Hitotsubashi Journal of Economics 52 (2011), pp.185-198.

ANTI-COMPETITIVENESS OF INSTANT MESSENGER TYING BY MICROSOFT

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Received January 2011; Accepted July 2011

Abstract

In this paper, we theoretically analyze Microsoft's tying practice in the instant messenger market. Using a model that highlights distinct features of the instant messenger, which are different from the cases of the web browser and the media player, we show that Microsoft can leverage its monopoly power in the operating system (OS) market to the instant messenger market through tying strategy. Microsoft's messenger tying hurts consumers because it enables Microsoft to monopolize messenger market and so fully exploit consumer's willingness to pay to the OS-messenger bundle. However, since tying saves installing costs, consumer loss is not so serious that total surplus improves under messenger tying. Finally we show that such results are robust to the possibilities of multi-homing in the instant messenger market.

Keywords: Microsoft, instant messenger, tying, foreclosure, multi-homing
JEL Classification: L12, L41, L86

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I. *Introduction*

In recent years, Microsoft's bundling behavior has become an important issue in applications software markets. Particularly the lawsuits against Microsoft's tying practices in US for the web browser and in EU for the media player have provoked significant attentions from lawyers, politicians, economists, and etc.[1]

A similar case, meanwhile, has occurred in Korea, which has one of the highest diffusion rate of high-speed Internet network in the world[2]; Daum Communications (Daum), a domestic instant messenger service provider, accused Microsoft of its alleged bundling, contending that Microsoft was attempting to monopolize Korean instant messenger market by selling Windows XP tied with the Windows Messenger, virtually the same product as Microsoft's MSN Messenger.[3] Actually the market share of MSN Messenger in Korea was only 13% when Microsoft first launched Windows XP at the end of 2000, however, had increased even up to 70% during the next four years. The question is whether such a tipping toward MSN Messenger in Korea was due to the Microsoft's tying behavior and/or whether it was anti-competitive, just as in the cases of web browser in US and media player in EU.[4]

The instant messenger market, even though it inevitably shares many common features with web browser and media player markets, also has several unique characters so that we can directly apply neither existing theories of tying nor the experiences of the web browser and the media player markets. Therefore, let us briefly illustrate the main characteristics of the instant messenger market, particularly focusing on some key features distinct from the web browser and the media player markets.

First, since instant messenger's main function is enabling its users to communicate with one another, it has not only indirect but strong direct network externalities, while only indirect network externalities exist in the web browser and in the media player markets. Second, what makes such direct network externalities have even more significant importance is the fact that there is no compatibility among different messenger programs in Korea. Without compatibility, the network size becomes an powerful strategic variable, probably more effective than price and quality, in inducing customers.[5] The special importance of the direct network externality in the instant messenger market, together with the incompatibility constraint, is the main difference from the cases of web browser and the media player.

Third, the price of the instant messenger programs is zero, like web browser, in the sense that they can be downloaded from the Internet for free. Zero price can be an optimal pricing

[1] While the web browser case in US has not been finished yet, at least officially, EU Commission has adjudicated Microsoft guilty for the case of media player.

[2] As of 1999, among the countries with more than 10 million Internet users, Korea has the highest Internet diffusion rate. See Dholakia et al. (2003) for details.

[3] The instant messenger provides users with real-time communications services, unlike e-mail.

[4] On 7th December 2005, the Korea Fair Trade Commission decided to levy fines against Microsoft, and ordered the company to sell, for the next 10 years, both Media Player and Windows Messenger separately from Windows or otherwise allow its rival companies' products as tied-in items together with Microsoft's products. In response to this measure, Microsoft had appealed to the higher court, but recently in October 2007, withdrew the appeal.

[5] In fact, Microsoft has demanded the compatibility among instant messengers in US where the instant messenger market was somewhat pre-empted by AOL, however in Korea, Microsoft is technically preventing other instant messengers from being compatible with MSN Messenger.

strategy since the instant messenger has dual sources of making profit, that is, is a two-sided market, just like newspapers, magazines, TV broadcasting markets; firms might earn more profits indirectly via advertising on the basis of the number of its customers, that is, the network size, than directly from the subscription fees. Thus, Microsoft can have a strong incentive to capture the instant messenger market even though consumers use the messenger program for free.[6]

Finally, as in the cases of web browser and media player, however, differently from the standard tying cases in literature, tying Windows Messenger with Windows XP cannot directly foreclose other competitors from the market since customers can easily and freely substitute any other instant messenger program for the pre-installed Windows Messenger without any technical problem.[7] That direct foreclosure via tying is impossible is also very important in analyzing tying effect in the instant messenger market.

Tying, or tie-in sale, has been thoroughly investigated by a number of economists, focusing on monopolist's incentive and its welfare effect; i.e., whether firms can gain any additional profits through tying, and whether it is harmful or not for consumers and for the whole society. The conventional conjecture, known as the leverage theory, is that a monopolist with market power can possibly obtain higher profits by forcing his consumers to purchase the tied product together, that is, by leveraging its monopoly power to the tied market.

However, this seemingly innocuous leverage theory has faced strong criticism; particularly the Chicago school economists point out that there is only one monopoly profit obtainable regardless of tying or independent selling, in case that the tied product market is competitive. For example, Posner (1976) contends that the monopolist cannot benefit from tying when the tied product is a complementary good of the primary (or tying) product, as in the cases of instant messenger, web browser, and media player. The reason is that, if a monopolist charges a higher price on his tied product than the competitive market price level, then consumers will regard the increase of the tied product price as the increase of the tying product price and so will buy less of the primary product. In this case, therefore, the monopolist will have no incentive to employ tying.[8]

Whinston (1990) notices the importance of the market structure in predicting tying effect and shows that, if the tied market is oligopolistic and the tying good is not essential for the use of tied good, the monopolist can exclude the rivals and earn higher profits in the tied good market through tying, contrary to the Chicago argument. However, Whinston also re-confirms Posner's contention for the case that tying and tied products are complementary in fixed proportions, which is more relevant assumption to analyze OS and applications software together. The intuition is that, if a monopolist's tying product is essential for the tied products, monopolist can always extract maximum profits from the complementary product simply by putting consumers' surplus into the price of his primary product. Actually, the monopolist

[6] Making profit from advertising may not be the only reason to monopolize instant messenger market. Protecting monopoly position in the OS market may be the other reason as in Carlton and Waldman (2002).

[7] That is, customers can easily switch to other instant messengers at the expense of some extra installing costs, which involve a series of costs that the consumers need to pay to actually use the product. For instance, in order to use DAUM instant messenger instead of pre-installed MSN Messenger, one needs to connect to the Internet, to find the Web sites that freely offer DAUM instant messenger program, and to download and install it.

[8] Some articles, in the same vein, explore tying arrangements on the positive side. See Bowman (1957), Burstein (1960), Blair and Kaserman (1978), Schmanlensee (1982) for the details.

would prefer that the competitors with high quality product continue operations in the complementary market, since then he can possibly raise the price of primary product even further as much as consumer's surplus from using the competitors' high quality products.

Note that most of the existing theories of tying are mainly concerned with the so-called 'old industry'. However, such traditional tying theories can hardly be directly applied to the 'new industry' like Internet and software programs, and etc. It is because there are several distinct characteristics in new industries compared to the old industries as we examined; there exist direct and/or indirect network externalities, marginal cost and the price are close to zero, direct foreclosure is not possible, and consumers can use more than one brand at the same time, and etc.

Carlton and Waldman (2002) establish a new tying theory for the application software industries by incorporating some, but not all, of these special features of the 'new industry' into their model. Particularly, when network externalities are important, they show that the monopolist of a primary market has an incentive to tie in order to monopolize the complementary good market, and tying may be harmful for the society since it deprives consumers of the opportunity of consuming better quality brands.

However, even Carlton and Waldman (2002) cannot be directly applied for the instant messenger market analysis since they do not consider the other key characteristics of the instant messenger. First, in Carlton and Waldman, the main reason for tying is to protect the monopoly position in the OS market. Therefore, if there is no entry threat in the OS market, and if there are competitors with high quality and/or product differentiation in the instant messenger market, the monopolist in the OS market will not use tying strategy since it reduces the profit from the primary market as Whinston (1990) contends. Second, in Carlton and Waldman (2002), tying has a direct and perfect foreclosing effect, however, in case of instant messenger, as we emphasized earlier, tying itself cannot directly foreclose other competitors; consumers can still freely download other messengers compatible with Windows, and multi-homing is also possible.

In this paper, with a new model which incorporates such key features of the instant messenger market, we analyze Microsoft's tying incentive, its effect on the market structure, and the resulting impact on social welfare. The main results are as follows: First, tying indirectly, or gradually, forecloses other competing instant messengers, even those with superior qualities, and so deprives consumers of the chance to use better messenger programs. Second, tying hurts consumers because it enables Microsoft to charge a maximum price to its OS product, that is, to fully exploit consumer's willingness to pay to the OS-messenger bundle. Third, however, total surplus will increase via tying; consumer's loss due to tying is not that large, being compared to the increase of the monopoly firm's profit, because tying saves consumers' installing costs. Finally, such results are robust to the possibilities of multi-homing in the instant messenger market.

II. *Model*

Consider operating system (OS) and instant messenger markets together. In the OS market, brand A is monopolistically provided by firm 1, that is, by Microsoft. Meanwhile, the messenger market is a duopoly where firm 1 and firm 2 offer B_1 and B_2 respectively for free.

To test the anti-competitive effect of the messenger tying by firm 1, we assume that the quality of B_2 is higher than that of B_1 by $\Delta > 0$. For simplicity, we normalize B_1's quality as 0 so that B_2's quality is Δ. Marginal production costs of A and B are assumed to be zero without loss of generality, however, there are per period fixed costs $F_A > 0$ and $F_{B1} = F_{B2} = F_B > 0$ for both markets.

Consumers choose one messenger out of two alternatives so that, since OS is required for the instant messenger program, either (A, B_1) or (A, B_2) is used as a bundle by each consumer.[9] Note that, unlike standard tying models, since messenger B_2 can be downloaded for free from the Internet and also can be used with product A substituting pre-installed B_1 without any technical problems, tying of B_1 to A cannot directly foreclose B_2 in the messenger market.

Consumers obtain utility both from the OS and from the messenger. The utility from the OS, product A, is V, and the utility from the messenger is $N_i + \Delta_i - s$, where N_i denotes the number of consumers who are using B_i and thus captures the network effect of the messenger, Δ_i is brand i's quality, and s is the installing cost of the messenger, which is the same for B_1 and B_2. As we assumed, $\Delta_1 = 0$ and $\Delta_2 = \Delta > 0$, and s occurs only when the consumer chooses a messenger which is offered independently from the OS, so that $s = 0$ for B_1 if it is offered being tied with product A.

To highlight the dynamic aspect of network building and the foreclosure mechanism in our messenger tying analysis, we adopt a (T+1)-period discrete model such that $t \in \{0,1,2,...,T\}$, where T can go to infinity.[10] At $t = 0$, firm 1 decides whether to offer B_1 being tied with A or independently. Every period from $t = 1$, new consumers of total mass S, who are uniformly distributed on the interval [0, S] according to their installing cost s, enter the OS-messenger markets. New consumers, on entering, buy A and choose either B_1 or B_2. From $t = 2$, there are two consumer groups; S newcomers and $(t-1)\,S$ existing customers. We assume that S newcomers first choose messengers given each brand's current network size up to period $(t-1)$, and then the $(t-1)S$ existing customers decide whether to stay with the current messenger or to switch to the other one given the new network sizes updated by the newcomers.

In each period, after both of new and existing consumers' decisions, there are advertisings on instant messenger. Advertising on messenger incurs no additional cost to the messenger provider, while total revenue from advertising is proportional to the network size, that is, the number of consumers who are currently using the messenger at that period. Let α be the per-consumer advertising revenue.

III. *Monopolization by Tying*

In this section, we will show that firm 1 can monopolize market B by tying B_1 with A. Let N_i^t be the network size of firm i in market B at period t. We assume $N_1^0 = N_2^0 = 0$ which means that the market shares were the same before firm 1's tying decision.

[9] In Section V, we will explore the case of multi-homing, which means that consumers have additional option of using both messengers at the same time.

[10] For simplicity, the discount factor is assumed to be 1.

Assumption 1. $2\Delta < S < \frac{V}{2}$

In Assumption 1, $2S < V$ means that the utility from OS are sufficiently large compared to the messenger installing cost, which seems true in reality. What is more important in Assumption 1 is $\Delta < \frac{S}{2}$. It means that we focus on the case that B_2 is of better quality than B_1, however, the quality advantage is not too big. If $\Delta \leq 0$, then tying strategy is not necessary for firm 1 to monopolize the instant messenger market. On the other hand, if $\frac{S}{2} < \Delta$, then the quality advantage of B_2 is so substantial that firm 2 will be the winner in the messenger market in spite of the tying strategy by firm 1. These two cases are trivial and so uninteresting because they are just consistent with the standard competition results. Assumption 1 focuses on the case that tying can offset rival's quality advantage, which might be anti-competitive.

First consider independent selling. Without tying, the utility of the consumer with installing cost of s who first enters OS-messenger market at $t=1$ is $U_1 = V - s$ for (A, B_1) and $U_2 = V + \Delta - s$ for (A, B_2), and therefore all the consumers will buy (A, B_2). For any $t \geq 2$, utilities of the new consumers from (A, B_1) and (A, B_2) become $U_1 = V - s$ and $U_2 = V + (t-1)\, S + \Delta - s$ respectively, which means that all the newcomers for every period will buy B_2. Furthermore, the existing customers will never switch to B_1 simply because it does not have any positive networks. Therefore, firm 1 will exit from the messenger market and firm 2 becomes the monopolist in market B.

Next, consider the tying case. Lemma 1 shows that the speed of foreclosure by tying depends on S and Δ.

Lemma 1: Assume that B_1 is pre-installed being tied with product A. Consider a sequence $f(t) = \frac{2}{(1-3^{-t})}$, which is monotonically decreasing from 3 to 2 as t goes from 1 to infinity. Furthermore, let t^* be the minimum $t \in \{1, 2, ..., T\}$ such that $S \geq f(t)\Delta$. Then firm 1 can capture the whole market B from $t^* + 1$.

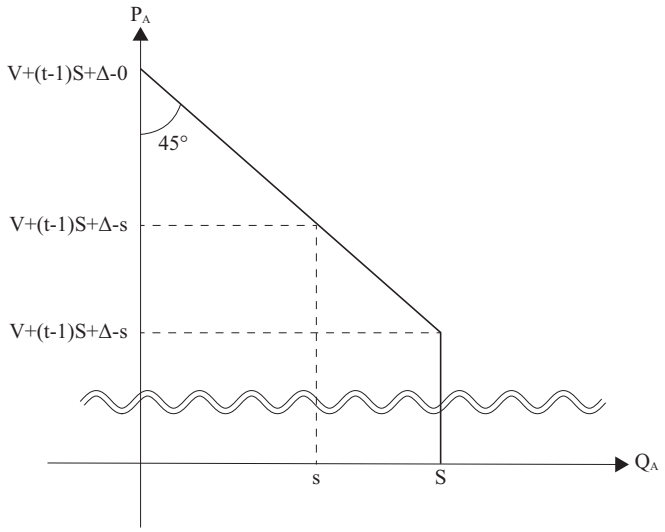
<**Proof**> See Appendix 1.

From Lemma 1, we can see that the speed of foreclosure depends on S and Δ: Given S, t^* increases as Δ increases, that is, foreclosure is more difficult as the quality advantage by B_2 is bigger. Given Δ, t^* decreases as S increases, which means that monopolization becomes easier as the cost of installing B_2 becomes larger. However, note that firm 1 can always monopolize market B after a finite period of time for any S and Δ. Therefore, we have Proposition 1.

Proposition 1. Under Assumption 1, the low quality messenger B_1 can foreclose the high quality messenger B_2 through tying strategy.

Even though the quality of B_1 is lower than that of B_2, firm 1 can strategically foreclose firm 2 and monopolize the messenger market by tying B_1 with the main product A, the Windows OS, which is solely provided by firm 1. It could be obvious that the monopolist can foreclose the rival messenger by tying despite the quality deficiency, if all consumers face a large installing cost. However, what if the installing cost is substantial to only a fraction of

FIG. 1. FIRM 1'S PRICING STRATEGY: INDEPENDENT SELLING CASE



consumers, but is negligible to others? Then, possibly the rival messenger survives in the messenger market with the help of her superior quality, because some consumers with low-installing costs would still use the rival messenger simply by installing it by themselves. Proposition 1, considering huge network effects in the messenger market and consumers' switching decision, argues that the monopolist can foreclose the rival messenger by tying even in this case, since the number of 'take-what-is-offered' consumers will eventually become large enough that the rival messenger's quality advantage is overwhelmed by the difference in cumulative network size after all.

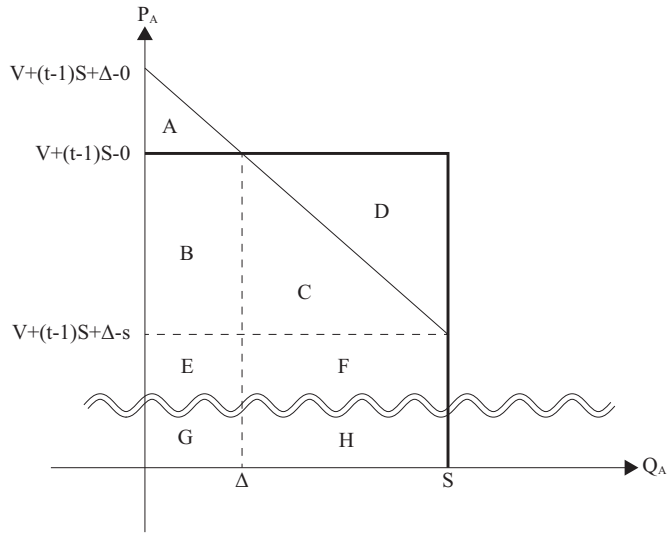
The next question is whether firm 1 actually has an incentive to monopolize the messenger market through tying strategy. Consider independent selling case first. As we showed earlier, if there is no tying, the high quality brand B_2 captures the whole messenger market and so the consumers will buy system (A, B_2). At any period $t \geq 1$, since the messenger price is zero, the newcomer's willingness to pay for the system (A, B_2) is uniformly distributed on $[V+(t-1)S+\Delta-S, V+(t-1)S+\Delta-0]$, so that we have a downward sloping demand for product A as in <Figure 1>.

Since firm 1 exits from the market B, its profit at t is $\pi_1^t = P_A \cdot Q_A(P_A) - F_A$, where P_A and Q_A are the price and the quantity of good A, respectively. Then it is easy to show that the optimal price of good A is $V+(t-1)S+\Delta-S$ under Assumption 1.[11] To sum, when the OS and the messenger are sold independently without tying, messenger market is monopolized by the high quality brand B_2, and firm 1's profit from the OS market only will be $\pi_1^I = [V+(t-1)S+\Delta-S]S-F_A$.

Next, consider the tying case. If firm 1 employs tying strategy, it can monopolize the

[11] Intuitively, since V is sufficiently large, firm 1's optimal strategy is to charge the maximum price that induces all the consumers regardless of their installing costs.

FIG. 2. FIRM 1'S PRICING STRATEGY: TYING CASE



market B from t^*+1. Market B is temporarily a duopoly up to t^*, however, it eventually becomes a monopoly from t^*+1 on. Since we focus on the long-term effect of tying on the market performance, we will only consider firm 1's profit after that critical time t^*. Note that newcomer's willingness to pay for the bundle (A, B_1) at time $t>t^*$ is $V+(t-1)S$. Since tying eliminates both quality differential and installing cost from the analysis, every newcomer has the same willingness to pay, and therefore, the demand for the bundle is a horizontal line as depicted bold in <Figure 2>

Firm 1's profit under tying is $\pi_1^t=[V+(t-1)\ S]S-F_A-F_B+\alpha tS$ by charging $P_A^t=V+(t-1)S$ on the OS product, where αtS is the advertising revenue which wouldn't be obtained if firm 1 does not employ the tying strategy. Tying raises firm 1's profit by $(S-\Delta)S$ (area B+C+D in Figure 2) $+\ \alpha tS-F_B$. Thus, we can conclude that firm 1 has an incentive to monopolize messenger market through tying strategy as long as the long-term gain from tying $(S-\Delta+\alpha t)S$ is greater than F_B, which seems to be easily satisfied in reality since fixed cost in the instant messenger market is substantially small and the network size continuously increases over time

Proposition 2. If $(S-\Delta+\alpha t)S\geq F_B$, then firm 1 has an incentive to tie its messenger B_1 to the main product A so that it can monopolize the messenger market.

IV. *Anti-competitiveness of Messenger Tying*

In the previous section, we confirm that firm 1, who is the monopolist in the OS market, has both incentive and power to monopolize the messenger market by using a tying strategy. Is it socially desirable or harmful? In this section, we will show that such tying strategy lowers

consumer surplus, while it improves total surplus. As before, we only consider the long-term effect of tying after $t=t^*$.

Consider consumer surplus first. Consumer surplus at time $t>t^*$ under independent selling is $CS^I=\int_0^S [V+(t-1)S+\Delta-s]ds-[V+(t-1)\ S+\Delta-S]\ S=\frac{1}{2}S^2>0$ (area A+B+C in <Figure 2>). Meanwhile, consumer surplus under tying is zero because firm 1 sets the price of the OS at $V+(t-1)S$ which is equal to consumer's willingness to pay. That is, under tying, consumer's willingness to pay is fully exploited by firm 1, who now is the monopolist in both OS and messenger markets. Note that, under independent selling, firm 1, even though it is the monopolist in the OS market, should have lowered its OS price to induce consumers with high installing cost in the messenger market. However, tying enables firm 1 to charge a maximum price on OS, and thus lowers consumer welfare.

Now consider total surplus. Let W^I and W^T be the total surplus at $t>t^*$, ignoring advertising revenue and fixed costs, under independent selling and under tying, respectively.[12] Since $W^I=\int_0^S [V+(t-1)S+\Delta-s]\ ds$ and $W^T=[V+(t-1)S]\ S$, we have $W^T-W^I=S\left(\frac{1}{2}S-\Delta\right)>0$. Tying improves total surplus. W^I and W^T are represented in the <Figure 2> by the area (A+B+C+E+F+G+H) and area (B+C+D+E+F+G+H), respectively, so that the welfare differential is exactly the area (D-A), which is positive by the assumption $S>2\Delta$.

Proposition 3. Tying the low quality messenger B_1 with OS lowers consumer surplus but increases total surplus.

Tying hurts consumers because it enables Microsoft to charge a maximum price to its OS product, that is, to fully exploit consumer's willingness to pay to the OS-messenger bundle. However, total surplus will increase via tying; consumer's loss due to tying is smaller than the profit gains of the monopoly firm.

V. *Multi-homing*

One of strong arguments by Microsoft during consecutive hearings in Korea was that tying would not generate tipping in the instant messenger market under multi-homing. In this section, in response to this argument, we extend our basic model to incorporate multi-homing possibility, and show that the main results of the previous sections still hold.

Assume that B_1 is being tied with product A by firm 1. Since multi-homing is possible, consumers choose one out of three options; to use B_1 only, to use B_2 only, and to use both B_1 and B_2 together, each of which is denoted by (A, B_1), (A, B_2), and $(A, B_{1/2})$, respectively. At period t, utilities of a newcomer from these three options are $V+N_1^{t-1}$, $V+N_2^{t-1}+\Delta-s$, and $V+N_U^{t-1}+\Delta-s$, respectively, where N_U^{t-1} is the number of the whole consumers, that is, $(t-1)S$. Under multi-homing, N_i^t should be cautiously understood; N_i^t is the number of consumers who choose either (A, B_i) or $(A, B_{1/2})$, since a consumer who uses B_i can communicate not just

[12] Since fixed costs and advertising revenue are symmetrically included in both W^I and W^T, ignoring these variable makes no change in comparing total surplus.

with those who use B_i only, but also with those who use B_1 and B_2 together. Therefore, the network effect of multi-homing $(A, B_{1/2})$ is that from the whole messenger market.

Lemma 2. Under Assumption 1 and multi-homing, $N_1^t = tS > N_2^t = t\Delta$ for all $t \in \{1, 2, ..., T\}$.

<**Proof**> First note that, when B_1 is already installed being tied with OS, 'choosing B_2 only' is strategically dominated by 'choosing $B_{1/2}$'. Therefore, none will choose 'B_2 only', and all the consumers will choose either (A, B_1) or $(A, B_{1/2})$, and hence, $N_1^t = N_U^t = tS \ \forall t \in \{1, 2, ..., T\}$. Then, since newcomer's utility of choosing the two alternatives are $V + (t-1)S$ and $V + (t-1)S + \Delta - s$, respectively, those with s and Δ such that $s \geq \Delta$ choose (A, B_1), while the others choose $(A, B_{1/2})$. Therefore, at any period, the number of newcomers who choose (A, B_1) is $S - \Delta$ and that of $(A, B_{1/2})$ is Δ. Furthermore, there is no switching from the existing consumers, since B_1 and $B_{1/2}$ have the same network effects. Therefore, we get the desired results that $N_1^t = tS$ and $N_2^t = t\Delta < N_1^t$. Q.E.D.

Under multi-homing, since the network effects are the same for both (A, B_1) and $(A, B_{1/2})$, consumers with high installing cost choose option (A, B_1) in order to save the installing cost, and those with low installing cost choose multi-homing option $(A, B_{1/2})$ to enjoy the benefit from the better quality brand B_2. However, there is no consumer who uses B_2 only, since it is strategically dominated by the multi-homing option. Every consumer chooses either (A, B_1) or $(A, B_{1/2})$, and therefore, the network size of firm 1 is always the whole market (i.e., $N_1^t = tS$), while that of firm 2 is only a part of it (i.e., $N_2^t = t\Delta < tS$). Thus tying is an effective tool to restrict the growth of firm 2's network, in spite of the fact that B_2 is of better quality than B_1.

Whether firm 2 can survive in the messenger market depends on both advertising pattern and firm 2's market share compared to the fixed cost. First, assume that the advertising revenue is simply proportional to the network size as before. In such case, if firm 2' market share is large enough to earn more advertising revenue than the fixed cost, that is, if $\alpha t\Delta \geq F_B$, it will stay in the messenger market against firm 1's tying strategy, and if $\alpha t\Delta < F_B$, it will be foreclosed by tying as under single-homing. Note, however, even in case of survival, firm 2's growth will be restricted by $N_2^t = t\Delta < tS$ despite it's quality advantage. Next, assume that, since advertisers do not want to duplicate their advertising expenditure, they advertise only on B_1, which is used by the whole consumers. If this is the case, firm 2 will exit from the messenger market by firm 1's tying strategy even under multi-homing.

Proposition 4. Under multi-homing, if advertising is not duplicated, messenger tying by Microsoft can foreclose the better quality competitor. Meanwhile, if advertising is duplicated, the better quality competitor will stay in the messenger market with restricted growth in case that $\alpha t\Delta \geq F_B$, and it will exit, otherwise.

Microsoft claims that the rival messenger will not be foreclosed under multi-homing, because consumers will simply use both messengers together. However, we show that the rival messenger still can be foreclosed by monopolist's tying strategy, if a large portion of the revenue in messenger markets is acquired through each firm's 'effective' network size, the number of consumers who exclusively use it. Note that the consumers who use both messengers have very little value from a messenger firm's perspective, since the selling price of such consumers in advertising market will easily go zero by price competition between

messenger firms. That is, the possibility of multi-homing may not help the rival firm survive, because it does not bring her effective network size. (The growth of the rival messenger will be severely restricted even in case that it can stay in the market.)

Will the welfare implication of tying change under multi-homing? First, without tying, firm 2 will be the monopolist in the messenger market, as under single-homing, since B_2 is preferred to B_1 by all the consumers. Then, firm 1 will set P_A at the lowest possible level to be able to induce even the lowest willingness-to-pay consumer, that is, the consumer with $\Delta - s = \Delta - S < 0$. Since P_A is the lowest, consumer surplus is the highest possible and firm 1's profit is the lowest, as in <Figure 1>.

Now assume tying. If firm 2 exits from the messenger market due to tying, then the welfare analysis will be the same under single-homing, which means that consumer surplus decreases and total surplus increases due to tying even under multi-homing. Meanwhile, if firm 2 stays in the messenger market, firm 1 will set P_A enough to induce the marginal consumer with the lowest willingness to pay to the OS product, that is, the consumer with $\Delta - s = \Delta - \Delta = 0$. (Note that P_A should be the same for both (A, B_1) -consumers and $(A, B_{1/2})$ -consumers.) In such case, consumer surplus is lower, because P_A is higher, than under independent selling, however, total surplus increases due to tying. As P_A increases, firm 1's profit from OS selling increases more than consumer surplus decreases; in <Figure 2>, total surplus increases by D (note that it was D-A under single-homing) since consumers who are using B_2 still enjoy surplus equal to A.

Proposition 5. Under multi-homing, tying lowers consumer surplus and increases total surplus, as in Proposition 3 under single-homing.

VI. *Concluding Remarks*

Instant messenger market has several distinct features such as strong direct network externalities, incompatibility, zero price, two-sided market, and impossibility of direct foreclosure through tying. We need a new model to analyze the tying practice in the instant messenger market because not only the two related lawsuit cases, the web browser case in US and the media player case in EU, but current literature about tying do not fully incorporate such key features of the instant messenger market. This paper is an attempt to develop a relevant theoretic model for the tying practice in the instant messenger market.

The three main claims/results throughout the paper can be summarized by i) the possibility of foreclosure by tying, ii) the incentives/profitability of tying, and iii) the anti-competitiveness of tying. Admittedly, the first part is not of great interest – some authors even "assume" this result (Carlton & Waldman 2002, as an example). But the second aspect of tying has been questioned and studied thoroughly by many economists, and is the key contribution of this paper. According to previous literature, the monopolist has no incentives to employ tying if the tied goods are complementary to primary goods and there is no entry threat in the primary good market (Whinston 1990; Carlton and Waldman 2002). However, in this paper, we show that the monopolist may want to tie even the complementary good (messenger) to her primary good (OS), if the complementary good markets are two-sided markets. The basic reason is that the monopolist now deals with two different groups of "consumers" in messenger markets: the one

group of consumers who are the "users of the messenger" and the other group who are the "companies making advertising campaign on the messenger users". Note that the former group of consumers views the messenger as a complementary good to OS, but the latter does not. Since the main source of revenue for the monopolist is the latter group rather than the former, she is no longer able to use her monopoly position in OS market to extract all the (advertising) profits from messenger markets, unless she retains the messenger users by herself. Therefore, the monopolist may find it profitable to tie her messenger to the OS in order to foreclose other competitors in the messenger market after all, even though the messenger is a complementary good and there is no threat in the OS market.

Microsoft has an incentive to capture the instant messenger market because then it can charge a higher price to the OS product, in addition to earning advertising revenue from the instant messenger market. Even though tying itself cannot directly foreclose other competitors, it can induce some of the customers who newly enter the messenger market to choose MSN Messenger by saving installing costs. Due to the strong network externalities without compatibility, then more customers, newcomers and the existing customers, will choose MSN Messenger to enjoy its large network size. The instant messenger market will be tipped toward MSN Messenger and finally other competing messenger providers will exit from the market. Tying MSN Messenger with Windows XP can indirectly monopolize the instant messenger market in this manner, even in case that MSN Messenger is inferior to other competing brands in terms of quality.

Such tying practice by Microsoft is harmful to the consumers because they have to pay a higher price to the OS so that their surplus will be fully exploited, if Microsoft monopolizes instant messenger market through tying strategy. Even though tying can improves total surplus, such an increase in total surplus is due to the increase of the Microsoft's profit in the OS market at the cost of the consumer surplus. Since Microsoft is not a domestic company, total surplus cannot be a good measurement of social welfare of Korea. Therefore, we conclude that the instant messenger tying by Microsoft in Korea is possibly anti-competitive due to its detrimental effect on consumer surplus.

It is needless to say that our conjecture about the Microsoft's anti-competitive tying behavior needs both further theoretic and empirical tests. This paper is only an attempt to develop a model that is more relevant to analyze the instant messenger case, which has many different key features from the web browser and the media player cases, and also from the standard tying models. We hope this paper provokes further theoretic and empirical studies on the Microsoft's tying practice in the instant messenger market.

Appendix 1

Proof of Lemma 1

Proof is done by two-steps: First, we will prove the following claim by mathematical induction, and then lemma 1 using the claim.

Claim: $N_1^t=\sum_{k=1}^{t}\left[\frac{1}{2}S+\frac{3^{k-1}}{2}(S-2\Delta)\right]$ and $N_2^t=\sum_{k=1}^{t}\left[\frac{1}{2}S-\frac{3^{k-1}}{2}(S-2\Delta)\right]$ for $S<f(t)\ \Delta$, that is, for $t<t^*$

Step 1: First, it is easy to see that the claim holds for $t=1$, that is, $N_1^1=S-\Delta$ and $N_2^1=\Delta$. Now, assume that the claim holds for any $t=m<t^*-1$, and we will show that the claim holds for $t=m+1<t^*$. A newcomer's utility from bundles (A, B_1) and (A, B_2) are $U_1=V+N_1^m$ and $U_2=V+N_2^m+\Delta-s$, respectively. Then consumers with $s\geq c(m)$ will choose (A, B_1), while those with $s<c\ (m)$ will choose (A, B_2), hence the numbers of newcomers who choose (A, B_1) and (A, B_2) are $S-c(m)$ and $c\ (m)$, respectively, where the critical level $c(m)\equiv\Delta-(N_1^m-N_2^m)=\left[\frac{1}{2}S-\frac{3^m}{2}(S-2\Delta)\right]$. Note that $c(m)>0$ if and only if $S<f(m)\ \Delta$. By observing the behavior of the newcomers, existing consumers decide whether to stay or switch. The utility of the existing customer of (A, B_1) is $U_1=V+(N_1^m+S-c(m))$ if he stays with (A, B_1), and $U_2=V+(N_2^m+c(m))+\Delta-s$ if he switches to (A, B_2). Note that $U_1-U_2=S-3c(m)+s>0$, since $s\geq c(m)$ and $2c(m)<S$. That is, all the existing customers who are using (A, B_1) will stay with (A, B_1). Next, the utility of the existing customer of (A, B_2) is $U_1=V+(N_1^m+S-c(m))$ if he switches to (A, B_1), and $U_2=V+(N_2^m+c(m))+\Delta$ if he stays with (A, B_2). Note that $U_1-U_2=S-3c(m)<0$ if and only if $S<f(m)\ \Delta$. So, all the existing consumers using (A, B_2) will continue to stay with (A, B_2). Since no existing consumers change their messengers, the network sizes at $t=m+1$ are as follows

$$N_1^{m+1}=N_1^m+S-c(m)$$
$$=\sum_{k=1}^{m}\left[\frac{1}{2}S+\frac{3^{k-1}}{2}(S-2\Delta)\right]+\left[\frac{1}{2}S+\frac{3^m}{2}(S-2\Delta)\right]=\sum_{k=1}^{m+1}\left[\frac{1}{2}S+\frac{3^{k-1}}{2}(S-2\Delta)\right]$$
$$N_2^{m+1}=N_2^m+c(m)$$
$$=\sum_{k=1}^{m}\left[\frac{1}{2}S-\frac{3^{k-1}}{2}(S-2\Delta)\right]+\left[\frac{1}{2}S-\frac{3^m}{2}(S-2\Delta)\right]=\sum_{k=1}^{m+1}\left[\frac{1}{2}S-\frac{3^{k-1}}{2}(S-2\Delta)\right]$$

Thus we show that the claim holds for $t=m+1$, too. The claim holds for all t as long as the condition $S<f(t)\Delta$ is satisfied, that is, as long as $t<t^*$.

Step 2: Note that the convergence of $f(t)$ makes sure that there exists a finite t^* such that $S\geq f(t)\Delta$ for $t\geq t^*$. At t^*, the behavior of the newcomers and the existing consumers who are using (A, B_1) are the same as at $t<t^*$, while that of the existing consumers who are using B_2 changes since $S\geq f(t^*)\Delta$; all of them switch to B_1 because $U_1-U_2\geq 0$. Since the number of these switching consumers is $N_2^{t^*-1}$, the network sizes at t^* become $N_1^{t^*}=N_1^{t^*-1}+N_2^{t^*-1}+S-c(t^*)=t^*S-c(t^*)$ and $N_2^{t^*}=c(t^*)$. In the next period t^*+1, all the newcomers will choose B_1 since $c(t^*+1)\leq 0$. Thus the network sizes that the existing consumers face become $(t^*+1)S-c(t^*)$ for B_1 and $c(t^*)$ for B_2. Then it can be easily verified that all of the existing consumers, regardless of their previous choice, will choose B_1. Thus, firm 1 monopolizes the instant messenger market through tying from t^*+1. Q.E.D.

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