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Silent financial interests and product innovation☆

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HIGHLIGHTS

- We study passive partial ownership (PPO) holdings with price and R&D competition.
- We examine how asymmetries in PPOs affect quality-enhancing R&D and welfare.
- With asymmetric PPOs, total and consumer surplus may increase even without spillovers.
- There exists a positive re-allocation effect that increases aggregate utility.

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ABSTRACT

We study quality-enhancing R&D, price competition, and welfare in markets with asymmetric passive partial ownership (PPO) holdings. The asymmetries in PPOs generate a positive re-allocation effect which, in some cases, can increase consumer and total surplus in markets with no spillovers.

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1. Introduction

There has been a recent and significant surge in silent financial interests, also called passive partial ownership holdings (hereafter PPO) in rival firms held by common investors which has attracted the attention of competition authorities around the world.[1] Although it has been both theoretically and empirically documented that PPOs tend to reduce price competition (see, e.g., Bresnahan and Salop, 1986; Reynolds and Snapp, 1986; Azar et al., 2018), there is limited research on the effects of PPOs in markets where firms also compete in investments. In this note we consider quality-enhancing R&D investments.

The asymmetries between firms are an important characteristic of these partial acquisitions because typically the PPOs are unequal across the industry. Recent examples include venture capital investors that acquire small stakes in competing firms often in high-technology sectors (see Hochberg et al., 2015).

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[1] For example, from 1900 to 1945 institutional investors owned close to 5% of the US stock market, while by 2010 this percentage had increased to almost 70% (Blume and Keim, 2014).

Our main result is that asymmetric PPOs can increase total welfare and consumer surplus even without spillovers, although the region where the latter increases is limited. We identify a positive re-allocation effect: PPOs alter the R&D investments of the competing firms so that more consumers buy the good of higher quality, and as a result, aggregate utility increases. We discuss how the re-allocation effect relates to the vertical to horizontal differentiation ratio, and compare equilibrium prices, R&D expenditures and market shares under different ownership structures.

While the debate on the relationship between competition and innovation is old, the effects of (partial and full) acquisitions on innovation have only been recently begun to be explored. López and Vives (2017) show in a symmetric model that PPO may stimulate cost-reducing R&D investments and improve total surplus, and even increase consumer surplus but only if spillovers are sufficiently high. Motta and Tarantino (2017) study how mergers affect the incentives to invest in cost-reducing R&D and show that with no (or low) efficiency gains, mergers lower R&D expenditures and consumer surplus. Federico et al. (2017, 2018) consider an oligopoly model of probabilistic product innovation and also find that a merger reduces overall industry innovation. In contrast, in a model with price competition and quality-enhancing R&D investments, we find conditions such that asymmetric PPOs might be beneficial for both consumers and the economy.

Our analysis follows. The Appendix A contains the proof of our main result (Proposition 3), and further proofs and simulations are provided in an Online Appendix.

2. Model

We consider a two period model with two firms (1 and 2 indexed by i, j, with $i \neq j$) and two investors. Each firm is owned by a major shareholder that controls the firm, but it might also be partially owned by another investor with a minority stake.[2] Let ω_i denote the stake in firm j of the major shareholder in firm i.[3] The manager of firm i maximizes the major shareholder's portfolio

$$\Pi_i = (1-\omega_j)\pi_i + \omega_i\pi_j. \tag{1}$$

In the first period, the manager chooses a level of R&D, x_i, that increases product quality. In the second period, and for given x_i, the manager sets the price, p_i. Firm i's operating profit is

$$\pi_i = p_i s_i - \frac{\lambda}{2}x_i^2, \tag{2}$$

where s_i is firm i's market share, and $\lambda > 0$.

The market is characterized by a general ownership structure, (ω_i, ω_j), which allows for asymmetries arising from unequal PPOs between rival firms. Define $\Omega \equiv \omega_i + \omega_j$. We solve the model for the general ownership structure, and also discuss three cases of special interest: (a) the major shareholder of firm i has a stake ω_i in firm j, while the major shareholder of j does not have any stake in i, that is $(\omega_i, 0)$; (b) PPO interests are symmetric, $\omega_i = \omega_j = \omega$, thus (ω, ω); (c) a market with no PPO, then $(0, 0)$.

There is a continuum of consumers of mass 1 that is uniformly distributed along the unit line; consumers can purchase one unit of a good either from i or j. We assume full participation. A consumer located at $q \in [0, 1]$ that buys from firm i obtains utility $U_i(x_0, x_i) - t|q_i - q| - p$, where $t > 0$ is the product differentiation parameter, $q_i \in \{0, 1\}$ is the location of the firm (without loss of generality: $q_i = 0$, $q_j = 1$), and U_i is given by

$$U_i(x_0, x_i) = x_0 + \rho x_i, \tag{3}$$

where x_0 is the initial gross utility and U_i strictly increases with x_i: $\rho > 0$. Define the vertical to horizontal differentiation ratio ($r \equiv \rho^2/t$): the smaller the ratio, the more important horizontal to vertical differentiation is. The market share of firm i, s_i, is

$$s_i = \frac{1}{2t}\left[\rho(x_i - x_j) + (p_j - p_i) + t\right],$$

and for firm j is $s_j = 1 - s_i$.

3. Equilibrium and market characterization

We solve the model for the general ownership structure and provide expressions for equilibrium R&D, prices and market shares in Lemma 1 in the Appendix A. By comparing equilibrium outcomes between firms, we can establish that:

Proposition 1 (*Inter-Firm Comparison*). *Let $\omega_i > \omega_j$, then firm i invests less in R&D than firm j. If the relative impact of quality on utility is sufficiently low such that $r < \bar{r} \equiv \frac{\lambda(3-\Omega)}{(4-\Omega)}$, then firm i competes less intensively than firm j in prices, otherwise, firm i becomes more competitive. Firm i's market share is lower than that of firm j.*

Consider first the ownership structure $\omega_i > \omega_j = 0$. Because firm j's profit positively affects the financial profit of the major shareholder in firm i, the manager of the latter has lower incentives to compete for market share. Thus, firm i decreases its R&D investment and charges a higher price than j. However, when the relative importance of vertical differentiation is sufficiently high (or the investment cost is sufficiently low), firm i may set a lower price than firm j in order to avoid losing too much market share. Note that at the second stage, the loss in quality of firm i's good is exacerbated by the gain in quality of firm j's (since R&D investments are strategic substitutes). The same reasoning applies to the more general case $\omega_i > \omega_j > 0$. The threshold $\bar{r}$ decreases with ω_i (and with ω_j) because the incentives for i to compete are lower as firm j's profit becomes relatively more important to the manager of firm i.[4]

Next, we compare the equilibrium outcomes of each firm with and without partial ownership.

Proposition 2 (*Intra-Firm Comparison*). *As compared to the case of no partial ownership:*

- *If $\omega_i = \omega_j = \omega > 0$, then firms compete less aggressively in R&D and prices.*
- *If $\omega_i > \omega_j = 0$, then firm i competes less aggressively in R&D, and likewise in prices unless $r > 2\lambda$. In contrast, firm j competes more aggressively in R&D and less aggressively in prices; as a result, firm i's market share is smaller and firm j's market share is larger.*
- *If $\omega_i > \omega_j > 0$, then firm i always invests less in R&D, and charges a higher price unless $1/r < \theta_{p,i}(\omega_i, \omega_j)/\lambda$. Firm j always competes less aggressively in prices, and invests less (more) in R&D if $r < (>)\lambda\theta_{x,j}(\omega_i, \omega_j)$. As a result, firm i's market share is smaller, while that of firm j is larger. The expressions $\theta_{p,i}(\omega_i, \omega_j)$ and $\theta_{x,j}(\omega_i, \omega_j)$ are given in the Appendix A.*

[2] This case is also known as common ownership. This is different from cross-ownership by firms, where firms acquire stakes in other firms.

[3] There is not a commonly agreed threshold for what constitutes non-controlling minority shareholdings by competitors. However, competition authorities often inspect the non-controlling minority shareholdings by competitors that are between 15% and 25% (Salop and O'Brien, 2000). In some applications, we restrict that PPO satisfies $0 \leq \omega_i, \omega_j < 1/2$.

[4] Note that maximizing $\Pi_i = (1-\omega_j)\pi_i + \omega_i\pi_j$ is equivalent to maximizing $\pi_i + \vartheta_i\pi_j$, where $\vartheta_i \equiv \frac{\omega_i}{1-\omega_j}$ is the relative weight of firm j in the objective function of the manager in firm i, and ϑ_i is increasing in both ω_i and ω_j.

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