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Mergers, investments and demand expansion[☆]

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HIGHLIGHTS

- A merger boosts investment in coverage for a new technology.
- When coverage is endogenous, a merger may raise total welfare and consumer surplus.
- Total coverage increases irrespective of whether coverage is observable or not before pricing.
- Total coverage increases when the new technology replaces a competitive old-generation.

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ABSTRACT

In this paper, we study the impact of a merger to monopoly on prices and investments. Two single-product firms compete in prices and coverage for a new technology. In equilibrium, one firm covers a larger territory than its competitor with the new technology, leading to single-product and multi-product zones, and sets a higher uniform price. If the firms merge, the merged entity can set different prices and coverage for the two products. We find that the merger raises prices and total coverage, but reduces the coverage of the multi-product zone. We also show that the merger can increase total welfare and consumer welfare.

1. Introduction

In a number of recent merger cases in Europe among mobile network operators, the potential impact of mergers on investment has been hotly debated.[1] Operators claim that mergers in the sector can foster the deployment of new technologies, while the European Commission has expressed the view that mergers are detrimental to investment absent efficiency gains.[2]

In this paper, we develop a simple model where a merger to monopoly raises investment in coverage of a new technology, despite the absence of synergies. As coverage is only one dimension at stake in a merger, our paper does not aim at providing a full analysis of mergers, but at delivering new insights that shed light on the operators' claim and should be factored in a merger case.

We consider a coverage-price game, where two firms decide on prices and coverage of a new technology over a territory.[3] When firms are separate, one firm covers a larger share of the

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1 See, for example, the European Commission decision on the Hutchison 3G/Orange merger case in Austria, COMP/M.6497 (December 2012).

2 Genakos et al. (2018) provide evidence that concentration in the mobile market may indeed imply a trade-off between prices and investments. Based on panel data for the period 2002–2014 covering 33 countries from Europe and the OECD, they find that a 4-to-3 merger raises prices by 16% on average, but at the same time increases investments by operator by 19%. However, the evidence of a positive effect of mergers on investment is not totally conclusive, since they find that total investment is not affected significantly by the merger.

3 In the telecommunication industry, roll-out of duplicated infrastructures occurs for mobile 4G and FTTH (for instance, in France and in Spain).

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territory than its rival. When a merger-to-monopoly takes place, the merged entity raises all prices, increases total coverage with a positive effect on welfare, and reduces the coverage of the multi-product zone, which can either harm welfare (due to lower variety) or increase it (due to the business-stealing effect). We provide an example where total welfare and consumer surplus can increase with the merger.

Our paper is related to Motta and Tarantino's (2017) finding that absent spillovers or synergies, the reduction of output by the merged entity induces a reduction of cost-reducing investment.[4] We identify a new effect that implies a positive impact of mergers on investment, when investment increases coverage. Other articles pointing to different channels which may lead to such a positive effect are Marshall and Parra (2017), in the context of a dynamic model of leadership, and Loertscher and Marx (2017), in a model with buyer power.[5] Our paper also builds on the literature on universal service in network industries, which focuses on regulatory issues (see, among others, Valletti et al., 2002; Hoernig, 2006; Gautier and Wauthy, 2010).

The model is presented in Section 2 and analyzed in Section 3. All the proofs are in Appendix.

2. Model

Consider a geographic market represented by a half-line from 0 to $\bar{z}$. Two operators, 1 and 2, deploy a new technology. Initially, the market is not covered at all and there is no alternative old-generation technology. The two operators have the same development cost $c(x)$ to deploy the technology in location x, where $c(x)$ is increasing. We define as

$$C(z) = \int_0^z c(x)\,dx$$

the total cost of covering the locations from 0 to z. We assume that $c(0)$ is small enough and $\lim_{x\to\bar{z}} c(x)$ is large enough so that in a duopoly both firms invest and no firm covers the whole market (see Footnote 7). We also assume that firm $i = 1, 2$ deploys the technology in all locations $x \le z_i$ where $z_1 \ge z_2$.[6]

The operators offer differentiated products, with product i designating firm $i = 1, 2$'s product. In each location x, the single-product monopoly demand (for product 1) is $D_s(p_1)$, while the multi-product demand is $D_1(p_1, p_2)$ for product 1 and $D_2(p_2, p_1)$ for product 2. We normalize the firms' (constant) marginal cost of production to 0.

We adopt the linear demand model of Dixit (1979) and Singh and Vives (1984). The utility of the representative consumer is given by

$$U(q_1, q_2, m) = \alpha\,(q_1 + q_2) - \frac{1}{2}(q_1^2 + q_2^2) - \gamma q_1 q_2 + m,$$

where m is the numeraire good and $\gamma \in [0, 1)$ represents the degree of substitutability between products 1 and 2. The products are unrelated if $\gamma = 0$ and become perfect substitutes when $\gamma \to 1$. In the paper we will assume that $\gamma \le 0.73$ to ensure the existence of a pure-strategy equilibrium.

If both goods 1 and 2 are available to the consumer, utility maximization yields the following multi-product demands for firms 1 and 2 (provided that quantities are positive),

$$D_1(p_1, p_2) = \frac{\alpha - p_1 - \gamma\,(\alpha - p_2)}{1 - \gamma^2} \text{ and}$$
$$D_2(p_1, p_2) = \frac{\alpha - p_2 - \gamma\,(\alpha - p_1)}{1 - \gamma^2}.$$

If only good 1 is available, the single-product demand for this good is

$$D_s(p_1) = \alpha - p_1.$$

For future use, we define the single-product monopoly price and the multi-product duopoly price as

$$p^m = \frac{\alpha}{2} \text{ and } p^d = \alpha\frac{1 - \gamma}{2 - \gamma},$$

respectively.

As Motta and Tarantino (2017), we study a simultaneous coverage-price game, where firms decide simultaneously on a coverage z_i for the technology and on a price p_i charged uniformly in all covered locations, with $i = 1, 2$. Note that this is equivalent to a situation where firms first decide on coverage and then on prices, but where coverage levels are not publicly observable when firms set their prices. In Appendix, we also present a sequential game, where firms first decide on coverage, then observe the coverage of their rival and set prices.

In the absence of merger, firm 1 and firm 2 are single-product firms. In the case of a merger, the merged entity offers the two products, 1 and 2, with potentially different coverage.

3. Analysis

We first determine the equilibrium of the coverage-price game without merger, and then with the merger. We finally compare the two equilibria to analyze the impact of a merger to monopoly on prices, coverage, and social welfare.

3.1. Without merger

Without a merger, firms 1 and 2 compete in coverage and prices.[7] Assuming that $z_1 \ge z_2$, firm 2 is competing on all its covered territory and faces the demand $z_2 D_2(p_2, p_1)$ over all locations, while firm 1 faces competition only on part of its territory, as it is the sole seller on all locations between z_2 and z_1, and faces the demand $z_2 D_1(p_1, p_2) + (z_1 - z_2) D_s(p_1)$. Firms' profits are then given by

$$\Pi_1 = z_2 p_1 D_1(p_1, p_2) + (z_1 - z_2)\, p_1 D_s(p_1) - C(z_1), \quad (1)$$

for firm 1, and

$$\Pi_2 = z_2 p_2 D_2(p_1, p_2) - C(z_2) \quad (2)$$

for firm 2.

Clearly, the pricing decision of firm 2 is the same as in the standard multi-product duopoly game, leading to the best-reply

$$p_2 = BR(p_1) = \frac{\alpha + \gamma\,(p_1 - \alpha)}{2}. \quad (3)$$

[4] See Gilbert (2006) or Shapiro (2012) for a general discussion of the impact of mergers on innovative investment. In two recent contributions, Federico et al. (2017, forthcoming) argue that internalization by the merged firm of cannibalization of sales leads to a reduction of demand-enhancing efforts. Denicolò and Polo (2017) show however that their conclusion holds only if the R&D technology exhibits sufficient decreasing returns to scale.

[5] Davidson and Ferrett (2007) and Motta and Tarantino (2017) argue that sufficient synergies may stimulate post-merger investment.

[6] In any equilibrium, it is optimal for both firms to start their deployment at $x = 0$, as all locations are equivalent except for the investment cost. We thus focus on equilibria with coverage on a single interval.

[7] For an interior solution, we assume that c increases fast enough so that $c(0) < \pi^d = \alpha^2(1-\gamma)/((2-\gamma)^2(1+\gamma))$ and $c(\bar{z}) > \pi^m = \alpha^2/4$.