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Various wholesale price equilibria for mobile virtual network operators

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ABSTRACT

In this paper, various equilibria are analyzed according to the leader–follower relationship between vertically integrated incumbents when downstream entries are present. This analysis broadens our understanding of the incentives involved in deciding the wholesale price, which can be applied to explain the different situations of diffusion of mobile virtual network operators in the telecommunications market. Several implications are derived to facilitate effective policy formulation and management.

1. Introduction

Mobile virtual network operators (MVNOs) or resellers, defined as operators without networks offering services to end users, are considered as vehicles that help in strengthening service-based competition. The introduction of MVNOs intensifies retail competition and induces a price decrease. In the telecommunications market in which various entry barriers exist, strengthening competition is the key agenda for regulation, making the introduction of MVNOs an important concern in many countries. With this background, this paper analyzes the process of determining wholesale prices for MVNOs, while considering asymmetry of the cost and leader–follower relationships between integrated incumbents.

Many studies have focused on the impact of service-based competition. Bourreau and Doğan (2004, 2005, 2006), Hausman and Sidak (2005), Jorde, Sidak, and Teece (2000), and Christodoulou and Vlahos (2001) viewed service-based entry such as MVNOs as a substitute strategy of facility-based entry, and analyzed facility-based incumbents' strategic decisions on wholesale price. In these studies, the main concerns are related to technology adoption or incentives for facility investment. These show that wholesale price may or may not be over-charged and that service-based competition may or may not promote facility-based competition. However, in the mobile telecommunications market in which the constraint of limited frequency exists, the importance of service-based competition is generally accepted and some policies for promoting MVNOs have been introduced in many countries.

However, the results of the introduction are different from country to country. In some countries like the UK and US, the introduction of MVNOs took place in the 1990s, but the MVNO diffusion is still moderate. In some countries like Denmark, many MVNOs and mobile network operators (MNOs) are keenly competing. On the other hand, according to Shin and Bartolacci (2007), MVNO market development in Asia is not as visible as that in Europe.

With these different situations, the terms of wholesale contracts, especially the wholesale price, are considered to play a critical role. The wholesale price can be the lower limit of the retail price and determines the competitiveness of MVNOs. Considering this, the wholesale price should be lowered to facilitate the diffusion of MVNOs and strengthen retail competition. Then, direct regulation on the wholesale price can be considered. However, the trend in the

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telecommunications market is to reduce direct regulation. This is also a reason why the introduction of MVNOs has become a matter of concern.

With this background, this study reviews how the wholesale price for MVNOs is determined by analyzing the competition in which vertically integrated incumbents and independent retail entrants coexist. In the absence of regulations, the determinants of wholesale price can be the structure of the industry and the strategic behavior of the MNOs. The strategic behavior reflects the attitudes toward MVNOs and rival MNOs. In this study, the main concern is the strategic behavior, not the industry structure. If the industry structure is very competitive, the introduction of MVNOs or service-based competition is not an important issue.

As regards the attitude toward MVNOs, Economides (1998), Mandy (2000), Reiffen (1998), Sibley and Weisman (1998), and Weisman (1995, 1998) showed that vertically integrated incumbents can have the incentive of deterring downstream entry with non-price discrimination. In these studies, the wireline market where wholesale price is regulated served as the main focus of analysis. Because the margin from resellers is restrained by the regulation, substitution of sales by entrants is magnified. The results of these papers, with reference to deterrence or sabotage, reflect this aspect. Sand (2004) showed that the wholesale price should be set higher to remove the incentive of deterrence than in the case where no discrimination is possible.

On the other hand, some studies reflect the phenomenon of the diffusion of MVNOs in the environment of diminished regulation. Song and Kim (2001) suggested that vertically integrated firms would voluntarily accommodate downstream entries when downstream entries are efficient in terms of cost. Banerjee and Dippon (2008) also showed that voluntary MNO–MVNO relationships are plausible if MVNOs add value by widening and/or deepening the MNO-served market. Dewenter and Haucap (2007) showed that MNOs are more likely to voluntarily accommodate MVNOs when (i) MNOs can extract more surplus from the MVNOs they host, (ii) the size of market demand is high, (iii) the fixed cost of reaching an agreement and providing access to MVNOs is low, and (iv) the services of MVNOs are more differentiated. The authors also showed that the competitive relationship in the retail market affects the possibility of accommodation.

Previous studies mentioned above discussed various factors affecting the condition for accommodation of MVNOs. Among those factors, the extent of extracting surplus from MVNOs is considered significant in this paper. Dewenter and Haucap (2007) explicitly pointed out the extent of extracting surplus as a main determinant of attitude for MVNOs; however, they assumed it as an exogenous variable. In Banerjee and Dippon (2008), the elasticity of the wholesale market does a similar role, but it is similarly assumed as an exogenous variable. In Song and Kim (2001), only the strong Bertrand competition in the wholesale market is assumed, and the case where the extent of surplus extraction is very low is analyzed.

In this study, a model which is basically similar to that of Song and Kim (2001) is analyzed. Vertically integrated incumbents (MNOs) and downstream entrants (MVNOs) compete in the retail market in the Cournot way, and integrated incumbents compete in the wholesale market. However, in this paper, the asymmetry of the cost between integrated incumbents is introduced, along with the leader–follower relationships in the wholesale market. The different leader–follower relationships in the wholesale market induce different types of equilibrium wherein the extent of extracting surplus and the possibility of voluntary accommodation of MVNOs are different.

Generally, the homogeneous wholesale market is believed to be more competitive than the retail market because downstream firms with some bargaining power will be more sensitive to price than consumers who simply take the price as given. Thus, the situation can be thought of as one in which the wholesale price decreases to the marginal cost (like the result of Bertrand competition), with active entries of MVNOs giving a sizable decrease in the retail price. Song and Kim (2001) adhere to this line of thought; in contrast, Dewenter and Haucap (2007) inclined to a contrary view. They assumed that MNOs can extract much of the surplus from MVNOs by introducing a two part tariff. As previous studies espouse different views, the level of wholesale price (i.e. the extent of extracting surplus) and as mentioned above the resulting level of proliferation of MVNOs differs between countries. By introducing various relationships in the wholesale market between MNOs, how the extent of extracting surplus is determined can be clarified.

The analysis shows that when incumbents engage in simultaneous price competition (Bertrand competition) in the wholesale market, the condition for entry-accommodation is that entrants are so efficient that they allow a potential margin to the efficient incumbents. When downstream entrants are accommodated, the wholesale price is determined below the marginal cost of the inefficient incumbent. Second, when the efficient incumbent acts as a leader, the condition for entry-accommodation is tightened and there can be three types of accommodation equilibrium according to the relative efficiency of entrants and the cost gap between incumbents: (i) with a large cost gap and very efficient entrants, the efficient incumbent sets the price at the marginal cost of the inefficient incumbent and drives out the inefficient incumbent from the wholesale market; (ii) with a large cost gap and moderately efficient entrants, the wholesale competition is not valid and the efficient incumbent sets wholesale price to maximize profit; and (iii) only the inefficient incumbent accommodates the entrants. Third, when the inefficient incumbent acts as a leader, the condition for entry-accommodation is the same as that in Bertrand competition but just one type of accommodation occurs in which only the efficient incumbent accommodates the entrants.

These different types of equilibria provide insights with which to explain various situations of MVNO diffusion and the prime movers in each country. In many countries the small, late-entry MNOs have moved first, but in France only the two dominant MNOs actively accommodate MVNOs. The results also present implications for regulation and management.

The remaining parts of the paper are organized as follows: an analytic framework for modeling strategic behavior of vertically integrated firms when there are downstream entries is presented in Section 2; retail equilibria are derived in