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Study on Short-Term Small-Value Insurance Sales of Big Tech Platform and Consumer Utility: Focused on the Self-Preferencing of the Platform*

빅테크 플랫폼의 소액단기보험 판매와 소비자 효용 연구: 플랫폼의 자사우대행위를 중심으로

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This paper analyzes the effect of the Big Tech platforms' data acquisition and self-preferencing on the entry decisions of short-term small-value (STSV) insurance carriers with a two-period model. When an online insurance product comparison and recommendation platform can acquire sales data and has low production costs, these abilities to gain advantages over STSV insurance carriers will influence the insurance carriers' entry decisions differently depending on the size of demand they are facing. While the platform's capabilities in data acquisition and self-preferencing will facilitate the entry of the carriers with low demand, it will threaten the entry of the ones with intermediate-sized demand. From the welfare perspective, these capabilities can improve consumer surplus and total welfare by lowering the platform's optimal solicitation fee rate for STSV insurance products but reduce STSV insurance carriers' profits.

Keywords: Data access, self-preferencing, two-sided platform, referral fee, short-term small-value insurance

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I. Introduction

As online platforms' market influence grows, there are concerns that they will engage in anti-competitive behavior in their platform marketplaces. According to Bamberger and Lobel (2017) and Bloodstein (2019), firms with a platform typically have market power, which is believed to negatively impact consumers and competitors in the goods and services markets in various ways. In reality, the market capitalization of the so-called Big Tech platforms, such as AAAMM,[1] has led the global market capitalization list for years. Therefore, it is necessary to determine whether the aforementioned public belief is accurate.

In this regard, competition policy authorities in numerous countries are legislatively establishing diverse standards. This is done mainly to increase the rationality and predictability of law enforcement and deter operators from violating laws. In January 2023, the Korea Fair Trade Commission also issued screening guidelines for online platform operators' abuse of market dominance and proposed specific criteria for applying the Monopoly Regulation and Fair Trade Act to online platform operators.

Platform services provided through platforms include online search engines, online social network services, digital content services, operating systems, and online advertising services, and their use is continually expanding. Particularly, the platform's influence on the insurance market is increasing daily, and distribution channels associated with online platforms have been steadily growing in various countries. The platforms' pilot operation plan for insurance product handling in Korea was announced in August 2022. Furthermore, in April 2023, the Financial Services Commission and the

1) Alphabet(Google), Amazon, Apple, Meta, and Microsoft

Financial Supervisory Service announced detailed plans for the platform's pilot operation to increase consumer benefits and promote competition in the insurance industry.

Because platforms are naturally incentivized to exploit consumer surplus or profits on both sides of the marketplace by abusing market power, how market power abuse negatively impacts economic welfare has been analyzed in various forms. First, Kamepalli et al. (2020) argued that platforms' ability to have greater bargaining power than competitors when merging with them could negatively affect potential entrants' ex-ante investment, thereby discouraging innovation and harming social welfare. Moreover, Zhu and Liu (2018) and Wen and Zhu (2019) empirically identified that a potential platform's entry into the seller's product space reduces third-party sellers' innovation incentive. Additionally, Padilla et al. (2022) assumed a durable device market and a non-durable service market and suggested that abuse of market power by gatekeeper platforms may harm consumers and that the loss of consumer surplus may increase as the device market saturation level increases. Moreover, the anti-competitive effects of self-preferencing behavior---whereby a platform prominently features its own products rather than competitors' products---have been analyzed in several papers. These include Colomo (2021), de Sousa (2020), Marty (2020), and Anderson and Bedre-Defolie (2021).

However, in the goods and services markets, the platform's market power does not always harm consumers or competitors. According to Hagiu et al. (2022), Dryden et al. (2020), and Etro (2023), dual-mode operations or hybrid marketplaces (i.e., platforms operating marketplaces for third-party products while selling their own products on those marketplaces) of digital platforms can positively impact consumer surplus and social welfare. Additionally, Etro

(2021) argued that competition among retailers for customers could reduce referral fees and prices, thereby maintaining efficiency. Furthermore, various studies have found that a platform’s market power may positively impact society. However, only a handful of papers have examined the context of self-preferencing in depth.

This study shows that a platform's ability to conduct data acquisition and self-preferencing, which can be acquired through market dominance, may positively impact consumer surplus and total economic welfare. Assuming that a platform does not alter the established referral rate once when the timeline spans two periods, the platform faces a trade-off with the choice of referral rates. Reducing the referral rate first decreases the short-term referral fee income, thereby reducing the platform's profit. In contrast, from a long-term perspective, the reduction in the referral rate enables more firms to enter the market in its early stages; thus, the platform has exposure to more diverse markets for sales information. This enables platforms that are capable of data acquisition and self-preferencing to monopolize more markets during the second period, thereby enabling them to generate greater profits. Consequently, the platform with these abilities lowers the referral rate compared with that without these abilities. This is because the latter effect is strengthened when the production costs are sufficiently low. The decline in product prices and the diversification of markets than benchmark cases due to such a cut in referral fees have increased consumer surplus and overall social welfare.

Section Ⅱ discusses how to determine an optimal solicitation fee rate for short-term small-value (STSV) insurance carriers when the online insurance product comparison and recommendation platform does or does not have both abilities. Using a simple two-period model, a continuum of STSV insurance carriers is assumed to pass through the platform's marketplace to sell the products. In Section Ⅲ, by simplifying the Section Ⅱ set-up (i.e., assuming the demand function, the random variable, and the parameters), the optimal solicitation fee rate that the platform should charge if it lacks both abilities is examined. Subsequently, the optimal solicitation fee rate that the platform establishes when it has both abilities is evaluated. Next, the impact of the two abilities acquirable by the platform on the optimal solicitation fee rate set by the platform and on the entry decision of STSV insurance carriers is examined using the results of the two previous analyses. Furthermore, the effects of the two abilities on consumer surplus, net profit of the third-party carriers, and total welfare are assessed. Lastly, Section Ⅳ provides a conclusion.

II. Model Environment

There are so-called “fat tail” or niche markets, and in these markets, potential insurers must sell via large online insurance product comparison and recommendation platform. Let the name of that platform be platform M. The mass of these insurers is normalized to one (1) and each market is assumed to be the same except for the market size. Presumably, each insurer knows its exact demand size, but platform M does not. Specifically, the demand for STSV insurance product i is given by $s_i D(p)$, where s_i represents the market size and $D(p)$ satisfies the usual assumption of demand function (that is, $D(p)$ is twice differentiable, greater than or equal to 0 and has a negative derivative on $(0, \infty)$).[2] Platform M knows the distribution of s, which is given by $F(s)$

2) Unlike the general goods market, in the insurance solicitation market, insurance

for $s \in [0, \bar{s}]$. Each product's marginal cost is equal to $c > 0$. It is assumed that platform M charges a so-called "solicitation fee rate" that is proportional to the premium (insurance product price) and common to all STSV insurance products.3) Alternatively, a fixed specific fee per unit sold can be assumed which is independent of the premium. Thus, carrier i's problem can be written as follows:

$$\max_p \underbrace{(1-r)p^* s_i D(p)}_{\text{Total sales}} - \underbrace{c^* s_i D(p)}_{\text{Total variable costs}} = s_i[(1-r)p - c]D(p) \tag{1}$$

Due to our demand specification, the market size is a scaling factor, and the monopoly price is independent of s. Let $p^m(c)$ and $\pi^m(c)$ represent the monopoly price and the monopoly profit associated with the market demand $D(p)$, respectively, where c represents the monopolist's constant marginal cost. Notably, the monopolist's problem can be rewritten as follows:

$$\max_p s_i(1-r)[p - \frac{c}{1-r}]D(p) \tag{2}$$

This implies that given a solicitation fee of r, the optimal price is as follows:

$$p^*(r) = p^m(\frac{c}{1-r}) \tag{3}$$

purchases are decided by premium and consumers' risk type and risk preference. While the risk types of individuals vary, in this research, for the convenience of analysis, it is assumed that individuals' risk types are homogeneous. However, to reflect the real economy, it is assumed that individuals' utility functions are different and that their decisions on insurance purchases may differ in association with premium loadings. More specifically, a downward-sloping demand function $D(p)$, like that for general goods, is assumed. Thus, in this model, if an insurer decreases premium loading for its market strategy, insurance purchases would increase.

3) In general, the platform charges a referral fee from the seller who wants to sell the product on the marketplace. For Amazon, the referral fee rate is 8% to 15% for most categories of products. See https://sellercentral.Amazon.com/help/hub/reference/external/200336920?locale=en.

Moreover, the STSV insurance carrier i's profit can be written as follows:

$$\begin{aligned} s_i\pi^*(r) &= s_i(1-r)[p^*(r) - \frac{c}{1-r}]D(p^*(r)) \\ &= s_i(1-r)[p^m(\frac{c}{1-r}) - \frac{c}{1-r}]D(p^m(\frac{c}{1-r})) \end{aligned} \tag{4}$$

Hence, platform M's profit from the carrier i's solicitation fee can be calculated as follows:

$$\begin{aligned} s_i\pi^M(r) &= s_i r p^*(r) D(p^*(r)) \\ &= s_i r p^m(\frac{c}{1-r}) D(p^m(\frac{c}{1-r})) \\ &= s_i r R(p^m(\frac{c}{1-r})) \end{aligned} \tag{5}$$

Note that $R(p)$ in equation (5) is a revenue function (i.e., $R(p) = pD(p)$). Then, platform M's optimal solicitation fee rate can be derived using the following FOC (first-order condition):

$$\frac{d\pi^M(r)}{dr} = R(p^m(\frac{c}{1-r})) + rR'(p^m(\frac{c}{1-r}))\frac{dp^m(\frac{c}{1-r})}{dr}\frac{c}{(1-r)^2} = 0 \tag{6}$$

Let $\widetilde{R}^0$ be a solution set of (6). If $\pi^M(r)$ is a concave function of $r \in (0,1)$, then $\widetilde{R}^0$ has a unique element $\tilde{r}^0$ that also satisfies SOC (second-order condition, i.e., $\frac{d^2\pi^M(r)}{dr^2}|_{r=\tilde{r}^0} < 0$). Note that $\tilde{r}^0$ is the optimal solicitation fee rate when the commitment is impossible.

Now a fixed entry cost of $K > 0$ is introduced for each insurer, which can be considered a sunk product development cost. Moreover, let $\bar{s}$ be large enough for some STSV insurance carriers to enter the market. To accommodate the possibility of platform M imitating a product and emerging as a competitor, a simple two-period model is considered.[4] Let $\delta \in (0,1]$ be a

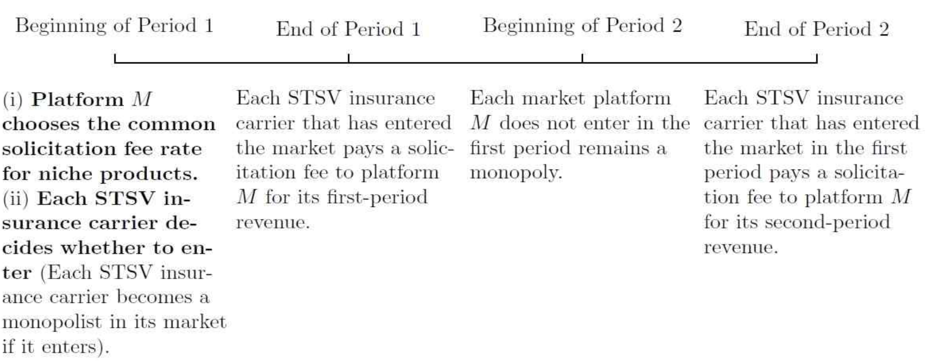
4) Unlike other general platforms, online insurance product comparison and recommendation platforms cannot sell insurance products directly (i.e., they cannot

common discount factor. Moving forward, it is assumed that platform M can have two abilities. One is the ability to access marketing data, which gives information about the market size of each STSV insurance carrier that has entered the market at the beginning of the first period. The other is the ability to prominently feature its own product in the marketplace. Like the third parties, platform M must also incur the fixed product development cost of K to enter the market with a competing product. Note that regardless of whether both abilities are available, the optimal price for each STSV insurance carrier at the beginning of the first period is $p^*(r) = p^m(\frac{c}{1-r})$. Hence, the STSV insurance carrier i's profit is $s_i \pi^*(r)$.

1. Impossible Data Acquisition and Self-Preferencing

First, it is assumed that platform M cannot imitate a product and emerge as a competitor in each market without the two described abilities. Then, the timeline is as shown in Figure 1.

〈Figure 1〉 Impossible Data Acquisition and Self-Preferencing



sell insurance products as insurers). However, in the case of platforms with insurance companies in the form of subsidiaries---for example, Kakao Pay Insurance Corp., a subsidiary of Kakao, sells some insurance products---subsidiary insurance products can be preferred by the parent platform. Although the platform and subsidiary are different corporations, in this study, they are considered one corporation.

Given a solicitation fee rate of r, only insurers whose market size is sufficiently large enter the market without facing a threat of platform M's entry. That is, each insurer's entry condition is as follows:

$$\underbrace{s\pi^{*}(r)}_{\text{First period profit}} + \underbrace{\delta^{*} s\pi^{*}(r)}_{\text{Second period profit}} = (1+\delta)s\pi^{*}(r) \geq K$$
$$\Leftrightarrow s \geq \frac{K}{(1+\delta)\pi^{*}(r)} \tag{7}$$

Moving forward, denote $s^{*}(r) = \min[\frac{K}{(1+\delta)\pi^{*}(r)}, \bar{s}]$. Note that from equation (4) one can see that $s^{*}(r)$ is an increasing function of $r \in (0,1)$, implying that a higher solicitation fee rate discourages entry. Then, when platform M cannot acquire marketing data from independent third parties and sell only its product, it solves the following problem:

$$\max_{r \in (0,1)} \Pi^{NA}(r) = \int_{s^{*}(r)}^{\bar{s}} \underbrace{s\pi^{M}(r)}_{\text{First period profit}} + \underbrace{\delta^{*} s\pi^{M}(r)}_{\text{Second period profit}} dF(s) \tag{8}$$

The optimal solicitation fee rate that considers both the extensive and intensive margins satisfies the following equation:

$$\frac{1}{1+\delta}\frac{d\Pi^{NA}(r)}{dr} = \underbrace{-s^{*}(r)\pi^{M}(r)\frac{ds^{*}(r)}{dr}}_{\text{Extensive margins}} + \underbrace{\int_{s^{*}(r)}^{\bar{s}} s\frac{d\pi^{M}(r)}{dr}dF(s)}_{\text{Intensive margins}} = 0 \tag{9}$$

The first and second terms in the middle of equation (9) capture the extensive margins and intensive margins, respectively. Let $\widetilde{R}^{NA}$ be a solution set of (9). If $\Pi^{NA}(r)$ is a concave function of $r \in (0,1)$, then $\widetilde{R}^{NA}$ has a unique element $\tilde{r}^{NA}$ that also satisfies SOC of (8) (i.e., $\frac{d^2\Pi^{NA}(r)}{dr^2}|_{r=\tilde{r}^{NA}} < 0$). Thus, It is claimed that $\tilde{r}^{NA}$ is the optimal solicitation fee rate for platform M in the absence of the two abilities. The consideration of extensive margins yields the following result.

Proposition 1. If $\pi^{M}(r)$ and $\Pi^{NA}(r)$ are concave functions of $r \in (0,1)$, then $\tilde{r}^{NA} < \tilde{r}^{0}$.

Proof. The extensive margins always have a negative sign because $s^{*}(r)$ is an increasing function of r. Hence, $\frac{d\pi^{M}(r)}{dr}|_{r=\tilde{r}^{0}} = 0$ implies that $\frac{d\Pi^{NA}(r)}{dr}|_{r=\tilde{r}^{0}} < 0$. Therefore, if $\Pi^{NA}(r)$ is a concave function of $r \in (0,1)$, then $\tilde{r}^{NA} < \tilde{r}^{0}$. □

According to Proposition 1, the optimal solicitation fee rate decreases when the commitment is possible. Thus, moving forward, we posit that platform M can commit to maintaining the solicitation fee rate established at the beginning of the first period.[5)]

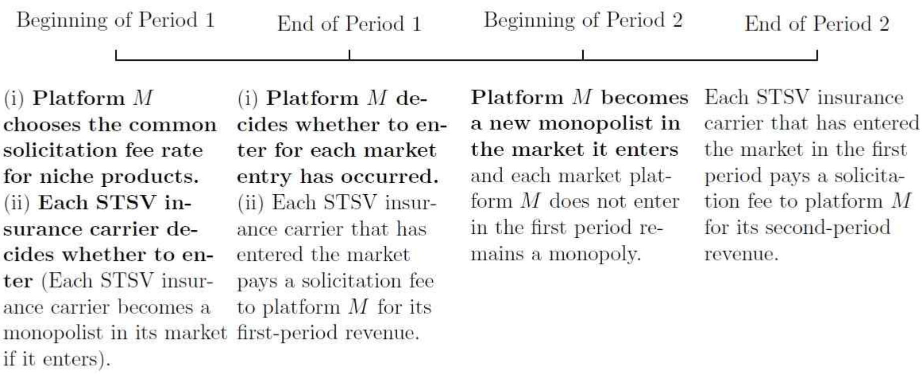
2. Possible Data Acquisition and Self-Preferencing

It is assumed that platform M can access marketing data for third parties (and hence, it can access the market size of each product that has entered a market during the first period). Additionally, platform M is assumed to be incentivized to imitate a product and emerge as a competitor in each market based on each product's precise market size. In the case of entry, it is necessary to simulate how platform M and the incumbent third-party insurers will compete. It is assumed that platform M has an advantage over third parties (for instance, it can prominently feature its own products) and operates as a monopolist. This assumption is natural because once the data is obtained and market entry is the optimal decision, platform M is incentivized to be a

5) In particular, in Korea, online insurance product comparison and recommendation platforms will be supervised by the Financial Services Commission, the Financial Supervisory Service, and the Fair Trade Commission; thus, it is likely that a sudden change in the solicitation fee rate will be impossible.

monopolist in each market to generate the largest possible profit.[6] Then, the timeline is as shown in Figure 2.

〈Figure 2〉 Possible Data Acquisition and Self-Preferencing



At the end of the first period, platform M evaluates each product's market size and decides whether to enter. It will enter a market subject to the following condition holding:

$$\underbrace{s\pi^*(0)-K}_{\text{Net profit at entry}} \geq \underbrace{s\pi^M(r)}_{\text{Net profit at non-entry}} \Leftrightarrow s \geq \frac{K}{\pi^*(0)-\pi^M(r)} \tag{10}$$

Moving forward, denote $s^M(r)=\min[\frac{K}{\pi^*(0)-\pi^M(r)},\bar{s}]$. The entry decision of third-party carriers is considered during the first period. Carriers, with a market size greater than $s^M(r)$, know that platform M will enter during the second period and that their future profits will be end. Due to the threat posed by platform M, they will enter if the following condition is met.

6) For Google, the top 3 organic search results receive more than two-thirds (68.7%) of all clicks on the Google Search page and the number 1 organic search result receives more clicks than results number 3-10 combined. See https://firstpagesage.com/seo-blog/google-click-through-rates-ctrs-by-ranking-position/.

$$s\pi^*(r) \geq K \Leftrightarrow s \geq \frac{K}{\pi^*(r)} \tag{11}$$

Moving forward, denote $s_1^*(r) = \min[\frac{K}{\pi^*(r)}, \bar{s}]$.

Proposition 2. $s_1^*(r) \geq s^M(r)$ for all $r \in (0,1)$.

Proof. Alternatively, here it is shown that $\pi^*(0) - \pi^M(r) \geq \pi^*(r)$. Notably,

$$\begin{aligned}
\pi^M(r) + \pi^*(r) &= rp^m(\frac{c}{1-r})D(p^m(\frac{c}{1-r})) \\
&\quad + (1-r)[p^m(\frac{c}{1-r}) - \frac{c}{1-r}]D(p^m(\frac{c}{1-r})) \\
&= [p^m(\frac{c}{1-r}) - c]D(p^m(\frac{c}{1-r})) \\
&\leq [p^m(c) - c]D(p^m(c)) \text{ (by a revealed preference argument)} \\
&= \pi^*(0).
\end{aligned}$$

Therefore, $s_1^*(r) \geq s^M(r)$ for all $r \in (0,1)$. □

Due to the threat of platform M's entry, Proposition 2 implies that only carriers whose market share is greater than $s_1^*(r)$ enter the market; whereas those whose market size belongs to $(s^M(r), s_1^*(r))$ refrain from entry.7) Thus, platform M loses potential revenue from the solicitation fee for the latter type of carrier.

Proposition 3. Assume that $\lim_{r\to 0}\pi^M(r) = \lim_{r\to 1}\pi^M(r) = \lim_{r\to 1}\pi^*(r) = 0$. If $f(r) = \pi^*(0) - \pi^M(r) - (1+\delta)\pi^*(r)$ is an increasing function of $r \in (0,1)$, then a unique $\hat{r} \in (0,1)$ exists such that $s^*(r) = s^M(r)$. Moreover, for that $\hat{r}$, $sign(s^*(r) - s^M(r)) = sign(r - \hat{r})$ is always satisfied for any $r \in (0,1)$.

Proof. First, it is easy to verify that $\lim_{r\to 0} f(r) = -\delta\pi^*(0) < 0$ and $\lim_{r\to 1} f(r) = \pi^*(0) > 0$.

Hence, if $f(r)$ is an increasing function of $r \in (0,1)$, then there exists a

7) Given that the Lebesque measure of the boundary value is 0, we can ignore the decision-making of the STSV insurance carrier whose market size is the exact boundary value. Therefore, it does not matter whether an open interval, a closed interval, or a half-open interval is used.

unique $\hat{r} \in (0,1)$ such that $s^*(r) = s^M(r)$ by the intermediate value theorem. Additionally, note that

$$\begin{aligned} s^*(r) - s^M(r) &= \frac{K}{(1+\delta)\pi^*(r)} - \frac{K}{\pi^*(0) - \pi^M(r)} \\ &= \frac{[\pi^*(0) - \pi^M(r) - (1+\delta)\pi^*(r)]K}{(1+\delta)\pi^*(r)[\pi^*(0) - \pi^M(r)]} \\ &= \frac{f(r)K}{(1+\delta)\pi^*(r)[\pi^*(0) - \pi^M(r)]} \end{aligned}$$

Therefore, $sign(s^*(r) - s^M(r)) = sign(r - \hat{r})$ is satisfied for any $r \in (0,1)$. □

Based on Proposition 3, two cases that depend on the solicitation fee rate set by platform M can now be considered.

1) Case 1: $r \geq \hat{r} \Leftrightarrow s^M(r) \leq s^*(r) \leq s_1^*(r)$

In this case, only insurers whose market size is greater than $s_1^*(r)$ enter the market during the first period, while platform M enters with a competing product during the second period. Thus, platform M's problem can be written as follows:

$$\max_{r \in (0,1)} \Pi^{A1}(r) = \int_{s_1^*(r)}^{\bar{s}} \underbrace{s\pi^M(r)}_{\text{First period profit}} + \underbrace{\delta * (s\pi^*(0) - K)}_{\text{Second period profit}} dF(s) \tag{12}$$

Let $\widetilde{R}^{A1}$ be a solution set of (12). If $\Pi^{A1}(r)$ is a concave function of $r \in (0,1)$, then $\widetilde{R}^{A1}$ has a unique element $\tilde{r}^{A1}$ which also satisfies SOC of (12) (i.e., $\frac{d^2\Pi^{A1}(r)}{dr^2}|_{r=\tilde{r}^{A1}} < 0$). In this case, it is claimed that $\tilde{r}^{A1}$ is the optimal solicitation fee rate for platform M. Then, for this case to be realized, $\tilde{r}^{A1} \geq \hat{r}$ must be satisfied.

2) Case 2: $r \leq \hat{r} \Leftrightarrow s^*(r) \leq s^M(r) \leq s_1^*(r)$

In this case, a gap exists in the types of insurers entering the market.

Insurers whose market size is greater than $s_1^*(r)$ enter the market during the first period as in the previous case. However, insurers whose market size belongs to $(s^*(r), s^M(r))$ also enter the market. In contrast, those whose market size is in the intermediate range of $(s^M(r), s_1^*(r))$ do not enter the market because they anticipate the future entry of platform M. Thus, platform M's problem can be stated as follows:

$$\max_{r \in (0,1)} \Pi^{A2}(r) = \underbrace{\int_{s^*(r)}^{s^M(r)} \underbrace{s\pi^M(r)}_{\text{First period profit}} + \underbrace{\delta^* s\pi^M(r)}_{\text{Second period profit}} \, dF(s)}_{\text{Low demand}} + \underbrace{\int_{s_1^*(r)}^{\bar{s}} \underbrace{s\pi^M(r)}_{\text{First period profit}} + \underbrace{\delta^*(s\pi^*(0) - K)}_{\text{Second period profit}} dF(s)}_{\text{High demand}} \tag{13}$$

Let $\widetilde{R}^{A2}$ be a solution set of (13). If $\Pi^{A2}(r)$ is a concave function of $r \in (0,1)$, then $\widetilde{R}^{A2}$ has a unique element $\tilde{r}^{A2}$ that also satisfies SOC of (13) (i.e., $\frac{d^2\Pi^{A2}(r)}{dr^2}|_{r=\tilde{r}^{A2}} < 0$). In this case, it is claimed that $\tilde{r}^{A2}$ is the optimal solicitation fee rate for platform M. Then, for this case to be realized, $\tilde{r}^{A2} \le \hat{r}$ must be satisfied.

Finally, platform M's problem can be constructed when platform M has both abilities of acquiring independent third parties' marketing data and selling only its product. Denote $\Pi^A(r)$ as follows:

$$\Pi^A(r) = \begin{cases} \Pi^{A1}(r) & \text{if } r \ge \hat{r} \\ \Pi^{A2}(r) & \text{if } r \le \hat{r} \end{cases}$$

Then, platform M solves the following problem:

$$\max_{r \in (0,1)} \Pi^A(r) \tag{14}$$

Let $\widetilde{R}^A$ be a solution set of (14). If $\widetilde{R}^A$ has a unique element, call it $\tilde{r}^A$.

Ⅲ. Numerical Example

Thus, moving forward, $D(p)$ is assumed to be a constant price elasticity demand function with a price elasticity of 2 (i.e., $D(p)=\frac{1}{p^2}$). Because each optimization problem cannot be solved without making assumptions regarding the distribution of s, an additional assumption on the distribution of s is needed. In particular, the uniform distribution between 0 and 1 (i.e., $F(s)=s$ where $s\in[0,1]$) is assumed, which is most familiar. Moreover, it is assumed that δ is equal to one. Then, one can observe the following facts.

Fact 1. Let $D(p)=\frac{1}{p^2}$, $s\sim \mathrm{Unif}[0,1]$ and $\delta=1$. Then,

$$\tilde{r}^0=\frac{1}{2},\ p^*(r)=\frac{2c}{1-r},\ \pi^*(r)=\frac{(1-r)^2}{4c},\ \pi^M(r)=\frac{r(1-r)}{2c}.$$

Fact 2. Let $D(p)=\frac{1}{p^2}$, $s\sim \mathrm{Unif}[0,1]$ and $\delta=1$. Then,

$$s^*(r)=\min[\frac{2cK}{(1-r)^2},1],\ s^M(r)=\min[\frac{4cK}{1-2r(1-r)},1],\ s_1^*(r)=\min[\frac{4cK}{(1-r)^2},1].$$

Using Fact 1, one can verify that $\lim_{r\to 0}\pi^M(r)=\lim_{r\to 1}\pi^M(r)=\lim_{r\to 1}\pi^*(r)=0$ and $f(r)=\pi^*(0)-\pi^M(r)-(1+\delta)\pi^*(r)=\frac{2r-1}{4c}$ is an increasing function of r. Hence, $\hat{r}=\frac{1}{2}$ is uniquely determined by Proposition 3. For now, the case where cK (a simple product of marginal cost and entry cost) is small enough to allow platform M with both abilities to enter some markets at the optimal decision is considered.

Fact 3. Let $D(p)=\frac{1}{p^2}$, $s\sim \mathrm{Unif}[0,1]$ and $\delta=1$. For sufficiently small cK (e.g., $cK\in(0,\frac{1}{13}]$), $\Pi^{NA}(r)$, $\Pi^{A1}(r)$, and $\Pi^{A2}(r)$ are concave functions of

$r \in (0,1)$. Moreover, $\widetilde{R}^A$ has a unique element. That is, a unique $\tilde{r}^A$ exists which solves (14).

Notably, because $\Pi^A(\tilde{r}^A)$ is greater than $\Pi^{NA}(\tilde{r}^{NA})$ for sufficiently small cK, platform M has an incentive to demonstrate two abilities when production costs are sufficiently low.

1. Impossible Data Acquisition and Self-Preferencing

If platform M cannot access the third-party marketing data of each carrier that has entered a market and it has to compete with Bertrand price competition within each entered market, platform M can solve the following problem:

$$\max_{r \in (0,1)} \Pi^{NA}(r) = \int_{\min[\frac{2cK}{(1-r)^2},1]}^{1} \underbrace{s\frac{r(1-r)}{2c}}_{\text{First period profit}} + \underbrace{s\frac{r(1-r)}{2c}}_{\text{Second period profit}} ds \tag{15}$$

Fact 4. For the given $cK \in (0, \frac{1}{2}]$, $(cK)^2 = \frac{(1-2r)(1-r)^4}{4(1+2r)}$ has a unique solution in $r \in (0,1)$. Thus, $\tilde{r}^{NA}$ can be defined as follows:

$$\tilde{r}^{NA} \equiv \tilde{r}^{NA}(cK) = \left\{ r \in (0,1) | (cK)^2 = \frac{(1-2r)(1-r)^4}{4(1+2r)} \right\}$$

Table 1 shows the optimal values visually.

〈Table 1〉 Optimal Values When Platform M Does Not Have Both Abilities

cK	$\tilde{r}^{NA}$	$s^*(\tilde{r}^{NA})$	$400c \times \Pi^{NA}(\tilde{r}^{NA})$
1/4	0.162771	0.713315	13.387307
1/5	0.209426	0.639993	19.550437
1/6	0.240590	0.577998	24.333526
1/7	0.273436	0.541233	28.094421
1/8	0.296608	0.505295	31.072636
1/9	0.315959	0.474923	33.476126
1/10	0.332391	0.448731	35.444837
1/11	0.346532	0.425783	37.078913
1/12	0.358835	0.405424	38.451162
1/13	0.369638	0.387174	39.615452
1/14	0.379197	0.370676	40.612324
1/15	0.387713	0.355655	41.472777
1/16	0.395342	0.341893	42.220862
1/17	0.402212	0.329220	42.875487
1/18	0.408426	0.317497	43.451695
1/19	0.414069	0.306608	43.961584
1/20	0.419212	0.296459	44.414985
1/21	0.423914	0.286970	44.819951
1/22	0.428226	0.278073	45.183142
1/23	0.432190	0.269709	45.510100
1/24	0.435843	0.261830	45.805474
1/25	0.439218	0.254391	46.073186
1/100	0.499364	0.025234	49.968081
1/1000	0.499994	0.002530	49.999680
1/2000	0.499998	0.001265	49.999920

2. Possible Data Acquisition and Self-Preferencing

When platform M can access the third-party marketing data of each market-entered carrier and become a monopolist for each market, there are two cases as observed in Section Ⅱ, which depend on the solicitation fee rate set by platform M.

1) Case 1: $r \geq \hat{r} \Leftrightarrow s^M(r) \leq s^*(r) \leq s_1^*(r)$

In this case, platform M solves the following problem:

$$\max_{r \in (0,1)} \Pi^{A1}(r) = \int_{\min[\frac{4cK}{(1-r)^2},1]}^{1} \underbrace{s\frac{r(1-r)}{2c}}_{\text{First period profit}} + \underbrace{s\frac{1}{4c} - K}_{\text{Second period profit}} ds \tag{16}$$

Fact 5. For the given $cK \in (0, \frac{1}{4}]$, $(cK)^2 = \frac{(1-2r)(1-r)^5}{16(1+5r-4r^2)}$ has a unique solution in $r \in (0,1)$. Thus, $\tilde{r}^{A1}$ can be defined as follows:

$$\tilde{r}^{A1} \equiv \tilde{r}^{A1}(cK) = \left\{ r \in (0,1) | (cK)^2 = \frac{(1-2r)(1-r)^5}{16(1+5r-4r^2)} \right\}$$

Table 2 shows the optimal values visually.

〈Table 2〉 Optimal Values When Platform M Has Both Abilities (Case 1)

cK	$\tilde{r}^{A1}$	$s_1^*(\tilde{r}^{A1})$	$400c \times \Pi^{A1}(\tilde{r}^{A1})$
1/4	0.000000	1.000000	0.000000
1/5	0.038393	0.865157	2.716257
1/6	0.071067	0.772574	7.656061
1/7	0.099163	0.704157	12.806503
1/8	0.123599	0.650975	17.602201
1/9	0.145078	0.608085	21.909977
1/10	0.164139	0.572522	25.734485
1/11	0.181197	0.542386	29.122198
1/12	0.196580	0.516409	32.128214
1/13	0.210529	0.493679	34.804845
1/14	0.223262	0.473569	37.198198
1/15	0.234942	0.455596	39.347685
1/16	0.245703	0.439395	41.286588
1/17	0.255657	0.424683	43.042893
1/18	0.264900	0.411239	44.640143
1/19	0.273509	0.398883	46.098195
1/20	0.281554	0.387473	47.433862

1/21	0.289090	0.376887	48.661438
1/22	0.296168	0.367028	49.793135
1/23	0.302830	0.357812	50.839436
1/24	0.309116	0.349171	51.809380
1/25	0.315056	0.341044	52.710798
1/100	0.493986	0.049401	73.610935
1/1000	0.499936	0.005058	74.872229
1/2000	0.499984	0.002530	74.936434

One can easily confirm that the optimal solicitation fee rate, $\tilde{r}^{A1}$, is less than $\hat{r}=\frac{1}{2}$ when cK is sufficiently small. Therefore, this case cannot be realized.

2) Case 2: $r \leq \hat{r} \Leftrightarrow s^*(r) \leq s^M(r) \leq s_1^*(r)$

In this case, platform M solves the following problem:

$$\max_{r\in(0,1)} \Pi^{A2}(r) = \underbrace{\int_{\min[\frac{2cK}{(1-r)^2},1]}^{\min[\frac{4cK}{1-2r(1-r)},1]} \underbrace{s\frac{r(1-r)}{2c}}_{\text{First period profit}} + \underbrace{s\frac{r(1-r)}{2c}}_{\text{Second period profit}} ds}_{\text{Low demand}} + \underbrace{\int_{\min[\frac{4cK}{(1-r)^2},1]}^{1} \underbrace{s\frac{r(1-r)}{2c}}_{\text{First period profit}} + \underbrace{s\frac{1}{4c}-K}_{\text{Second period profit}} ds}_{\text{High demand}} \tag{17}$$

Fact 6. For the given $cK\in(0,\infty]$,

$$(cK)^2 = \frac{(1-2r)(1-r)^5(1-2r+2r^2)}{8[(1-2r+2r^2)^3(3+11r-10r^2)-4(1-2r)(1+2r-2r^2)(1-r)^5]}$$

has a unique solution in $r\in(0,1)$. Thus, $\tilde{r}^{A2}$ can be defined as follows:

$$\tilde{r}^{A2} \equiv \tilde{r}^{A2}(cK) = \left\{ r\in(0,1) | (cK)^2 = \frac{(1-2r)(1-r)^5(1-2r+2r^2)}{8[(1-2r+2r^2)^3(3+11r-10r^2)-4(1-2r)(1+2r-2r^2)(1-r)^5]} \right\}$$

Table 3 shows the optimal values visually.

〈Table 3〉 Optimal Values When Platform M Has Both Abilities (Case 2)

cK	$\tilde{r}^{A2}$	$s^{*}(\tilde{r}^{A2})$	$s^{M}(\tilde{r}^{A2})$	$s_1^{*}(\tilde{r}^{A2})$	$400c\times \Pi^{A2}(\tilde{r}^{A2})$
1/4	0.148418	0.689473	1.000000	1.000000	13.261542
1/5	0.163194	0.571229	1.000000	1.000000	18.400249
1/6	0.177150	0.492309	0.941003	0.984617	19.695138
1/7	0.190161	0.435647	0.825763	0.871294	23.553326
1/8	0.202242	0.392824	0.738204	0.785647	27.200714
1/9	0.213456	0.359204	0.669127	0.718408	30.505025
1/10	0.223881	0.332027	0.613042	0.664054	33.456741
1/11	0.233596	0.309544	0.566463	0.619087	36.085001
1/12	0.242673	0.290591	0.527064	0.581182	38.428400
1/13	0.251176	0.274364	0.493234	0.548728	40.524766
1/14	0.259164	0.260290	0.463819	0.520580	42.407898
1/15	0.266686	0.247947	0.437969	0.495894	44.106897
1/16	0.273786	0.237018	0.415044	0.474035	45.646434
1/17	0.280501	0.227259	0.394551	0.454518	47.047317
1/18	0.286865	0.218481	0.376104	0.436962	48.327085
1/19	0.292908	0.210535	0.359398	0.421070	49.500556
1/20	0.298656	0.203300	0.344187	0.406600	50.580294
1/21	0.304132	0.196679	0.330270	0.393357	51.577002
1/22	0.309356	0.190589	0.317481	0.381179	52.499833
1/23	0.314347	0.184967	0.305682	0.369933	53.356660
1/24	0.319120	0.179754	0.294758	0.359507	54.154282
1/25	0.323692	0.174904	0.284612	0.349809	54.898598
1/100	0.492881	0.024593	0.025293	0.049186	73.612551
1/1000	0.499923	0.002529	0.002530	0.005058	74.872229
1/2000	0.499981	0.001265	0.001265	0.002530	74.936434

Table 3 confirms that the optimal solicitation fee rate, $\tilde{r}^{A2}$, is less than $\hat{r}=\frac{1}{2}$. Therefore, $\tilde{r}^{A2}$ is the optimal solicitation fee rate when platform M can access marketing data for third parties and can be a monopolist for each product. Moving forward, $\tilde{r}^{A2}$ is denoted as $\tilde{r}^{A}$.

3. The Impact of Two Abilities on Each Group

When platform M has two capabilities, verifying that the optimal solicitation fee rate is reduced (i.e., $\tilde{r}^{A} < \tilde{r}^{NA}$) is straightforward. This statement can be justified as follows. First, reducing the solicitation fee rate decreases two-period solicitation fees from STSV insurance carriers with low demand and a one-period solicitation fee from STSV insurance carriers with high demand. However, reducing the solicitation fee leads to more STSV insurance carriers entering than before. Hence, the range where platform M can monopolize during the second period is wider than before, which is achieved by reducing the solicitation fee rate. Finally, if the second (first) effect is greater, then platform M reduces (increases) the optimal solicitation fee rate when it has both abilities. At this time, because there are few or no ranges of high demand when platform M sets $\tilde{r}^{NA}$ with both abilities, platform M can increase two-period profit by decreasing the solicitation fee rate. Therefore, $\tilde{r}^{A} < \tilde{r}^{NA}$ is always satisfied when a simple product of two costs, cK, is sufficiently small.

For the remainder of this subsection, the effect of two abilities on consumer surplus, net profit of STSV insurance carriers, and total welfare (including platform M's profit) are analyzed. For each $r \in (0,1)$, one-period consumer surplus in each market i can be expressed as follows:

$$\int_{p^{m}\left(\frac{c}{1-r}\right)}^{\infty} s_i \frac{1}{p^2} dp = s_i \frac{1}{p^{m}\left(\frac{c}{1-r}\right)} = s_i \frac{1-r}{2c} \tag{18}$$

Tables 4 and Table 5 show the visual impact of data acquisition and self-preferencing exposures enabled by platform M on each group.

〈Table 4〉 Impact of Two Abilities on the Optimal Values

cK	$\tilde{r}^{NA}$	$\tilde{r}^{A}$	$s^{*}(\tilde{r}^{NA})$	$s^{*}(\tilde{r}^{A})$	$s^{M}(\tilde{r}^{A})$	$s_1^{*}(\tilde{r}^{A})$
1/4	0.162771	0.148418	0.713315	0.689473	1.000000	1.000000
1/5	0.209426	0.163194	0.639993	0.571229	1.000000	1.000000
1/6	0.240590	0.177150	0.577998	0.492309	0.941003	0.984617
1/7	0.273436	0.190161	0.541233	0.435647	0.825763	0.871294
1/8	0.296608	0.202242	0.505295	0.392824	0.738204	0.785647
1/9	0.315959	0.213456	0.474923	0.359204	0.669127	0.718408
1/10	0.332391	0.223881	0.448731	0.332027	0.613042	0.664054
1/11	0.346532	0.233596	0.425783	0.309544	0.566463	0.619087
1/12	0.358835	0.242673	0.405424	0.290591	0.527064	0.581182
1/13	0.369638	0.251176	0.387174	0.274364	0.493234	0.548728
1/14	0.379197	0.259164	0.370676	0.260290	0.463819	0.520580
1/15	0.387713	0.266686	0.355655	0.247947	0.437969	0.495894
1/16	0.395342	0.273786	0.341893	0.237018	0.415044	0.474035
1/17	0.402212	0.280501	0.329220	0.227259	0.394551	0.454518
1/18	0.408426	0.286865	0.317497	0.218481	0.376104	0.436962
1/19	0.414069	0.292908	0.306608	0.210535	0.359398	0.421070
1/20	0.419212	0.298656	0.296459	0.203300	0.344187	0.406600
1/21	0.423914	0.304132	0.286970	0.196679	0.330270	0.393357
1/22	0.428226	0.309356	0.278073	0.190589	0.317481	0.381179
1/23	0.432190	0.314347	0.269709	0.184967	0.305682	0.369933
1/24	0.435843	0.319120	0.261830	0.179754	0.294758	0.359507
1/25	0.439218	0.323692	0.254391	0.174904	0.284612	0.349809
1/100	0.499364	0.492881	0.025234	0.024593	0.025293	0.049186
1/1000	0.499994	0.499923	0.002530	0.002529	0.002530	0.005058
1/2000	0.499998	0.499981	0.001265	0.001265	0.001265	0.002530

〈Table 5〉 Impact of Two Abilities on Each Group

cK	Π^{NA}	Π^{NA}	CS^{NA}	CS^{A}	Π^{NA}_{NF}	Π^{A}_{NF}	TW^{NA}	TW^{A}
1/4	13.387307	13.261542	82.246267	89.352656	34.429480	38.045557	130.063054	140.659755
1/5	19.550437	18.400249	93.352480	112.750767	36.901022	47.175259	149.803939	178.326274
1/6	24.333526	19.695138	101.141055	111.402936	38.403764	44.577910	163.878346	175.675984
1/7	28.094421	23.553326	102.745875	123.293335	37.325727	40.171499	168.166023	187.018160
1/8	31.072636	27.200714	104.759937	131.137023	36.843651	37.040384	172.676224	195.378122
1/9	33.476126	30.505025	105.950854	136.583874	36.237364	34.684603	175.664344	201.773502
1/10	35.444837	33.456741	106.635971	140.514995	35.595567	32.834397	177.676374	206.806133
1/11	37.078913	36.085001	106.999968	143.437449	34.960528	31.332258	179.039408	210.854708
1/12	38.451162	38.428400	107.155550	145.661446	34.352194	30.080518	179.958905	214.170364
1/13	39.615452	40.524766	107.173644	147.385934	33.779096	29.015498	180.568192	216.926198
1/14	40.612324	42.407898	107.100857	148.742697	33.244267	28.093646	180.957447	219.244241
1/15	41.472777	44.106897	106.967723	149.823269	32.747473	27.284541	181.187973	221.214707
1/16	42.220862	45.646434	106.795793	150.692124	32.287465	26.566027	181.304120	222.904585
1/17	42.875487	47.047317	106.599224	151.396411	31.861869	25.921762	181.336580	224.365490
1/18	43.451695	48.327085	106.388170	151.970610	31.468238	25.339190	181.308103	225.636885
1/19	43.961584	49.500556	106.169707	152.440680	31.104061	24.808568	181.235353	226.749804
1/20	44.414985	50.580294	105.948744	152.826608	30.766879	24.322259	181.130608	227.729162
1/21	44.819951	51.577002	105.728878	153.143919	30.454463	23.874152	181.003292	228.595073
1/22	45.183142	52.499833	105.512374	153.404922	30.164616	23.459331	180.860133	229.364086
1/23	45.510100	53.356660	105.301141	153.619138	29.895520	23.073664	180.706762	230.049462
1/24	45.805474	54.154282	105.096271	153.794663	29.645398	22.713886	180.547144	230.662831
1/25	46.073186	54.898598	104.898219	153.937294	29.412517	22.376978	180.383922	231.212870
1/100	49.968081	73.612551	100.063444	150.350833	25.047681	12.828274	175.079206	236.791659
1/1000	49.999680	74.872229	100.000560	150.003863	25.000440	12.503530	175.000680	237.379623
1/2000	49.999920	74.936434	100.000240	150.000940	25.000160	12.500870	175.000320	237.438245

Note: For the convenient value comparison, all values are multiplied by $400c$.

Thus, it can be concluded that the platform's two abilities are not always socially harmful. This is because by lowering the platform's optimal solicitation fee rate, these abilities increase the consumer surplus and total welfare. Moreover, these abilities enable STSV insurance carriers facing low demand ($s \in (s^*(\tilde{r}^A), s^*(\tilde{r}^{NA}))$) to enter the market during the first period, which would be impossible without these abilities. As may be expected, there are also negative effects of net STSV insurance carriers' profit decreasing and STSV insurance carriers with intermediate-sized demand ($s \in (s^M(\tilde{r}^A), s_1^*(\tilde{r}^A))$) being blocked from entry during the first period.

Ⅳ. Conclusion

The platform's ability to conduct data acquisition and self-preferencing based on market power can be evaluated as harmful to both consumers and STSV insurance carriers. However, if the marginal cost and entry cost are sufficiently low, then the optimal solicitation fee rate will be reduced when the platform demonstrates both abilities; thereby resulting in lower product prices in each niche market. As a result, this lowered product price enables consumers to achieve more consumer surplus than before. Additionally, the platform's two abilities expand the market scope where first-period entry occurs by enabling the entry of STSV insurance carriers facing low demand which would not be possible without the two abilities. Therefore, it positively impacts total welfare. However, despite there being positive impacts on consumer surplus and total welfare, there are a few drawbacks that require consideration. The potential for second-period market entry of the platform stemming from its two abilities threatens STSV insurance carriers facing intermediate-sized demand, thereby preventing them from entering the market at the end of the first period. In other words, there is also a negative impact on total welfare. At this time, from the overall perspective of STSV insurance carriers, the negative impact of the platform's two abilities is greater than their positive impact. Ultimately, STSV insurance carriers' overall profit margin decreases when the platform can demonstrate both abilities. However, consumer surplus and total welfare are improved mainly due to the reduced solicitation fee rate.

In Korea, the Financial Services Commission and the Financial Supervisory Service are currently preparing regulations on algorithm verification, solicitation fee limitation and transparency for insurance product comparison and recommendation platforms, prevention of specific bias, abuse of superior status, and fairness of alliance procedures to ensure that consumer protection is thoroughly conducted. These regulations may prevent winner-takes-all market structures and establish and maintain order to revitalize public competition. However, they may negatively affect consumer welfare by hindering innovation due to excessive regulations.

Furthermore, regarding welfare, online insurance product comparison and recommendation platform's data acquisition and self-preferencing were found to be able to improve the consumer's surplus and total welfare.

However, this paper's main findings stem from the assumption that only two periods exist, and that the platform cannot commit to changing the initial solicitation fee rate in the next period in the case where the online insurance product comparison and recommendation platform can demonstrate two abilities. If the period in which the platform can act as a monopoly in each market is extended or the platform can change the solicitation fee rate set in the first period, an anti-competitive welfare effect may arise. Therefore, regulatory agencies should continually monitor for adverse long-term effects on consumers, and it will be necessary to allow solicitation fee rate increases only when the regulatory agency approves. In summary, efficiency could be increased if the future direction of regulation on solicitation fee rates changes from the fee cap to a regulation that permits solicitation fee rates to be changed with the regulators' approval.

Ultimately, rather than unconditionally introducing new regulations on platforms, such as an upper limit on solicitation fee rates, policymakers must find the right balance between the benefits and losses associated with potential anti-competitive behavior.

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요 약

본 연구는 두 기간 모형을 이용하여 빅테크 플랫폼의 데이터 획득 및 자사 우대 행위가 소액단기보험회사의 시장 진입 의사결정에 미치는 영향을 분석한다. 온라인 보험상품 비교·추천 플랫폼이 소액단기보험회사의 판매 데이터에 접근할 수 있고 생산비용이 저렴한 경우, 플랫폼의 소액단기보험회사 대비 우위를 점할 수 있는 능력은 소액단기보험회사가 직면하는 수요 크기에 따라 다양한 방식으로 시장 진입 의사결정에 영향을 미친다. 구체적으로, 플랫폼의 두 가지 능력(데이터 획득 및 자사 우대 행위)으로 인해 수요가 적은 소액단기보험회사의 시장 진입은 증가하는 반면, 플랫폼의 잠재적인 진입 가능성으로 중간 규모의 수요를 지닌 소액단기보험회사의 시장 진입은 일부 저지된다. 후생 분석 결과, 앞선 플랫폼의 두 가지 능력은 플랫폼의 균형 모집수수료율을 감소시킴으로써 소비자잉여와 사회 후생을 향상시켰으나, 소액단기보험회사의 총이윤은 낮추었다.

국문색인어: 데이터 접근, 자사 우대, 양면 플랫폼, 수수료, 소액단기보험