Antitrust Limits on Startup Acquisitions

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- Many dominant incumbents acquire startups at a very high rate
  - E.g., Tim Cook says Apple buys a new company "every 2-3 weeks."
- A steady flow of relatively small acquisitions
  - Targets are young and small, but highly innovative
  - Value based mainly on tech/IP and future potential
- Traditional merger analysis won't be very practical or informative
  - The relevant concerns center on *future* effects, which are inherently speculative
  - Often can't clearly identify the startup's "relevant market"
  - Often can't establish whether the merger is horizontal or vertical

Paper Outline

- Persistent acquisitions by dominant firms may generate significant effects in the aggregate, even if every *individual* deal is small
  - Possible effects on competition, innovation incentives, and the diffusion of new technologies
- We explore these effects, and the potential utility of antitrust
  - Two incumbents, with one being dominant
  - A startup is an innovator looking to monetize its new tech
  - No assumption that the startup is a prospective competitor
  - But diffusion of new tech will itself impact competition
- Complete endogeneity of technology development and diffusion
  - Acquisitions of startups are endogenous
  - All firms can endogenously license their tech
  - Innovators' choice of "direction of innovation" is endogenous

Duopoly with Quality Differentiation

- Two incumbents: "leader" (firm 1) and a "laggard" (firm 2).
- Sing-Vives (1984) differentiated duopoly framework.
  - Quality differentiation in a linear demand system.
- Equilibrium is a function of the "quality profile" $\mathbf{z} = (z_1, z_2)$.
  - $z_i =$ firm i's product quality ($=$ demand-shifter $-$ cost-shifter)
- Equilibrium profits: $\pi_i(\mathbf{z})$
  - Industry profits: $\Pi(\mathbf{z}) = \pi_1(\mathbf{z}) + \pi_2(\mathbf{z})$.
  - Consumer surplus: $CS(\mathbf{z})$.

Component Technologies

- Each product comprises numerous upstream **component technologies**, $t = 1, 2, ..., T$.

- Each firm's overall product quality z_i is an aggregate of its component quality levels:

$$z_i = \sum_t \lambda^t x_i^t$$

- x_i^t is the quality of i's component-t technology.
  - $\lambda^t > 0$, with $\sum_t \lambda^t = T$, describe relative importance of components.

- A startup is the creator of a new technology in some component τ.
  - Ex ante, it chooses which component τ to work on ("direction of innovation"), and how much to invest in R&D

Endogenous Licensing

- If firm i's component-t technology is superior ($x_i^t > x_j^t$), it can license this tech to firm j.
    - Licensee's product quality rises by $\Delta z_j = \lambda^t[x_i^t - x_j^t]$.

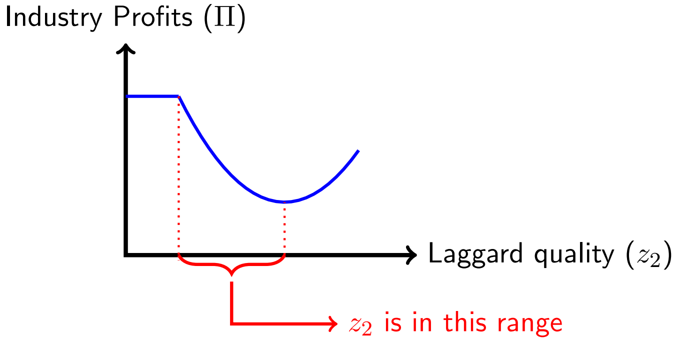
- Licensing updates the quality profile: $\mathbf{z} \to \mathbf{z}'$
    - Licensing can be mutually beneficial iff it raises total profits.

      $\Rightarrow$ Licensing occurs iff $\Pi(\mathbf{z}') \geq \Pi(\mathbf{z})$.

- Comparative statics of $\Pi(\mathbf{z})$ determine which licensing deals occur.

- If leader is far ahead ($z_1 \gg z_2$), industry profits are locally decreasing in laggard quality ($\partial\Pi/\partial z_2 < 0$).
  - But increases in leader quality *always* raise industry profits.

- **Assumption:** The leader is far ahead: $z_1 \gg z_2 \Rightarrow \partial\Pi/\partial z_2 < 0$.
  - This is our criterion for labeling firm 1 as "dominant"



Statics Drive Technology Transfers

- When leader quality (z_1) rises, so does quality differentiation (z_1/z_2)
  - Competition gets softer $\Rightarrow$ total profits rise

- Opposite happens when laggard quality (z_2) rises.
  - Implication: Deals that raise laggard quality are bad for total profits.

- After endogenous licensing, leader is weakly ahead *in all components* ($x_1^t \geq x_2^t \, \forall t$)
  - If laggard is initially ahead in any component t ($x_2^t > x_1^t$), it will license that tech to the leader.
  - But leader never licenses its superior tech to the laggard.

Startups

- Startup: the creator of a new technology for component τ.

- Startup's tech has quality $x^{\tau}_{startup} > \min\{x^{\tau}_{1}, x^{\tau}_{2}\}$
  - Startup's tech is definitely superior to the laggard's current tech
  - May or may not be superior to the leader's current tech

- Startup can choose to be acquired by one firm or license to both.
  - Prices determined via Nash-in-Nash solution
  - Equilibrium allocation of tech rights will always be that which maximizes total profits
  - Outside options determine how profit gains are distributed.

Equilibrium & Antitrust Remedies

- In equilibrium, startup is always acquired by leader.
  - Leader always willing to outbid laggard
  - Leader won't license the laggard post-acquisition
  - "Efficiency effect" from Gilbert-Newbery (1982).

- Takeaway: new technologies diffuse narrowly.
  - Conducive to expansion/maintenance of leader's dominance.

- We consider two antitrust remedies: (A) block the acquisition; or (B) compulsory licensing requirement.
  - Compulsory licensing: leader must license acquired tech to laggard
  - We show that both options lead to same end-result in eqlm.
  - Broader diffusion: both firms end up with tech rights
  - **Caveat:** acquisition price goes down $\Rightarrow$ startup worse off

Direction of Innovation

- Now shift to ex ante stage:
  - Decision problem of an innovator: a *prospective* startup
  - Innovator can choose which component τ to work on

- For each τ, there is a "project" the innovator could pursue
  - Characterized by a tuple $(\Delta_1^\tau, \Delta_2^\tau) \in \mathbb{R}_+^2$
  - Δ_i^τ says: by how much would this tech increase z_i?

- Absent antitrust, innovator preferences over projects deviate sharply from consumer preferences
  - Consumers would like the project that maximizes the total quality enhancement: $\Delta_1^\tau + \Delta_2^\tau$.
  - Innovators' preferences skew heavily in favor of projects with larger Δ_1^τ—i.e. they cater to the leader.
  - Antitrust intervention significantly reduces this distortion.

Rate of Innovation

- Conditional on a choice of project, how much does innovator invest in R&D? (bigger investment $\Rightarrow$ higher probability of success).
  - This shapes the *rate* of innovation.

- Absent antitrust, acquisition prices are higher
  - This induces bigger investment, all else being equal

- However, once leader obtains full monopoly, its WTP for new tech falls abruptly
  - Under competition, leader's WTP was driven mainly by the value of reducing competition (a market-structural effect)
  - Upon reaching monopoly, this source of value is exhausted.
  - Moving forward, acquisition prices are much lower $\Rightarrow$ rate of innovation declines

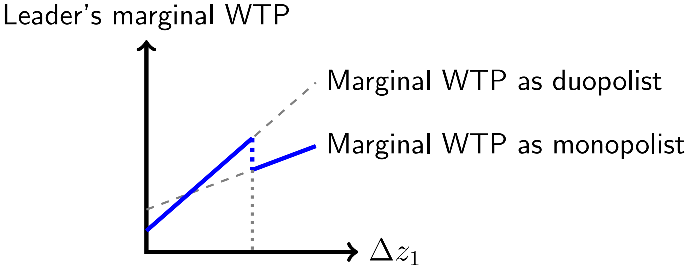


Figure: Leader's marginal WTP (for a quality boost) drops abruptly upon crossing monopoly threshold, becoming permanently flatter

- The drop reflects Arrow's "replacement effect" — monopolist not willing to pay as much for an innovation as a competitive firm.
- Antitrust would help avoid this by maintaining competition over time.

Three Strands of Inefficiency

- Our paper looks at the endogenous creation and diffusion of new technologies under oligopoly with a dominant firm
- We focus on outcomes along three dimensions:
  - The diffusion of innovation—how many firms end up getting the rights to use valuable new technologies?
  - The direction of innovation—what projects do innovators choose to pursue, and how do they compare to what consumers would pick?
  - The rate of innovation—how much do innovators invest in R&D projects?
- With a dominant firm and no antitrust intervention, we identify inefficiencies along all three dimensions.
  - In each case, antitrust could help to reduce the operative inefficiency.

Conclusion

- Commonly assumed that antitrust intervention in startup acquisitions would necessarily hamper innovation

- But our results indicate that a laissez-faire policies may distort innovation incentives and undermine diffusion of new technologies
    - When the leading incumbent is sufficiently dominant

- Our results suggest the conventional economic arguments for nonintervention are much less robust than they purport to be.

Thanks!