



# Mergers and Demand-Enhancing Innovation

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# **I. Economic Issue**

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Important remark: **demand-enhancing innovation:**

E.g. in a duopoly, demand for good 1:  $D_1(p_1, p_2, \gamma_1, \gamma_2)$ , where  $\gamma_i$  = level of innovation

$$\frac{\partial D_1(p_1, p_2, \gamma_1, \gamma_2)}{\partial \gamma_1} > 0$$

Moreover, it is assumed  $\frac{\partial D_1(p_1, p_2, \gamma_1, \gamma_2)}{\partial \gamma_2} < 0$ , otherwise not interesting.

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Intuition already at US 2010 Guidelines §6.4:

«A problem is most likely to occur if at least one of the merging firms is engaging in efforts to introduce new products that would capture substantial revenues from the other merging firm.»

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**2017: Case M.7932 Dow / DuPont: Pesticides markets** (very dependent on innovation). EU Commission especially concerned about innovation competition as they were two of the few only innovators in most of the markets they operated. Result: approval conditional on the **divestiture of Dupont's R&D organisation**.

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**2019: Case M.9205 IBM / RED HAT: Cloud computing.** EU Commission concerned about innovation, **but IBM agreed to keep Red Hat nature (open source)** and differentiation between IBM and RedHat untouched. This enhanced inside and most importantly outside innovation (collaboration with third parties) as their products are inputs for innovation.

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**20XX?: Case M.XXXX Microsoft / OpenAI.** Market of AI developers very concentrated: Meta, Amazon, Google (DeepMind), OpenAI and Microsoft (Azure). Lately, large “investments” of Microsoft on OpenAI (~10B\$). A merge or “just” exclusive contracting? Revenue schema not clear yet. Potential spillovers large enough? Potential remedies: data sharing or open source?

## **II. Model and Results**

# **(Simplified) Model**

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Framework:

- 2 firms, differentiated goods, compete in prices and innovation levels
- Common marginal cost of production  $c$  and convex cost of innovation  $C(\cdot)$ .
- **Simplification:** linear demand  $D_i(p_i, p_j, \gamma_i, \gamma_j) = M - \alpha p_i + \beta p_j + A\gamma_i - B\gamma_j$

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Problem of the **independent firm**  $i$ :  $\Pi_i(p_i, p_j, \gamma_i, \gamma_j) = (p_i - c) \left( M - \alpha p_i + \beta p_j + A\gamma_i - B\gamma_j \right) - C(\gamma_i)$

From FOCs, the symmetric equilibrium satisfies:

$$h^*(\gamma^*) = C'(\gamma^*)$$

$$h(p, \gamma) \triangleq D_i(p, p, \gamma, \gamma) \frac{A}{\alpha}$$

$h^*(\gamma) \equiv$  **firm's marginal gain from an increase in its innovation level** when its price is set optimally holding constant the innovation and price levels of firm  $j$  at  $\gamma$  and  $p(\gamma) \equiv$  optimal pricing decision for innovation each level



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Profit of the **merged entity**:

$$\Pi_M(p_1, p_2, \gamma_1, \gamma_2) = \sum_{i=1}^2 (p_i - c + \sigma) D_i(p_i, p_j, \gamma_i, \gamma_j) - C(\gamma_i)$$

FOC of the merged entity's problem:

$$l^M(\gamma^M) = C'(\gamma^M)$$

$$l^M(\gamma) \triangleq D_i(p, p, \gamma, \gamma) \frac{A - B}{\alpha - \beta}$$

$l^M(\gamma) \equiv$  **slope of the merged entity's profit with respect to  $\gamma_i$**  when all prices are set optimally, holding the innovation level of the other unit

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- $H_I$  - **innovation diversion effect**  $\leftrightarrow$  internalization of the diversion of sales

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**Result 3:** A P-neutral merger increases incentives to innovate if and only if:

$$\begin{array}{cc}
 \textit{Price diversion} & \textit{Innovation diversion} \\
 \textit{ratio} & \textit{ratio} \\
 \hline
 \frac{\frac{\partial D_j^M(\gamma^*)}{\partial p_i}}{\frac{\partial D_i^M(\gamma^*)}{\partial p_i}} & > \frac{\frac{\partial D_j^M(\gamma^*)}{\partial \gamma_i}}{\frac{\partial D_i^M(\gamma^*)}{\partial \gamma_i}}
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**In general, low or complex tractability and results very dependent on demand functional forms.**

### **III. Further Discussion**

# Other literature

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**Innovation / competition literature:** Classical inverted-U results (Aghion et al, 2005) or ambiguous results (Gilbert, 2020) relating innovation and number of firms. Microprocessors: low number of players fosters innovation (Goettler and Gordon, 2011). Hard-disk drives: small actors (large number of players) foster innovations (Igami, 2016)

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## **Federico, Langus & Valletti (2017)**

- Model where innovation does not lead to cost reductions or demand enhancing, but to **new products**.
- $n > 2$  firms compete on R&D, they invest  $\omega_i$  at cost  $C(\omega_i)$ , convex, to obtain  $P(\text{discover new product}) = \omega_i$ .
  - If one and only one firm discovers a new product, obtains a prize = 1
  - If two or more firms discover the new product, obtain a prize  $\delta < 1$

### **Main results:**

- The merged firm decreases effort  $\omega_i$  compared to the situation pre-merger for any  $\delta > 0$ .
- Total industry effort decreases after the merger **iff  $n$  is low enough**.



# **Conclusion and some possible applications/extensions**

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- As noted, effects **very dependent** on the shape of demand -> no scope for a (more) general theory

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  - It is possible that a merger is incentivized partly by the willingness to obtain better data for the parties. This might be killed with strong data sharing policies, which can be imposed as a condition to a merger. However, what would happen to innovation in that case?