

Foreclosure Complementarities: Exclusionary Bundling and Predatory Pricing

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Motivation

- Many foreclosure concerns in recent merger cases
- And fear of mistakes in past cases
- Common denominators:
 - Increasing returns / economies of scale
 - Product complementarities / economies of scope
- Often data responsible for both

Foreclosure definition: *“a firm’s restriction of output in one market through the use of market power in another market”* (Rey and Tirole, 2007).

Research Questions

1. How do scale economies interact with complementary markets?
2. How much of the resulting behavior is predatory?
3. What are the policy implications?

Results

- Bundling and predatory pricing are complementary
 - Without economies of scale, lower incentives to bundle products
 - Without bundling, lower incentives to price below cost
 - Often neither of them alone is sufficient to have market tipping in the long run
- Predatory incentives are key
 - Dominant firms bundle products and price aggressively to exclude competitors
 - If firms were not internalizing the effect of their actions on competitor's exit, markets would not tip
- Effective policies:
 - Ban mergers between market leaders
 - Ban bundling when only one firm can offer the integrated product
 - Soften the economies of scale with data/knowledge sharing

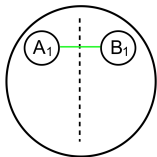
Literature

- Foreclosure
 - Literature: Rey & Tirole (2007)
 - Two-period models: Whinston (1990), Choi & Stefanadis (2001), Carlton & Waldman (2002)
- Learning-by-doing
 - Theory: Cabral & Riordan (1994), Cabral & Riordan (1997)
 - Computation: Besanko et al. (2010), Besanko et al. (2014), Besanko et al. (2019)
- Computation Theory
 - Pakes & McGuire (1994), Ericson & Pakes (1995), Doraszelski & Pakes (2007), Doraszelski & Satterthwaite (2010)
- Recent literature
 - Data and competition: Hagiu & Wright (2020), De Corniere & Taylor (2020), Kehoe et al. (2018)
 - Google-Fitbit: Chen et al. (2020), Condorelli & Padilla (2020), Motta & Peitz (2020)

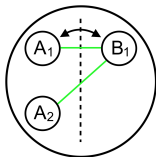
Model

Model

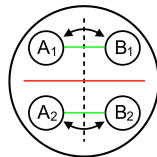
- Two markets: A and B
- Complements: consumers demand one unit of each product (system)
- At most two products per market (for now)
- Firms can enter, exit and merge



a) 2 firms, 2 products,
1 system



b) 2 firms, 3 products,
2 systems



c) 2 firms, 4 products,
2 systems

Demand

Example setting:

- 2 markets: A and B
- 4 products: A_1, A_2, B_1, B_2
- 4 systems: $A_1B_1, A_1B_2, A_2B_1, A_2B_2$
- Consumers only demand systems
- Consumer i utility from system A_1B_1

$$u_{iA_1B_1} = v_i - \sigma(p_{A_1} + p_{B_1}) + \varepsilon_{iA_1B_1}$$

- Assume logit error. Demand of firm A_1

$$q_{A_1}(\mathbf{p}) = q_{A_1B_1}(\mathbf{p}) + q_{A_1B_2}(\mathbf{p}) = \frac{e^{-\sigma p_{A_1}}}{e^{-\sigma p_{A_1}} + e^{-\sigma p_{A_2}}}$$

Where v_i is the value of a system for consumer i , p_{A_1} is A_1 's price, $\varepsilon_{iA_1B_1}$ is consumer i shock for system A_1B_1 .

Dynamics

- Three mechanisms of market dynamics
 - Entry
 - Exit
 - Mergers
- Same mechanism
 - In each period a random firm gets an opportunity to exit/enter/merge
 - Draws a uniform random cost (entry, mergers) or scrap value (exit)
 - Firm makes decision that maximizes value

Scale Economies: Learning-by-Doing

- Learning-by-doing: firms decrease their marginal cost through sales
 - Only one firm gets a sale in each period
 - The firm that gets the sale decreases its marginal cost
 - Up to a lower bound
- Model: learning-by-doing *only in market A*
- Learning-by-doing introduces endogenous asymmetries
- ...and changes firms' **pricing incentives**
 - Lower price \rightarrow higher probability of lower marginal cost in the future
 - Result: aggressive pricing behavior
- and adds further dimension: firm experience.

Foreclosure

Two potential foreclosure practices in this model:

1. Product bundling
2. Below-cost pricing

The incentives for both practices can be decomposed into a competitive and an anti-competitive component.

Bundling

Competitive component

- Bundling allows integrated firm to internalize pricing externalities

Anti-competitive component

- Bundling disadvantages non-integrated competitors
- Might cause competitor exit or prevent entry
- Carlton & Waldman (2002): bundling by integrated monopolist can prevent competitor sequential entry by negating sales in intermediate period.

Below-cost Pricing

Competitive component

- With economies of scale, firms have the incentive to be aggressive at the bottom of the learning curve
- Besanko et al. (2014): *advantage-building motive*

Anti-competitive component

- Predatory pricing can also be used to prevent rivals from climbing the learning curve
- Besanko et al. (2014): *advantage-denying motive*
- Can be decomposed into predatory and non-predatory incentives, depending on whether the purpose is to induce exit

Equilibrium Dynamics

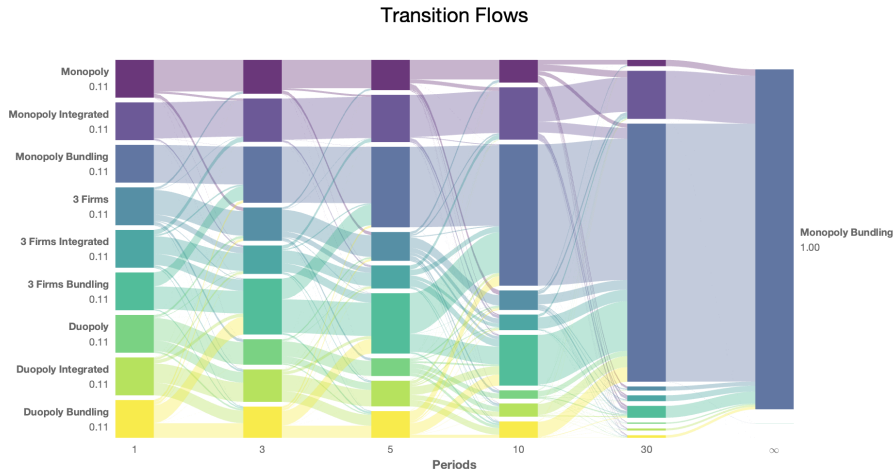
Equilibrium Dynamics

How do the equilibrium dynamics look like?

- Note: two type of underlying dynamics:
 1. Within markets: learning curve
 2. Across markets: entry, exit, mergers, bundling

We now look at one example ($\rho = 0.5$, $\sigma = 0.15$) of the dynamics across markets, from different initial states.

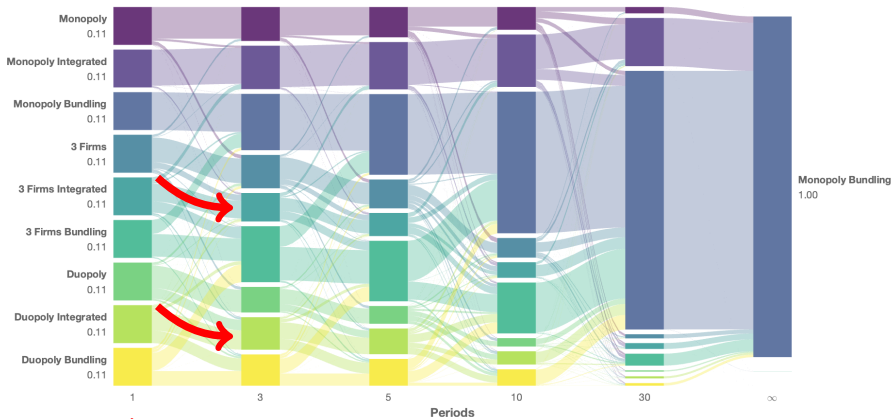
Example of Dynamics ($\rho = 0.5$, $\sigma = 0.15$)



In the long run, market degenerates to monopoly from any initial state.
How?

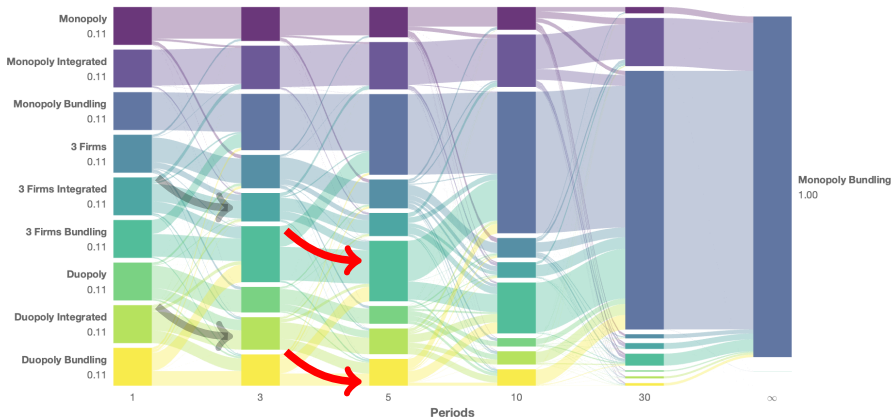
Example of Dynamics ($\rho = 0.5$, $\sigma = 0.15$)

Transition Flows



Example of Dynamics ($\rho = 0.5$, $\sigma = 0.15$)

Transition Flows

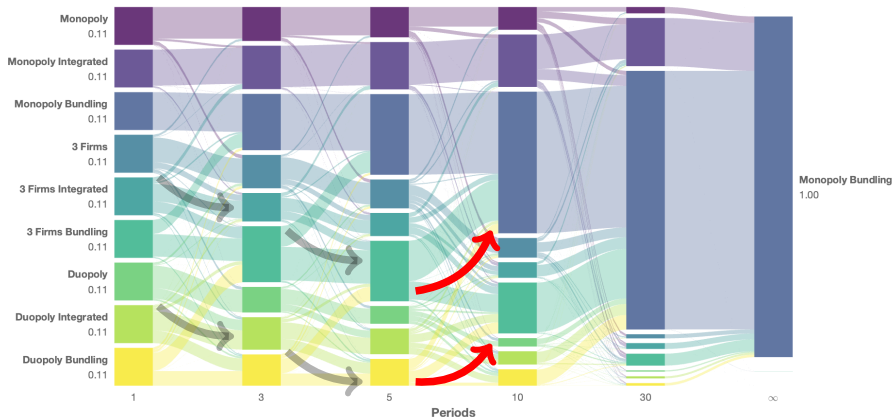


1) Firms integrate

2) Integrated firms bundle

Example of Dynamics ($\rho = 0.5$, $\sigma = 0.15$)

Transition Flows



- 1) Firms integrate
- 2) Integrated firms bundle
- 3) Non-integrated firms exit

Comparative Statics

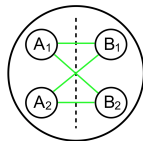
Comparative Statics

How much do the previous insights generalize?

Explore two main parameters:

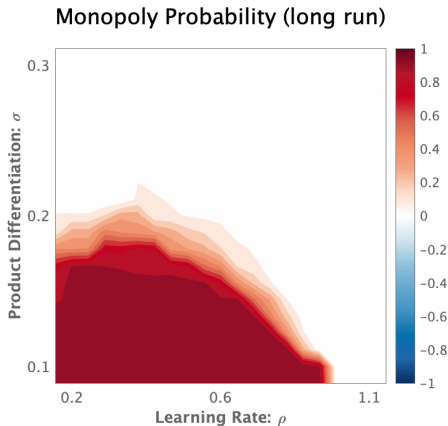
- Product Differentiation: σ
 - Determines the intensity of competition / profitability of the market
 - Higher σ : lower competition
- Learning Rate: ρ
 - Determines the extent of scale economies
 - Higher σ : higher increase in marginal cost with each sale

Initial state: non-integrated duopoly.



Comparative Statics

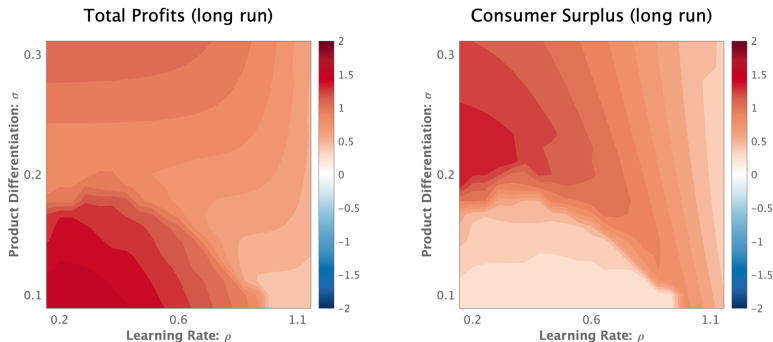
High competition and low learning rates \rightarrow integrated monopoly in the long run.



What is the impact on profits and consumer surplus?

Profits and Consumer Surplus

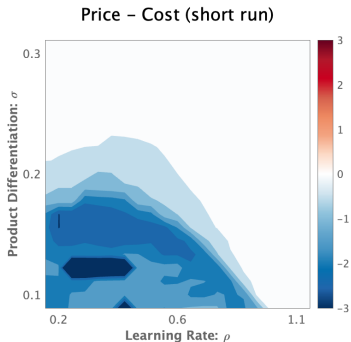
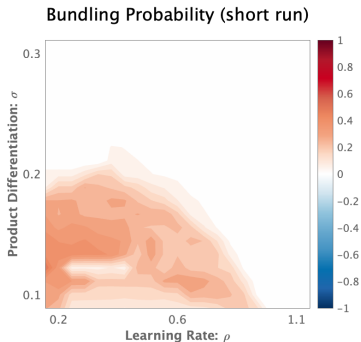
Higher profits and lower consumer surplus when markets degenerate to monopoly.



What is the role of bundling and learning-by doing?

Bundling and Below-cost pricing

In the initial periods, firms bundle their products and price below cost.



Comments

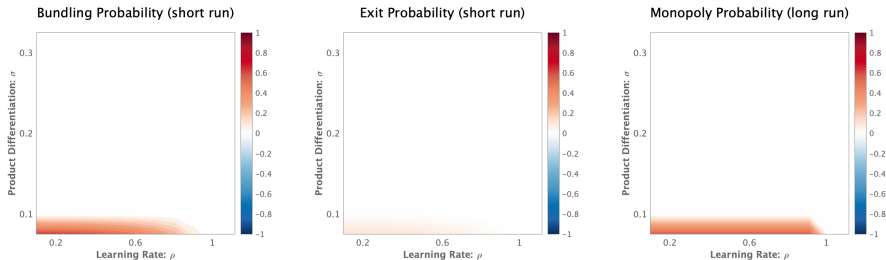
- Firms integrate and bundle their products
- Seems a positive outcome in the short run
- But in the long run degenerates to monopoly

Questions

- Is it bundling?
- Is it learning by doing?
- Is it both?

Effect of learning by doing on bundling

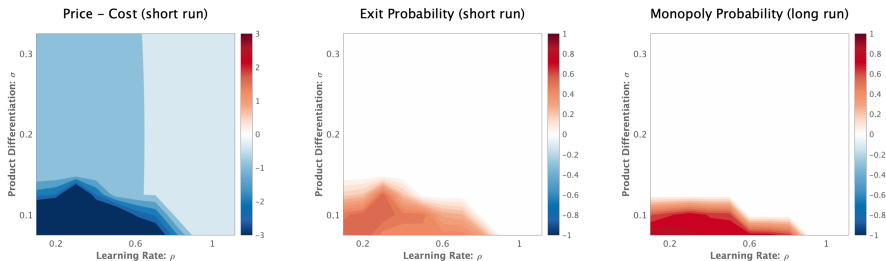
What happens if you remove learning by doing?



Short run bundling probability decreases \rightarrow short run exit probability decreases \rightarrow long run market tipping probability decreases

Effect of bundling on learning by doing

What happens if you remove bundling?



Aggressive below-cost pricing decreases (dark blue) → short run exit probability decreases → long run market tipping probability decreases

Comments

Wrap-up

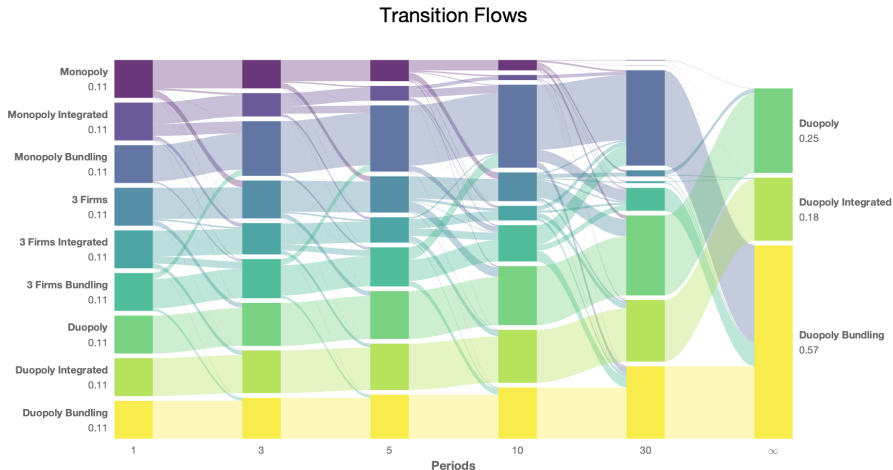
- With learning, firms have more incentives to bundle products
- With bundling, firms have more incentives to price below cost
- Both behaviors ultimately lead to competitor's exit
- And ultimately, market monopolization
- In many scenarios, we observe market monopolization only with bundling and learning combined

How much of this is due to predatory incentives?

- Remove internalization of impact own action on rivals' exit decision
- Firms exit but do not change their actions to induce exit

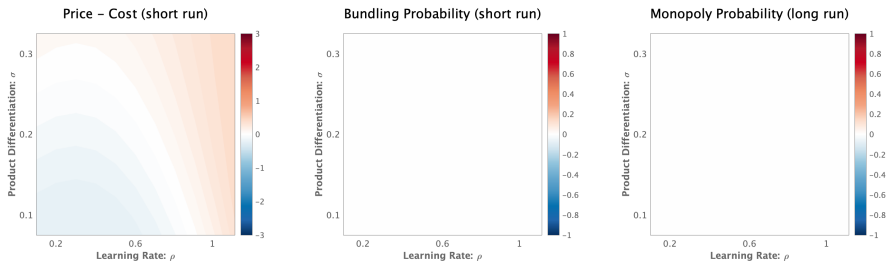
Example ($\rho = 0.5$, $\sigma = 0.15$)

There is a lot of state persistence, but ultimately firms enter the market.



How much do these results generalize?

Removing predatory incentives



Results

- Little below-cost pricing in the short run
- No bundling in the short run
- No monopoly in the long run

Comments

- Complementary markets decrease the incentives of predatory pricing
- Why? Rivals enjoy the benefits of my below-cost prices
- Bundling restores predatory pricing incentives in complementary markets
- How? Allows firms to fully internalize below-cost prices benefits

Solutions

- Limit the ability to bundle
- Limit the incentives to price below cost

Policy

Policies Considered

Policies analyzed

1. Limit mergers

- Ban mergers between market leaders

2. Limit bundling

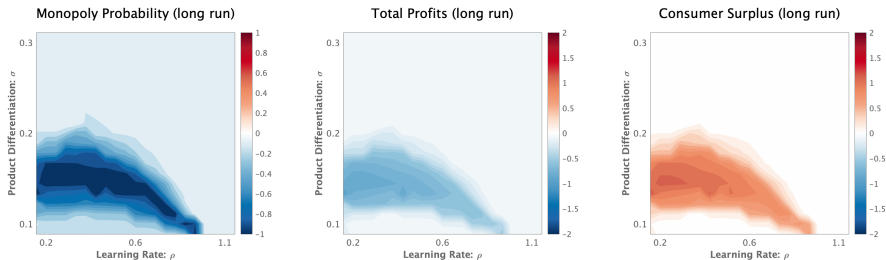
- Allow bundling only when more than one firm can offer the bundle

3. Data sharing

- Leader and follower can be at most 1 level of experience apart

Limit Mergers

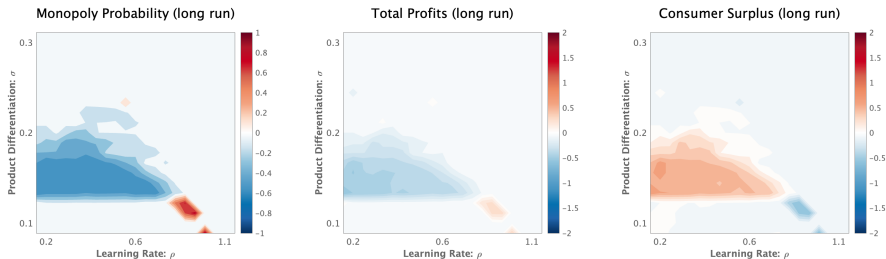
Firms that are ahead in the learning curve cannot integrate.



Rationale: firms merge as soon as they are ahead in the learning curve to internalize their advantage and use it to exclude non-integrated rivals.

Limit Bundling

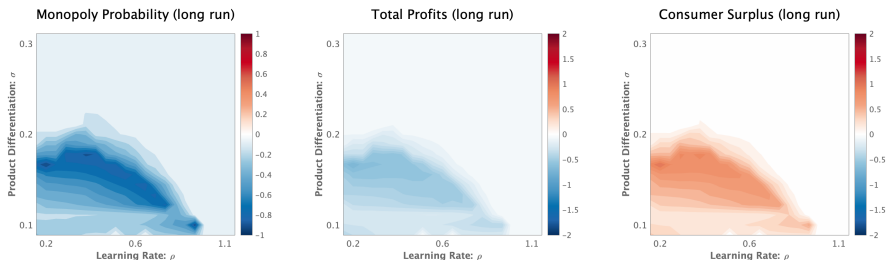
Integrated firms can bundle their products only if also the other firms are integrated and able to offer a bundled product.



Rationale: when only one firm is integrated, bundling generates an asymmetry in price internalization that disadvantages non-integrated firms.

Data sharing

Firms can be at most 1 level of experience apart in the learning curve: follower inherits the old knowledge/technology from the leader.



Rationale: softening the scale economies softens predatory incentives.

Conclusion

We have seen that

- Bundling and below-cost prices seem complementary
- Complementarity driven by predatory incentives
- Effective policies: limit mergers or bundling and data sharing

Next steps

- Map to real cases
- Partial complementarity?
- Efficiencies from mergers/bundling?
- ...

Appendix 1: Bibliography

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