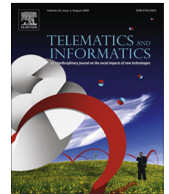




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# Impacts of subsidy regulation on the mobile market in Korea : Major provider's diversification of handset quality

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## ABSTRACT

In the mobile service market, operators competitively engage in price discrimination of a bundle of handset and service over customers who have their switching costs and are locked-in under a long-term contract in return for subsidizing the handset. This paper is motivated by a recent legislation enacted in Korea (Mobile Device Distribution Improvement Act) that bans price discrimination with handset subsidy. We study the impacts of subsidy regulation on equilibrium prices, profit, and average revenue per user (ARPU) in a game approach. We set up an integrated model of price and quality competition under a duopoly structure. By comparative static and dynamic analysis, we configure the equilibrium of price and quality competition when two MNOs are differentiated in terms of handset quality, marginal cost, and market share. Our results are as follows. When two operators are randomly differentiated in quality and market share, the regulation induces only the minor operator to lower its incumbent price with adjusting quality and cost (dis)advantages. Although the regulation can lead to a drop in ARPU as the regulator wishes, it is achieved at the cost of the minor operators loss of profit if the market structure is significantly asymmetric. If two operators can choose their quality of service in the long run and if marginal costs are dependent on the quality level, quality differentiation is more likely to happen with the regulation. As subsidies are banned, the major operator now targets customers who are less sensitive to quality by degrading its quality, thus charging a lower price. When the marginal cost is independent of quality level, both operators go for the top quality. Our findings propose that the market structure, financial status of operators, channel and cost of distributing handsets before the subsidy regulation is introduced be considered fully.

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## 1. Introduction

Mobile network operators (MNO) offer consumers a new mobile phone using the practice of handset bundling. Handset bundling, which subsidizes consumers in return for an obligatory minimum subscription period (for instance, 18 months in Korea). Korea has been lenient regarding handset bundling since handset subsidies can contribute to the expansion of the domestic service market and the growth of handset exports. In fact, handset subsidies attract more consumers to mobile services and induce frequent phone replacement.

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Nonetheless, handset bundling also brings up controversial issues, such as price discrimination between loyal consumers (attached) and switchers (unattached), and long-term contracts for expensive payment plans associated with handset subsidies. In October 2014 for instance, Korea implemented the 'Mobile Device Distribution Improvement Act' (*the Act* hereafter) that sets a ceiling on handset subsidies and banned price discrimination. There are unequivocal evaluations regarding *the Act's* effects. Nominal indices from a Korean government report appear to favor the regulator at first glance. According to the report, the proportion of low-quality handsets (costing less than about 450 USD) sold increased by 13% (from 21.5% to 34.8%) since *the Act* (Yonhap News, 2015). In contrast, the proportion of subscribers with an expensive plan (about 55 USD/month or higher) showed a drastic drop (from 33.9% to 14.8%) (Korea Joongang Daily, 2015). The Korean government recognized those indices as a sign that consumers have paid more attention to their usage patterns and purchasing power rather than to expensive high-end smart-phones. As a consequence, payment plans were adjusted downward, average revenue per user (ARPU) fell, and the number of users switching declined. However, a group of consumers refuted the government report by arguing that quality-adjusted ARPU is not lower than ever and that many retail shops were forced to shutdown by *the Act*.

Further, significant changes appeared in handset manufacturing and distribution. Both Samsung Electronics and LG Electronics increased their low-quality handset line-ups and released formerly foreign-exclusive models into the domestic market. SK Telecom, the dominant operator in the Korean mobile market, voluntarily degraded the quality of its smart-phone range by introducing medium-quality handsets (*Luna and Sol*) (Korea Joongang Daily, 2016; The Chosunilbo, 2016), which undoubtedly led to cheaper payment plans and lower ARPUs.

Recently, however, many mobile providers such as Verizon, T-mobile and AT&T stopped offering subsidies for mobile phones. Verizon announced that it would be phasing out its device subsidy in August, 2015 (Allen, 2015). AT&T decided to stop offering 2 year contract with subsidy from January, 2016 (Oliver, 2015). Accordingly, competition in telecommunication market will migrate to a new stage since subsidy ends, whether it is done voluntarily or by regulations.

Competition in the mobile service market is characterized with switching costs, long-term contracts, poaching, and handset bundling. From the literature, it is well-known that switching costs encourage intertemporal price discrimination, whereupon prices are lower in the beginning and higher later (Klemperer, 1987; Varian, 2003; Taylor, 2003). Klemperer (1987), with a two-period Hotelling model, shows that competition under switching costs cause firms to focus more on market share in the early stages. They offer lower prices in the first period than those in the second as customers are reluctant to move to the next period once switching costs are established. This type of pricing profile, called "bargains then ripoffs," is characterized by introductory offers followed by an exploitation phase for locked-in customers. Farrell and Klemperer (2007) show a similar profile in their study on competition with network effects as well as switching costs, i.e. switching costs and network effects are important elements for service providers as well as in regulatory policy for social welfare. They stress that the result can lead to efficient competition for larger units of business.

One crucial source of switching costs in the mobile service market is long-term contracts featuring an obligatory minimum subscription period, during which consumers are locked-into the network. When a user under a long-term contract wants to switch operators before the contract period is over, a breach fee is payable, which is another source of revenue for networks. An incumbent operator can use long-term contracts to prevent potential firms from entering the market although it does not preclude new entrants completely (Aghion and Bolton, 1987).

Though customers are locked in due to switching costs, it is not uncommon for customers to switch brands as a result of poaching. Chen (1997) argues that the price discrimination of offering discounts to new switching customers can be explained by switching costs. He shows that prices and discounts are independent of market share in an equilibrium and that the higher the switching cost, the higher the subsidy amount. Fudenberg and Tirole (2000) study duopoly poaching under both short-term and long-term contracts. They argue that if customer taste is fixed, poaching should be banned as it induces socially inefficient switching. They also argue that long-term contracts promote efficiency as switching is less in equilibria than under short-term contracts.

Customers are attracted to long-term contracts by the quality of handset offered under a bundling strategy in the mobile market. Traditional models of vertical product differentiation since Shaked and Sutton (1982) show that service providers in competition choose different levels of quality to reduce price competition. They explain that providers will choose distinct qualities; thus, both enjoy positive profits at an equilibrium. Price competition between increasingly similar products reduces both providers' profits. By contrast, Gehrig and Stenbacka (2004, 2005), study quality differentiation in markets with switching costs. They show that quality competition leads to minimum quality differentiation as only the two top providers offering the best quality can survive. Competition for the establishment of customer relationships eliminates low-quality providers; accordingly, low-quality firms can survive only through poaching profits. They stress that quality choice in vertical product differentiation models typically also depends on aspects of the market environment other than income, such as switching costs.

In this paper, we configure an equilibrium of price and quality competition wherein two MNOs differentiated in terms of handset quality deploy the strategy of exploiting attached consumers as well as poaching unattached rivals consumers. We also propose to draw policy implications by examining changes in ARPU, profits, and quality choice due to *the Act*. As two MNOs compete in incumbency pricing and poaching pricing, our model can be seen as an extension of Gehrig and Stenbacka (2005).

We set up an integrated model of price and quality competition under a duopoly structure in the mobile market. We conduct comparative static and dynamic analyses. For the comparative static analysis, we assume that two operators engage in

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