Killer Acquisitions and Beyond:
Policy Effects on Innovation Strategies

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Introduction: Background

- Current practice: start-up acquisitions are waved through.
  - Acquisitions by Google, Amazon, Apple, Facebook and Microsoft (31.6 billion USD in 2017).
  - Google acquired about one firm per month between 2001 and 2018.
- Recent concern about eliminating potential competition:
  - Crémer et al. (2019) ("EU Report"),
  - Furman et al. (2019) ("Furman Report"),
  - Scott Morton et al. (2019) ("Stigler Report").
- Anti-competitive motive particularly salient in the case of killer acquisitions (Cunningham, Ederer and Ma 2020).

INVESTIGATION OF COMPETITION IN DIGITAL MARKETS

MAJORITY STAFF REPORT AND RECOMMENDATIONS

SUBCOMMITTEE ON ANTITRUST, COMMERCIAL AND ADMINISTRATIVE LAW OF THE COMMITTEE ON THE JUDICIARY

Jerrold Nadler, Chairman, Committee on the Judiciary

David N. Cicilline, Chairman, Subcommittee of the Judiciary on Antitrust, Commercial and Administrative Law

UNITED STATES
2020

Intention to act against acquisition of start-ups

- Subcommittee report (p.395):

Since startups can be an important source of potential and nascent competition, the antitrust laws should also look unfavorably upon incumbents purchasing innovative startups. One way that Congress could do so is by codifying a presumption against acquisitions of startups by dominant firms, particularly those that serve as direct competitors, as well as those operating in adjacent or related markets.[2485]

- NY Times, December 9, 2020:

U.S. and States Say Facebook Illegally Crushed Competition

Regulators are accusing the company of buying up rising rivals to cement its dominance over social media.

Intention to act against acquisition of start-ups

- Chief Executive of the CMA, Andrea Coscelli, lecture on Febrary 9, 2021:

> Many of us are now familiar with the statistic that – between 2008 and 2018 of the 400 acquisitions made globally by the 5 largest digital firms – none has been blocked by competition authorities. But it remains a powerful one. It is very hard to look at those numbers, to look at the state of the relevant markets today, and conclude with hindsight that the balance has been struck correctly.

Should start-up acquisitions be prohibited?

- Ex post effect: Entrant and its innovation are preserved.
- Ex ante effect:
  - Selling the firm can foster innovation by entrants (Rasmussen 1988).
  - But prohibiting acquisitions could increase innovation by incumbents.
  - Is there a difference between killer and other acquisitions?

- This paper: Foundations for a market-by-market approach to start-up acquisitions.

Our paper

- Most innovation models only focus on the amount of resources that firms invest in innovation.
- This does not necessarily reflect the market-wide probability of an innovation! Why?
  - Firms also choose in which research projects to invest.
  - Duplicate projects don't increase the probability of innovation!
- We develop a framework where firms can choose both in which projects to invest and how much to invest.
- This allows us to uncover an important channel: a ban on acquisitions affects the incentives to invest in new projects differently from incentives to invest in duplicate projects.

Main Results

- Prohibiting killer acquisitions has a strictly negative innovation effect.
- Prohibiting other acquisitions has a weakly negative innovation effect.
  - We provide conditions under which the effect is zero.
- Innovation effect is likely to be small (and prohibition of acquisitions justified) when:
  - entrant has low bargaining power,
  - incumbent's profits after entry are large.

Literature

- Cunningham et al. (2020) explain rationale behind discontinuing development, but not initial innovation decisions.
- Innovation effects of mergers between incumbents:
  - negative effects: Federico, Langus and Valletti (2017, 2018), Motta and Tarantino (2018), Gilbert (2019);
  - positive effects: Denicolò and Polo (2018);
  - mixed effects: Bourreau, Jullien and Lefouili (2018);
  - distortion of direction: Moraga-Gonzalez, Motchenkova and Nevrekar (2020), Cabral (2018).
- Innovation effects of start-up acquisitions:
  Rasmussen (1988), Mason and Weeds (2013), Gans (2000, 2002), Phillips and Zhdanov (2013), Bryan and Hovenkamp (2020), Fumagalli, Motta and Tarantino (2020), Hollenbeck (2020), Kamepalli, Rajan and Zingales (2020), Katz (2020).

Model

Model: Overview

- Two firms: incumbent and entrant.
- Incumbent faces entry challenge.
- Contrary to incumbent, entrant has to innovate to produce.

Laissez-faire model:

1. Firms choose investments in different R&D projects.
2. Incumbent can acquire the entrant.
3. Commercialization decision.
4. Product market competition.

Alternative: No-acquisition policy (without Stage 2).

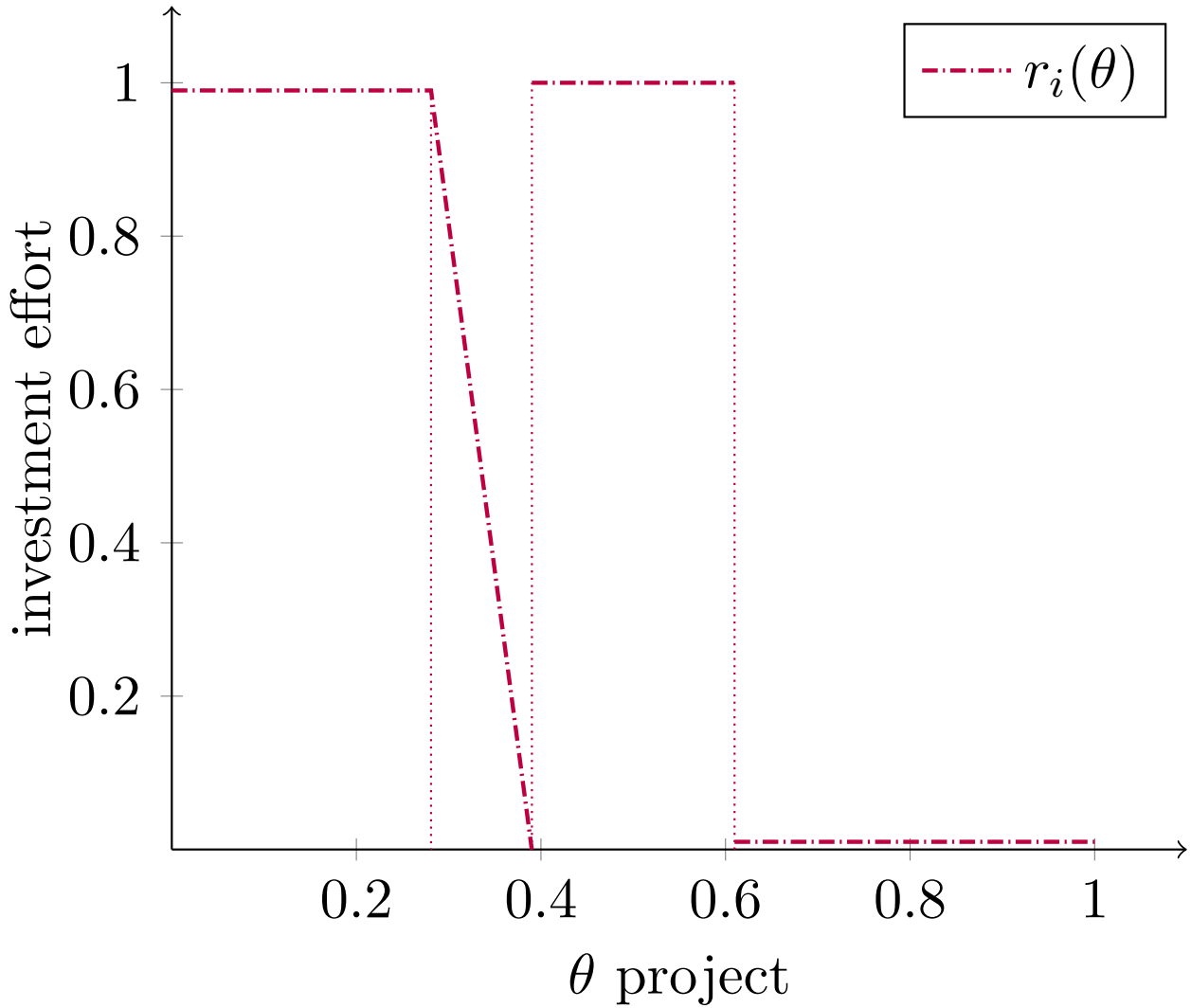
Model: Investment Stage

- Incumbent I and entrant E simultaneously choose how much to invest in each project θ from $\Theta = [0, 1)$.
- Firms choose research intensity $r_i(\theta) \in [0, 1]$.
- Marginal cost of investing in project θ is $C(\theta)$, where $C : \Theta \to \mathbb{R}_+$ is well-behaved and strictly increasing.
- Total investment cost: $\int_0^1 r_i(\theta) C(\theta) d\theta$.

Model: Investment Stage

- Only one project, $\hat{\theta} \in \Theta$ is correct (leads to an innovation).
- Each project is equally likely to be the correct project.
- The correct project yields high technology H (drastic innovation) with probability p, otherwise non-drastic innovation L.
- Firm innovates with probability $r_i(\hat{\theta})$.
- Patent for innovator (probability $1/2$ if both innovate).
- Firms learn technology state from $(\ell, 0)$, (ℓ, L), (ℓ, H), $(L, 0)$, $(H, 0)$, where ℓ is incumbent's default technology.

Model: Investment Stage



Model: Stages of the Game

Acquisition stage 2:

- The incumbent can acquire the entrant by paying the foregone profits plus a share β of the bargaining surplus.
- Acquisition iff bargaining surplus is strictly positive.
- Patents are transferred to the acquiring firm.

Commercialization stage 3:

- Patent holder can commercialize at cost κ.
- Firms' final technology states t_I^{fin} and t_E^{fin} are realized.

Market stage 4:

- Incumbent profits $\pi(t_I^{fin}, t_E^{fin})$; entrant profits $\pi(t_E^{fin}, t_I^{fin})$.

Model: Further assumptions

Assumption 1 (Market profits)

(i) *Profits are non-negative.*

(ii) *Without an innovation, the entrant earns zero profits.*

(iii) *Technology H corresponds to a drastic innovation.*

(iv) *Competition decreases total profits:*

$$\max\{\pi(L,0),\pi(\ell,0)\} > \pi(\ell,L)+\pi(L,\ell).$$

Assumption 2 *(Commercialization costs)*

(i) $\pi(L,\ell) \geq \kappa$;

(ii) $\pi(H)-\pi(\ell,0) \geq \kappa$.

Investments under the Laissez-Faire Policy

Subgames

Lemma 1 (Acquisitions)

Acquisition stage 2:

- The incumbent acquires the entrant iff the entrant holds the patent to L.

Commercialization stage 3:

- Entrant commercializes both technologies.
- Incumbent commercializes H always and L iff $\pi(L,0) - \pi(\ell,0) \geq \kappa$.

Market stage 4:

- Incumbent profits $\pi(t_I^{fin}, t_E^{fin})$; entrant profits $\pi(t_E^{fin}, t_I^{fin})$.

Critical Projects

- Characterization of equilibrium investments will rely on critical projects: θ_I^1, θ_E^1, θ_I^2 and θ_E^2.

$$
\begin{aligned}
C(\theta_E^1) &= pv_E(H) + (1-p)v_E(L,\ell) \\
C(\theta_E^2) &= \frac{1}{2}\left(pv_E(H) + (1-p)v_E(L,\ell)\right) \\
C(\theta_I^1) &= pv_I(H) + (1-p)v_I(L,0) - v_I(\ell,0) \\
C(\theta_I^2) &= \frac{p}{2}v_I(H) + (1-p)\left(\frac{1}{2}v_I(L,0) + \frac{1}{2}v_I(\ell,L)\right) \\
&\quad - (1-p)v_I(\ell,L).
\end{aligned}
$$

Critical Projects

- $C(\theta_i^1)$ equals expected value increase to firm i if it invests in the project when the other firm does not.
- $C(\theta_i^2)$ analogous for the case that both firms invest.

Critical Projects

Lemma 3

Under laissez-faire, the only possible relations between the critical projects are:

(i) $\theta_I^1 \leq \theta_I^2 = \theta_E^2 < \theta_E^1$;

(ii) $\theta_I^2 = \theta_E^2 < \theta_I^1 < \theta_E^1$;

(iii) $\theta_I^2 = \theta_E^2 < \theta_E^1 \leq \theta_I^1$.

Relation (iii) can only arise in the case with commercialization.

Equilibrium Investments

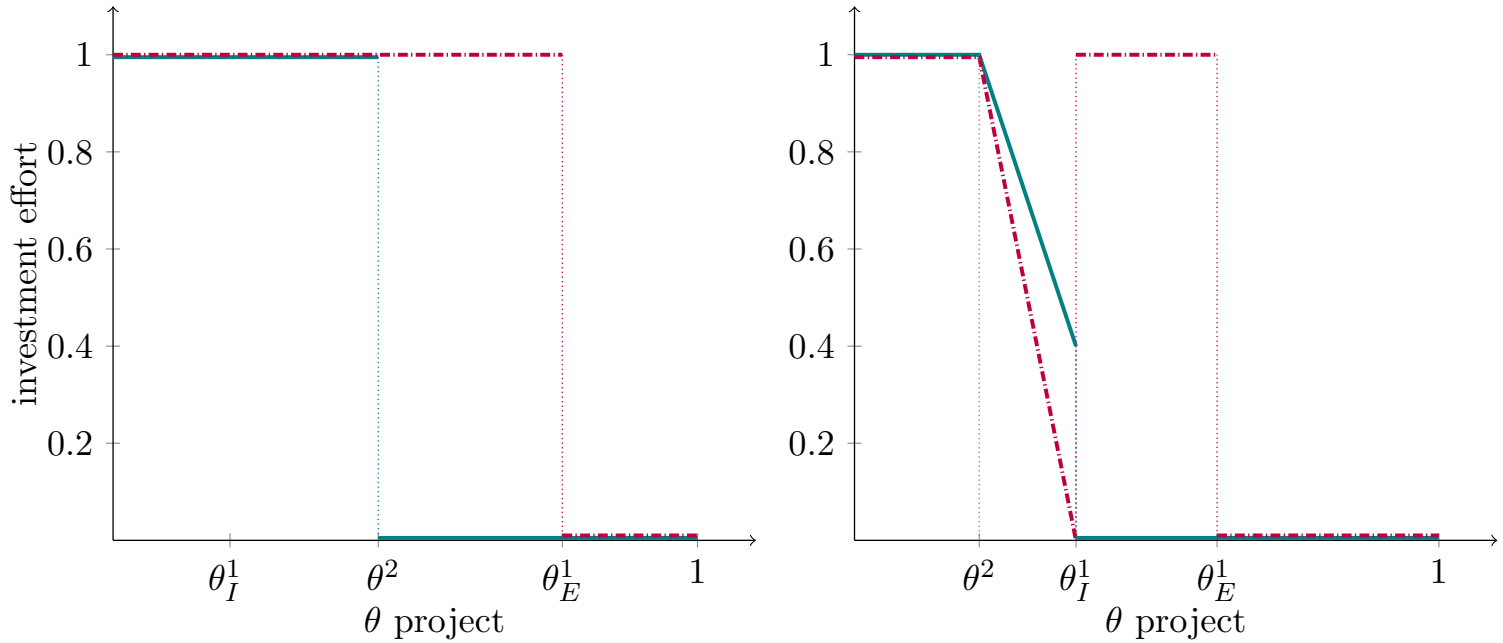


Figure: Proposition 1 – Equilibrium portfolio if $\theta_I^1 < \theta_E^1$.

- A *simple equilibrium* (where firms either invest maximally or not at all in each project) always exists.
- In the no-commercialization case, only $\theta_I^1 < \theta_E^1$ can arise.

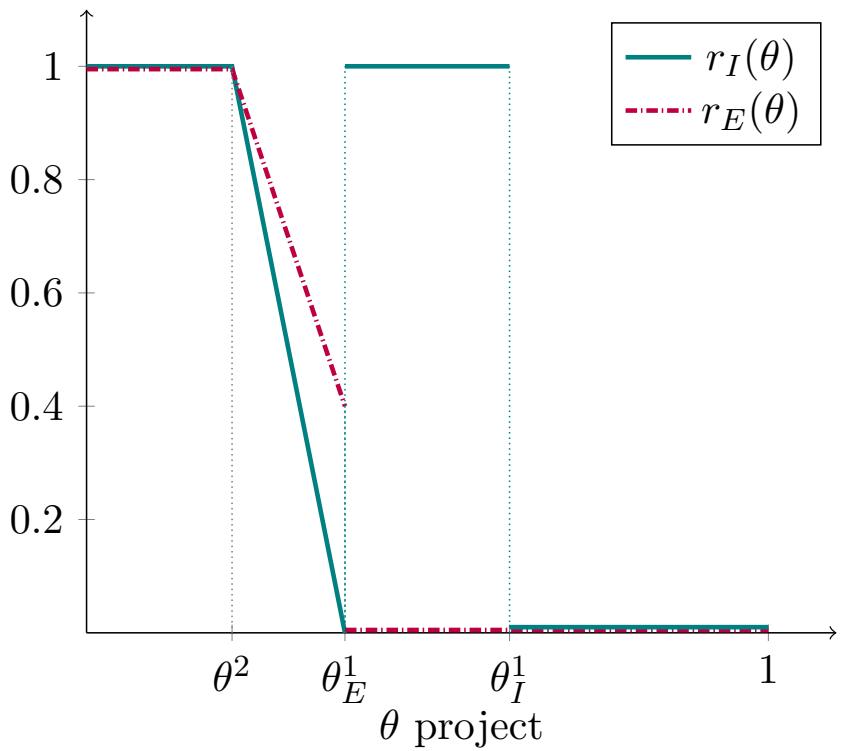


Figure: Proposition 1 – Equilibrium portfolio if $\theta_I^1 \geq \theta_E^1$.

- In the commercialization case, also $\theta_I^1 \geq \theta_E^1$ can arise.

Prohibiting Acquisitions

The Effects on Variety

Note: $\theta_E^1(N) < \theta_E^1(A)$ and $\theta_I^1(N) = \theta_I^1(A) = \theta_I^1$.

Proposition 3

(i) In any equilibrium under the no-acquisition policy,
(a) variety is weakly smaller than in any equilibrium under laissez-faire
(b) the innovation probability is weakly smaller than in any simple equilibrium under laissez-faire.

(ii) The inequalities in (i) are strict, except that there is no effect on variety in the case with commercialization if $\theta_E^1(A) \leq \theta_I^1$.

The Effects on Variety and Duplication

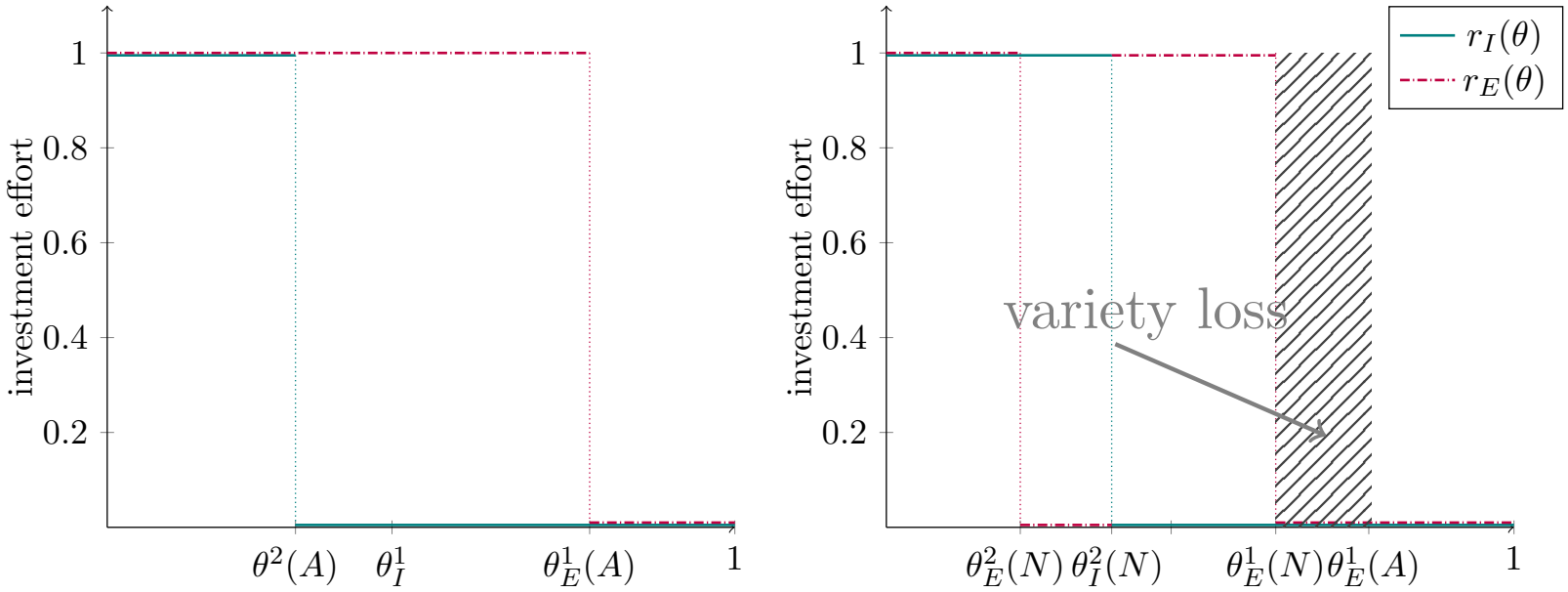


Figure: Laissez-faire (left), no-acquisition (right).

Corollary 2 (Duplication effect)

(i) $\theta_I^2(N) > \theta^2(A)$

(ii) $\theta^2(A) > \theta_E^2(N)$.

The Size of the Effect on Variety

Proposition 4

(i) The size of the policy effect is:
(a) weakly increasing in entrant bargaining power β;
(b) weakly decreasing in incumbent duopoly profits $\pi(\ell, L)$.

(ii) The effects in (i) are strict if $\theta_I^1 < \theta_E^1(A)$ and they are zero if $\theta_I^1 > \theta_E^1(A)$.

Discussion and Further Results

Innovation vs. Competition Effect

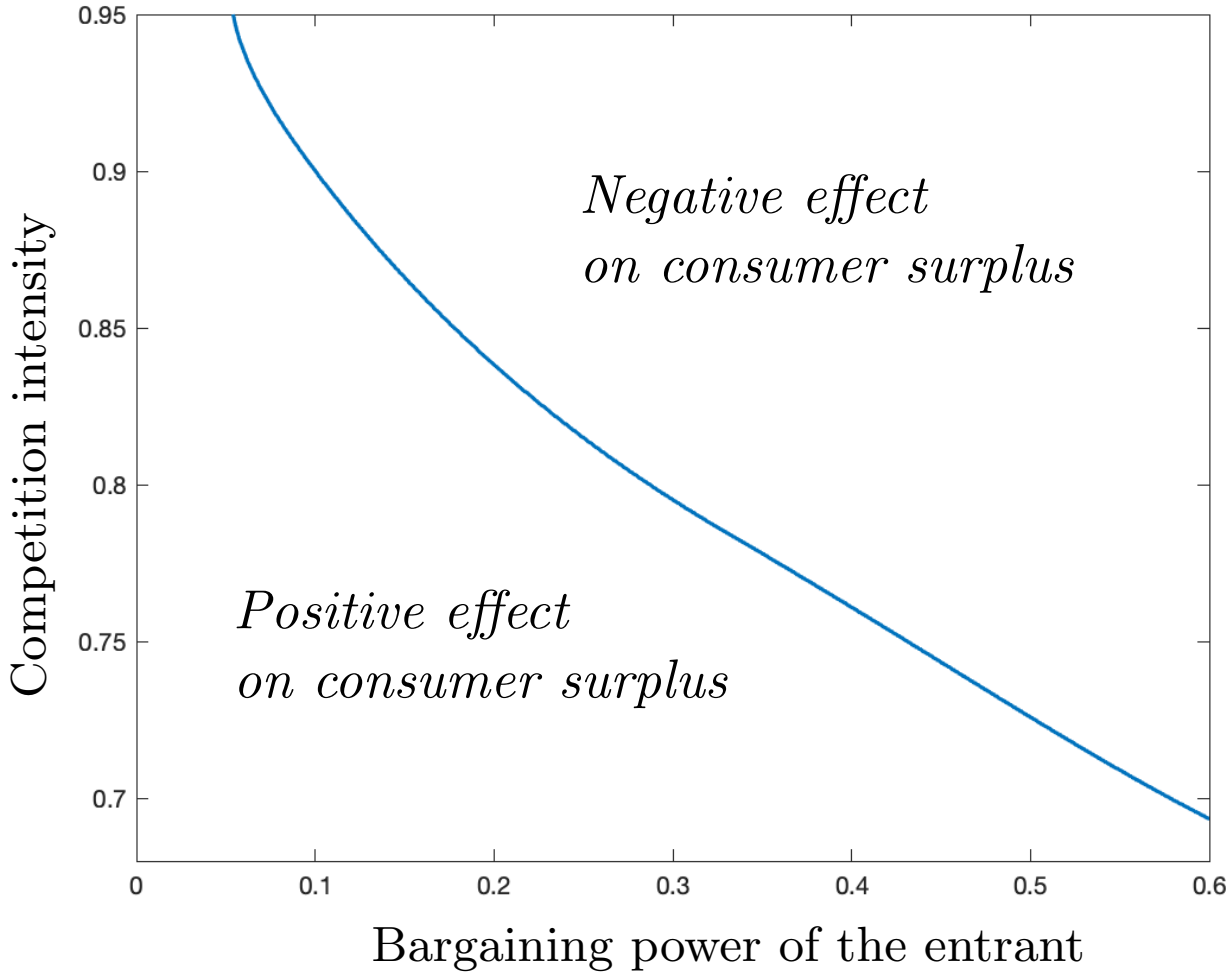


Figure: Overall effect on CS is in line with effect on innovation for parameterized examples.

Results robust to:

- Innovation uncertainty at the time of acquisition.
- Asymmetric chances of receiving patents.
- Heterogeneous commercialization costs.
- Multiple entrants.

Conclusion

- We analyze the innovation effects of a prohibition on acquiring start-ups.
- We show that the (negative) innovation effect is likely to be small when:
  - entrant has low bargaining power,
  - incumbent's profits after entry are large.
- Non-killer acquisitions may be just as problematic as the killer ones.

Appendix

The Determinants of Innovation Strategies

Definition: *The variety of research projects pursued is the size of the set of projects in which at least one firm invests.*

Note: Variety is an upper bound for innovation probability, variety and probability coincide for simple equilibria

Proposition 2 (Comparative statics under laissez-faire)

(i) Variety is
  (a) weakly increasing in entrant bargaining power β;
  (b) weakly increasing in the entrant's profits $\pi(L, \ell)$
  (c) weakly decreasing in the incumbent profit $\pi(\ell, L)$.

(ii) These effects are strict, except if $\theta_I^1 \geq \theta_E^1$.