediary market such as the internet, which is characterized with network externality, non-exclusive service and price discrimination.

In the case of single-homing (exclusive service), though two platforms compete with each other, customers lean toward one platform (monopolist) and the profit of a monopolist is zero.

In case of a multi-homing (non-exclusive service), every equilibrium becomes profitable, so they concluded that intermediary agents permit multi-homing in equilibrium.

3. Modelling Framework

- **This study transformed the model of Hagiu(2009), which considers competition among participants in the two-sided market.**
 - **Users and contents providers are differentiated by their own type, and they participate in the platform until their net utility becomes zero, considering their types.**
 - **A monopolistic platform provider sets a user's platform membership fee and contents provider's transaction fee in order to maximize his profit**
 - **The number of users and contents providers is determined according to the fee.**
 - **We modified this model to explain the characteristics of media platform, which is transaction of contents.**
 - **With this modified model, we analyzed the effect of matching technology, smart advertising, and adopting prosumer policy with several pricing types.**

3. Modelling Framework

Examples of major pricing types of leading media platforms

	CPs		Users		Key points
	Lump-sum fee	Transaction fee	Lump-sum fee	Transaction fee	
1 Apple App market	\$99/year Mac computer	30% of sales (support App developers)	Apple receiver	None	matching advertising
2 Netflix, Hulu plus, poog, tving			Membership fee		(advertising)
3 Google App market	Subscription fee \$25	30% of sales (support App developers)	Receiver (various manufactures)	none	matching Advertising
Youtoub Portals (google, naver)	-	-	-	-	Matching Advertising Prosumer(blog) 10

3. Modelling Framework

- We analyze three common media pricing types.

- Pricing type1: if $\Pi^* - c_e - c_s \geq 0$, lump-sum fee for users and transaction fee for CPs
- Pricing type2: if $\Pi^* - c_s \geq 0$, and $\Pi^* - c_e < 0$, lump-sum fee for users and no fee for CPs
- Pricing type3: if $\Pi - c_s \geq 0$, and $\Pi - c_e < 0$ no user fee and transaction fee for CPs

- We analyze three factors

- Development of matching technology
- Prusummer policy (ex. Blog, 'Jisic-In'(wise person: naver))
- Smart Advertising (search, personalized, targeted advertising)

3. Modelling Framework

Decision Process

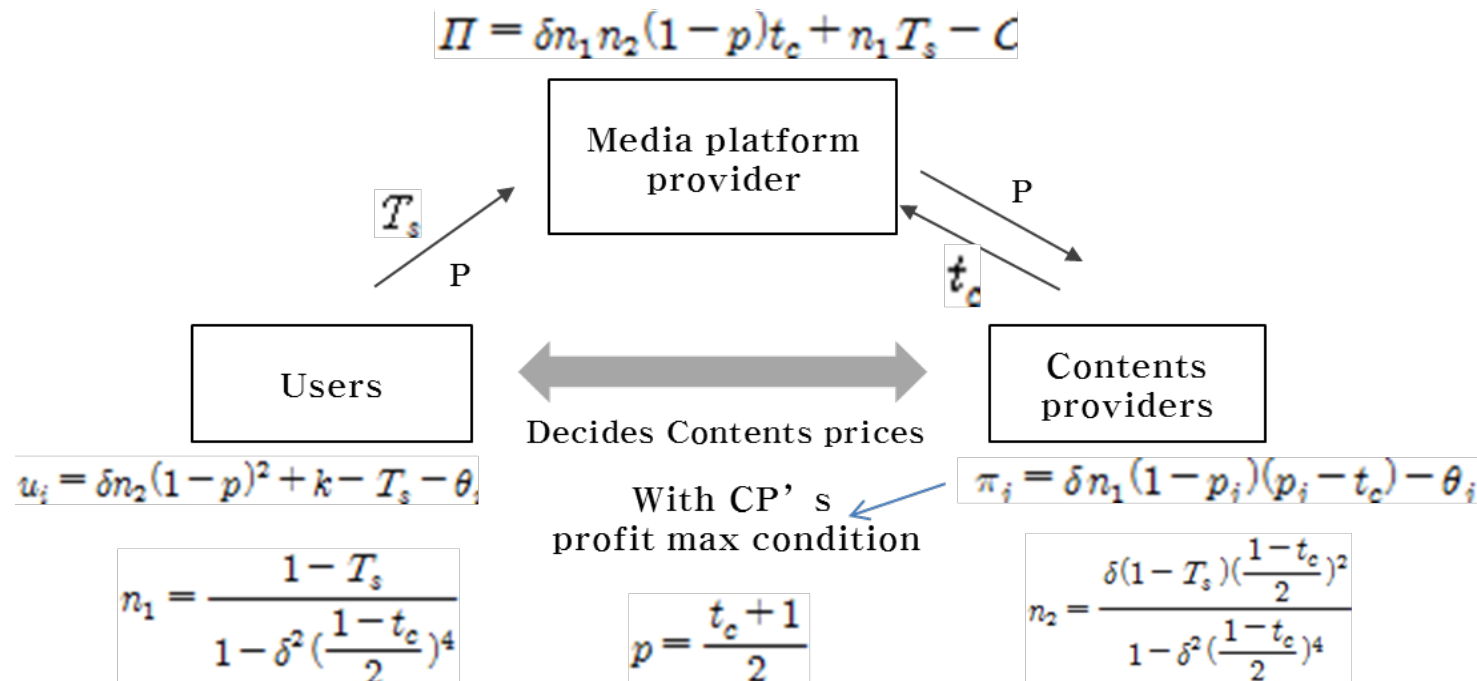
1st step: Platform provider selects the proper business model fitting for its company.

2nd step: Platform provider sets (charge on contents provider) and (fee on user)

3rd step: (the price of contents) is set on a contents market.

4th step: Users and contents providers decide whether to transact in the platform or not, observing the price of a platform provider and contents, and by their decision, are determined.

Pricing type 1: lump-sum fee for users and transaction fee for CPs



3. Modelling Framework

δ : matching probability (matching technology level) $0 \leq \delta \leq 1$

n_2 : the number of contents providers (=the number of contents varieties)

p : the price of contents per unit

$1 - p$: demand on one content per one user

$1 - p$: user's net utility per one unit of contents

t_1 : flat-rate fee including membership fee, monthly fixed fee, etc.

k : utility from using a platform

θ : disutility(transportation cost) caused by not satisfying a user's various kinds of preferences, equal distribution between $[0,1]$

3. Modelling Framework

PROPOSITION 1.1 Monopolistic platform operator chooses higher level of fees when they do not have matching technology than when they have it.

- 1) If $C \geq \frac{27\delta}{4(256-27\delta^2)}$, the platform operator will not develop the matching technology and will choose $t_c^* = 1$, $T_s^* = 0.5$.
- 2) If $C < \frac{27\delta}{4(256-27\delta^2)}$, the platform operator will develop the matching technology and will choose $t_c^* = -0.5$, $T_s^* = -\frac{27\delta^2 + 256}{54\delta^2 - 512}$, Where $0.5 \leq T_s^* \leq 0.6179$ ($0 \leq \delta \leq 1$)

Proof Using (1-4), (1-5), (1-6), we can get new platform operators profit expressions (1-9) and can get optimizing level of fees through the first order conditions of (1-9).

$$\text{Max}_{T_s, t_c} \Pi = \frac{T_s(T_s - 1)}{\delta^2(\frac{t_c - 1}{2})^4 - 1} - \frac{\delta^2 t_c (\frac{t_c - 1}{2})^3 (T_s - 1)^2}{\{\delta^2(\frac{t_c - 1}{2})^4 - 1\}^2} - C \quad (1-9)$$

Using $t_c = -0.5$, $T_s = -\frac{27\delta^2 + 256}{54\delta^2 - 512}$, we can yield the condition of C, with which the platform operator's profit is higher than $\Pi = 0.25$ ($\delta = 0$).

$$\Pi_{t_c = -0.5, T_s = -\frac{27\delta^2 + 256}{54\delta^2 - 512}} = \frac{T_s(T_s - 1)}{\delta^2(\frac{t_c - 1}{2})^4 - 1} - \frac{\delta^2 t_c (\frac{t_c - 1}{2})^3 (T_s - 1)^2}{\{\delta^2(\frac{t_c - 1}{2})^4 - 1\}^2} - C > \Pi_{\delta=0} = 0.25$$

3. Modelling Framework

PROPOSITION 1.2 If the platform do not have matching technology and charge transaction fee to CPs, the platform fails to build the network of CPs, $n_2 = 0$.

When platform operator chooses not to develop matching technology and decide the level of fees as $t_c^* = 1, T_s^* = 0.5$, the optimal contents price for one unite would be $p = 1$, the number of users would be $n_1 = 0.5$, and the number of contents provider would be $n_2 = 0$. In this case, platform operator's profit would be $\Pi = 0.25$, total utility of user group would be $U = 0.125$, total profit of CPs would be $\Pi_c = 0$, and social welfare would be $W = 0.375$.

Proof. By putting $t_c^* = 1, T_s^* = 0.5$ in to the (4), (5), (6) and (9), we can easily get $p = 1$, $n_1 = 0.5$, $n_2 = 0$, and $\Pi = 0.25$, where $c(0) = 0$. For, social welfare, following expressions yields each groups welfare level.

$$\begin{aligned} U &= \int_0^{n_1} u_i d\theta_i = \int_0^{n_1} \delta n_2 (1-p)^2 + 1 - T_s - \theta_i d\theta_i \\ &= \{ \delta n_2 (1-p)^2 + 1 - T_s \} n_1 - \frac{1}{2} n_1^2 \end{aligned}$$

$$\begin{aligned} \Pi_c &= \int_0^{n_2} \pi_c d\theta_j = \int_0^{n_2} \delta n_1 (1-p)(p-t_c) - \theta_j d\theta_j \\ &= \delta n_1 n_2 (1-p)(p-t_c) - \frac{1}{2} n_2^2 \end{aligned}$$

$$\Pi = \delta n_1 n_2 (1-p)t_c + n_1 T_s - c(\delta)$$

$$W = U + \Pi_c + \Pi = \delta n_1 n_2 (1-p) + n_1 - \frac{1}{2} (n_1^2 + n_2^2) - c(\delta) \quad \blacksquare$$

3. Modelling Framework

PROPOSITION 1.3 If the platform have matching technology and charge lower transaction fee to CPs, the platform can build two-sides of network and make higher profits .

When platform operator choose to develop matching technology and decide the level of fees as $t_c^* = -0.5$,

$T_s^* = -\frac{27\delta^2 + 256}{54\delta^2 - 512}$, the optimal contents price for one unite would be $p = 0.25$, the number of users and CPs would be increasing function of δ like followings.

$$n_1 = -\frac{\frac{27\delta^2 + 256}{54\delta^2 - 512} + 1}{\frac{81\delta^2}{256} - 1}, \quad n_2 = -\frac{9\delta(\frac{27\delta^2 + 256}{54\delta^2 - 512} + 1)}{16(\frac{81\delta^2}{256} - 1)}$$

We can get the ranges, $0.5 \leq T_s^* \leq 0.61790$, $0.4410 \leq n_1 \leq 0.559$, $0 \leq n_2 \leq 0.3144$ as $0 \leq \delta \leq 1$.

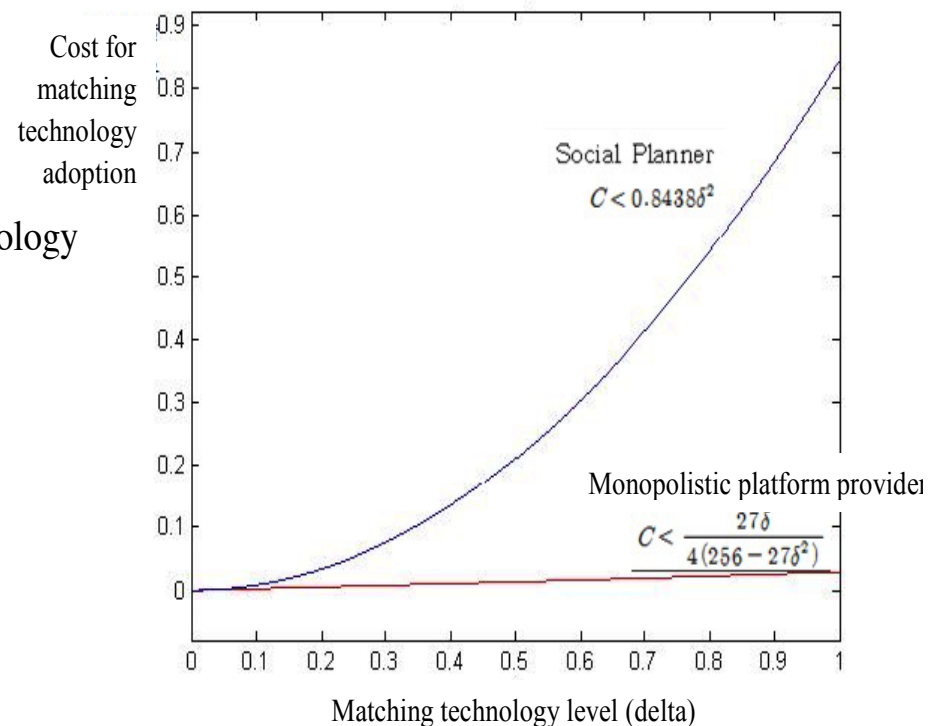
3. Modelling Framework

PROPOSITION 1.4 If a social planner operates the media platform, he would develop matching technology under more relaxed conditions.

) if $C \geq 0.8438\delta^2$, he will choose not to develop matching technology and will choose the level of fees $t_c^* = 1, T_s^* = 0$.

) if $C < 0.8438\delta^2$, he will choose to develop matching technology

and will choose the level of fees $t_c^* = -2, T_s^* = \frac{54\delta^2}{16 - 27\delta^2}$.



3. Modelling Framework

PROPOSITION 1.5 If social planner develop matching technology, transaction fee for CPs and contents price are lower and the network size of each group is bigger than those of monopoly provider.

Proof. When social planner choose to develop matching technology, the optimal fees to

maximizing social welfare are $t_c^* = -2$, $T_s^* = \frac{54\delta^2}{16-27\delta^2}$ and content price is $p = -0.5$. In this case, network sizes of each groups are $n_1 = 1$, $n_2 = 1.5^2\delta$.

In addition, total utility of user groups, profit of CPs and social welfare are higher than those of monopoly operator. Profit of monopoly operator is smaller.

$$U = 1.5^4\delta^2 - \frac{54\delta^2}{16-27\delta^2} + 0.5 \geq 0.5, \quad 0.5 < U \leq 10.4716$$

$$\Pi_c = 0.5 * 1.5^4\delta^2 = 2.5315\delta^2 \geq 0, \quad 0 < \Pi_c \leq 2.515$$

$$\Pi = (-2) * 1.5^3\delta^2 + \frac{54\delta^2}{16-27\delta^2} = -6.75\delta^2 + \frac{54\delta^2}{16-27\delta^2} \geq 0, \quad -5.5841 < \Pi \leq 0$$

$$W = U + \Pi_c + \Pi = 0.844\delta^2 + 0.5 \geq 0.5, \quad 0.5 < W \leq 0.844$$

3. Modelling Framework

Summary

Flat-rate fee + charge		User flat-rate fee	Charge on a contents provider ($\delta = 0.5$)
$\Pi^* - c_c - c_s \geq 0$			
$\Pi^* - c_\delta \geq 0$	$\Pi^* - c_\delta < 0$	$\Pi^* - c_s \geq 0,$ $\Pi^* - c_c < 0$	$\Pi^* - c_c \geq 0,$ $\Pi^* - c_s < 0$
$t_c^* = -0.5,$ $0.5 \leq T_s^* \leq 0.6179$ ($0 \leq \delta \leq 1$)	$t_c^* = 1$ $T_s^* = 0.5$	$T_s^* = 0.5$ $t_c^* = 0$	$T_s^* = 0$ $t_c^* = 0.3306$
$p = 0.25$ $0.4410 \leq n_1 \leq 0.559$ $0 \leq n_2 \leq 0.3144$ ($0 \leq \delta \leq 1$)	$p = 1$ $n_1 = 0.5$ $n_2 = 0$	$p = \frac{1}{2}$ $0.5 \leq n_1 \leq 0.5333$ $0 \leq n_2 \leq 0.1333$ ($0 \leq \delta \leq 1$)	$p = 0.6653$ $n_1^* = 1.0031$ $n_2^* = 0.0562$
$0.125 < U \leq 0.1562$ $0 < \Pi_c \leq 0.0494$ $0.25 < \Pi \leq 0.3706$ $0.375 < W \leq 0.5762$ ($\delta = 1, c = 0$; W is maximized)	$U = 0.125$ $\Pi_c = 0$ $\Pi = 0.25$ $W = 0.375$	$0.125 \leq U \leq 0.1422$ $0 \leq \Pi_c \leq 0.0089$ $0.25 \leq \Pi \leq 0.2666$ $0.3750 \leq W \leq 0.4177$	$U = 0.5032$ $\Pi_c = 0.0016$ $\Pi = 0.0093$ $W = 0.5140$

4. Modelling Extensions

(2-9)

Model with Prosumer effect

Users $u_i = \delta n_2(1-p)^2 + k - T_s - \theta_i$ (2-1) $n_1 = \hat{\theta}_i = \delta n_2(1-p)^2 + k - T_s$ (2-2)

CPs $\pi_i = \delta n_1(1-p_i)(p_i - t_c) + l n_1 - \theta_i$ (2-3) $n_2 = \hat{\theta}_i = \delta n_1(1-p_i)(p_i - t_c) + l n_1$ (2-4)

l : Prosumer effect. Utility from j company's promotion effect on its own contents, or utility that an individual blogger gets from self-expression, same on every j CPs

Monopoly platform provider $\Pi = \delta n_1 n_2(1-p)t_c + n_1 T_s$ (2-5)

price of contents $p = \frac{t_c + 1}{2}$ (2-6)

4. Modelling Extensions

$$\text{Max}_{t_c, T_s} \Pi = \delta n_1 n_2 (1-p) t_c + n_1 T_s - C(c_\delta + c_s)$$

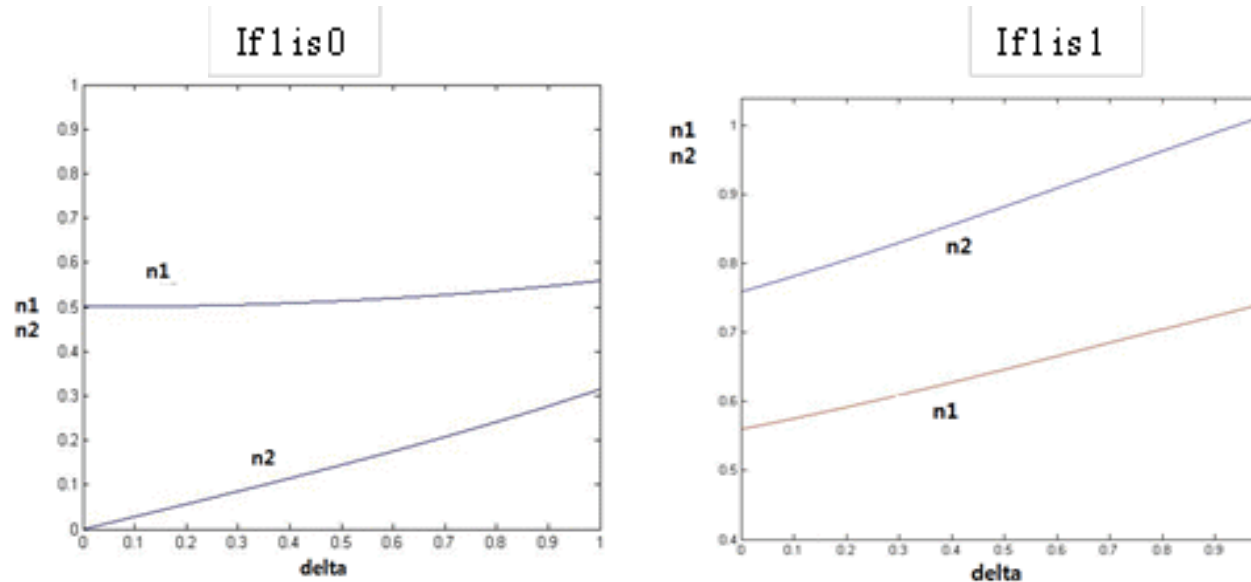
$$t_c^* = A - \frac{\frac{2l}{3\delta} - \frac{1}{4}}{A} + \frac{1}{2} \quad \text{where } A = \left[\left\{ \left(\frac{2l}{3\delta} - \frac{1}{4} \right)^3 + \left(\frac{l}{2\delta} + \frac{1}{8} \right)^2 \right\}^{\frac{1}{2}} - \frac{l}{2\delta} - \frac{1}{8} \right]^{\frac{1}{3}}$$

$$T_s^* = \frac{k(16 - \delta^2 - 4\delta l + 6\delta k B + 12\delta k l B^2 - 8\delta^2 B^3 + 3\delta^2 B^4 - 8\delta k l B)}{-2\delta^2 + 32 - 8\delta l - 4\delta^2 B^3 + 4\delta^2 B + 8\delta l B^2 + 2\delta^2 B^4}$$

$$\text{where } B = C - \frac{\frac{2l}{3\delta} - \frac{1}{4}}{C} + \frac{1}{2} \quad C = \left[\left\{ \left(\frac{2l}{3\delta} - \frac{1}{4} \right)^3 + \left(\frac{l}{2\delta} + \frac{1}{8} \right)^2 \right\}^{\frac{1}{2}} - \left(\frac{l}{2\delta} + \frac{1}{8} \right) \right]^{\frac{1}{3}}$$

To get numerically comparable solutions, we put $l=0.1, k=1$ and $l=1, k=1$ into the solutions and then we can get followings

4. Modelling Extensions



Pricing type 1

$l = 0.1, k = 1$

$$0.5 < T_s^* < 0.5072$$

$$-0.355 < t_c^* < 0$$

$$0.5 < n_1 < 0.5066$$

$$0.05 < n_2 < 0.1126$$

$$U = 0.125$$

$$\Pi_c = 0.0013$$

$$\Pi = 0.25$$

$$W = 0.3763$$

$k = 1, l = 1$

$$0.5 < T_s^* < 0.6301$$

$$-0.2117 < t_c^* < 0$$

$$0.5595 < n_1 \leq 0.7423$$

$$0.7586 < n_2 \leq 1.0148$$

$$0.125 < U < 0.1413,$$

$$0.125 < \Pi_c < 0.1612$$

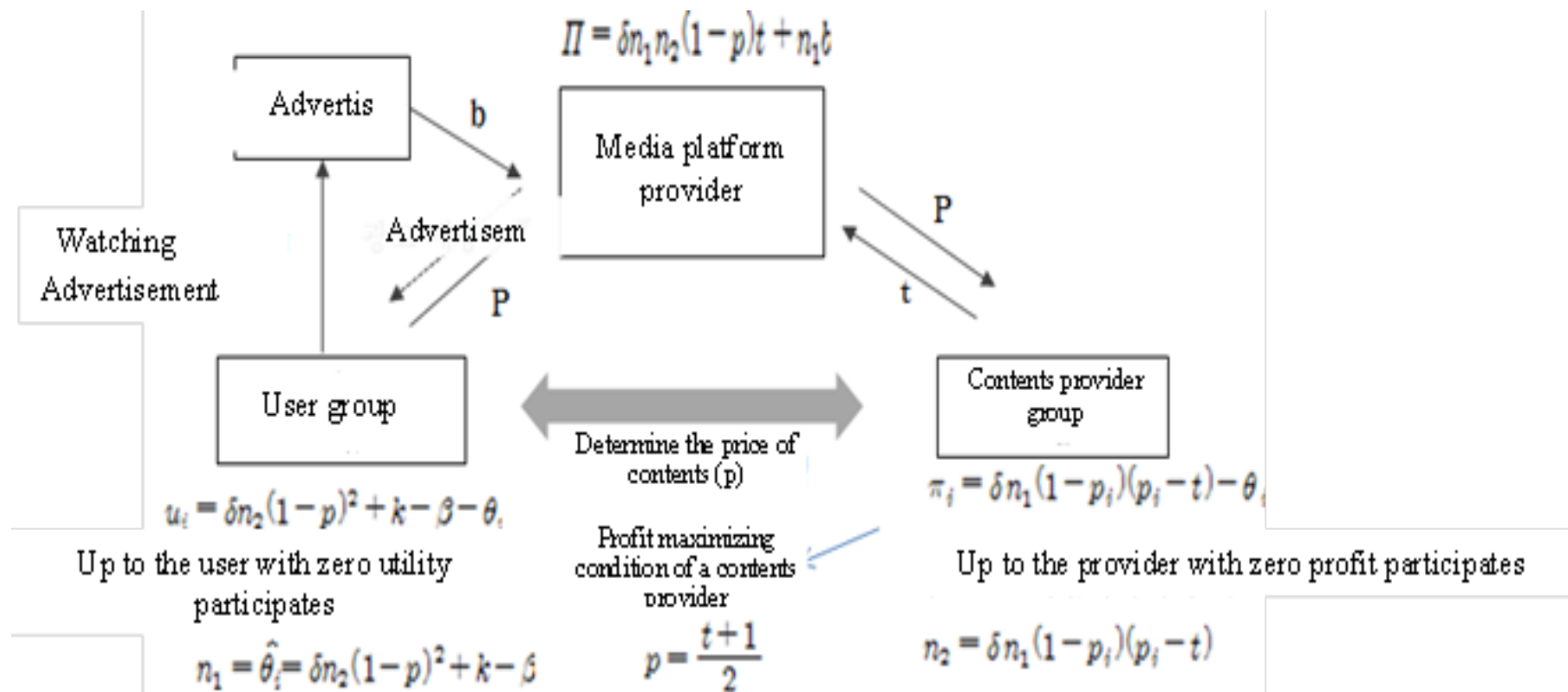
$$0.25 < \Pi < 0.2568$$

$$0.5 < W < 0.5593$$

4. Modelling Extensions

Model with Smart Ads

The user feels the utility of β on ads of the platform provider,
and depending on the effect of ads, the utility becomes $-1 \leq \beta \leq 1$.



4. Modelling Extensions

PROPOSITION 3.1. In case that a monopolistic provider makes advertisement revenue without charging membership fee on a user, he/she can choose among two pricing policies maximizing the profit.

i) $t_{ad}^* = 1$ without matching tech.

ii) $t^* = 1 + 2(A + \frac{B}{A} - \frac{3d^2(\beta-1)}{6bd^2})^{\frac{1}{2}}$ with matching tech.

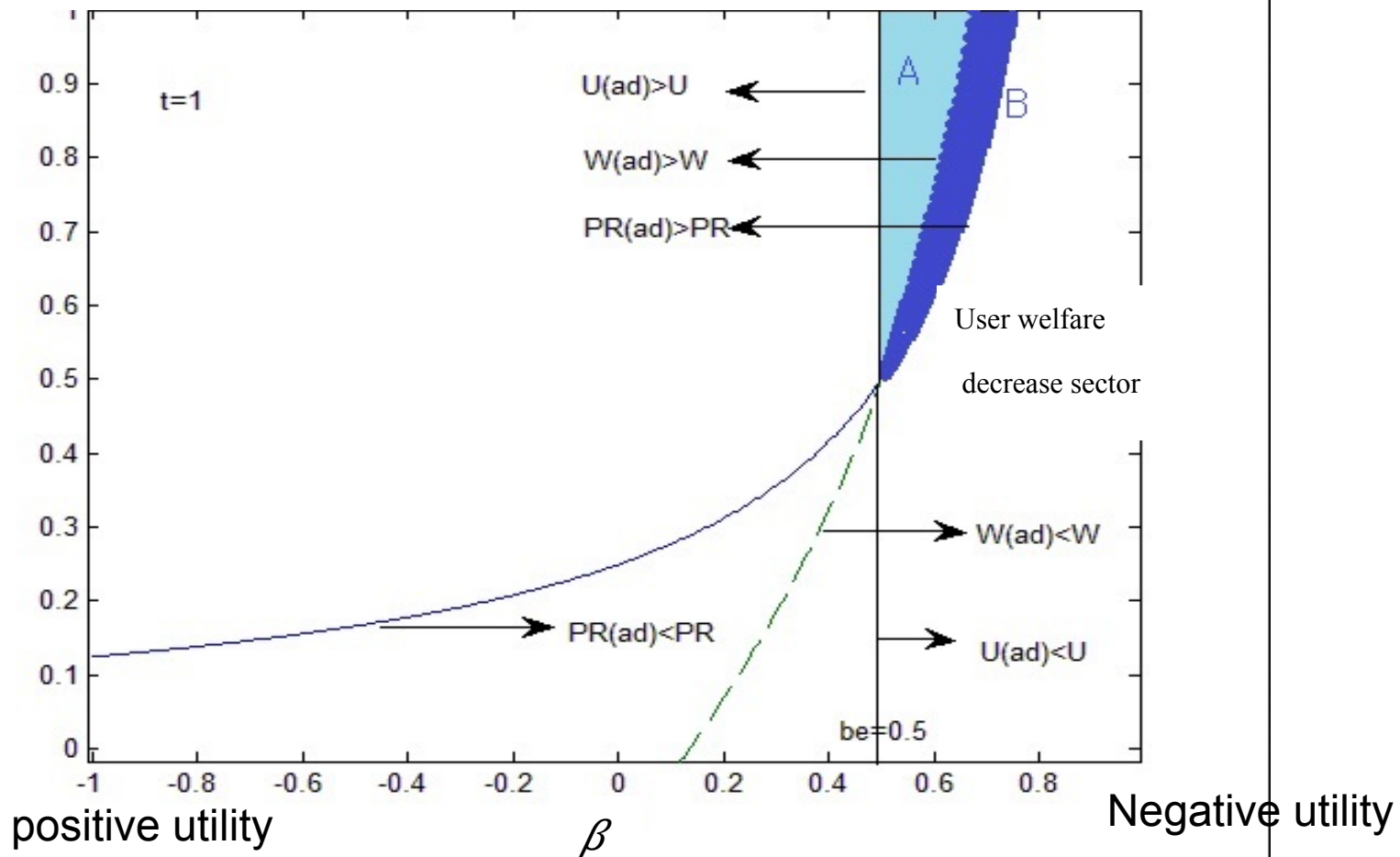
$$t^* = 1 - 2(A + \frac{B}{A} - \frac{3d^2(\beta-1)}{6bd^2})^{\frac{1}{2}}$$

$$\text{where } A = \left[\left\{ \frac{(\beta-1)^3}{8b^3} + \frac{(\beta-1)}{2bd^2} \right\}^2 - B^2 \right]^{\frac{1}{2}} - \frac{(\beta-1)^3}{8b^3} + \frac{(\beta-1)}{2bd^2}$$

$$B = \left(\frac{1}{3d^2} + \frac{(\beta-1)^2}{4b} \right)$$

4. Modelling Extensions

Comparison of Ads model and user subscription fee model
(without matching technology)



● Main Findings

- Monopoly platform is a very efficient system especially in this two-sided media platform market.
- However, governments need to monitor the operator and promote the industry with following three ways.

1. **Development of matching technology** can maximize the profit of monopoly platform operator. However he/she has less incentive to invest in developing technology than social planner.
 - If government funds or subsidizes R&D, the total social welfare, (especially CPs') will increase

2. **Prosumer policy** is a good way to increase number of CPs.

- In many cases, platform operators fail to induce CPs and fail to provide highly qualified various contents.
- Government can support prosumer policy by supporting CPs with equipments (such as cameras, editing tools, and so on.)
- A very wise and proper level of copyright protection policy need to be applied to promote the media contents providers to produce high quality contents.

3. **Smart advertising** can increase users', platform provider's, and total social welfare.

- However platform provider has incentive to increase the level of ads even though users' disutility increases. (too many ads or using too much personal information)
- Gov. needs to monitor the operator's ads and should give some guidelines or apply some proper regulations to protect individual user.

● Contribution

1. We built a two-sided media platform model connected to the internet to analyze the monopolistic platform operators' performance
2. We analyzed and tested the effects of matching technology, internet blog, and the development of advertising technology and skill with this model.
3. We compared social planner's choice and monopoly operator's so that we suggested some implications of how to reduce the gap of monopoly's and social planner's choice.

● Limitation

1. Competitive market also should be analyzed and compared.
 - In the early stage of media platform markets are competitive market, and that may go on.
2. More various pricing types should be analyzed.

Thank you for you attention.

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