# Dynamics of Compatibility under Switching Cost

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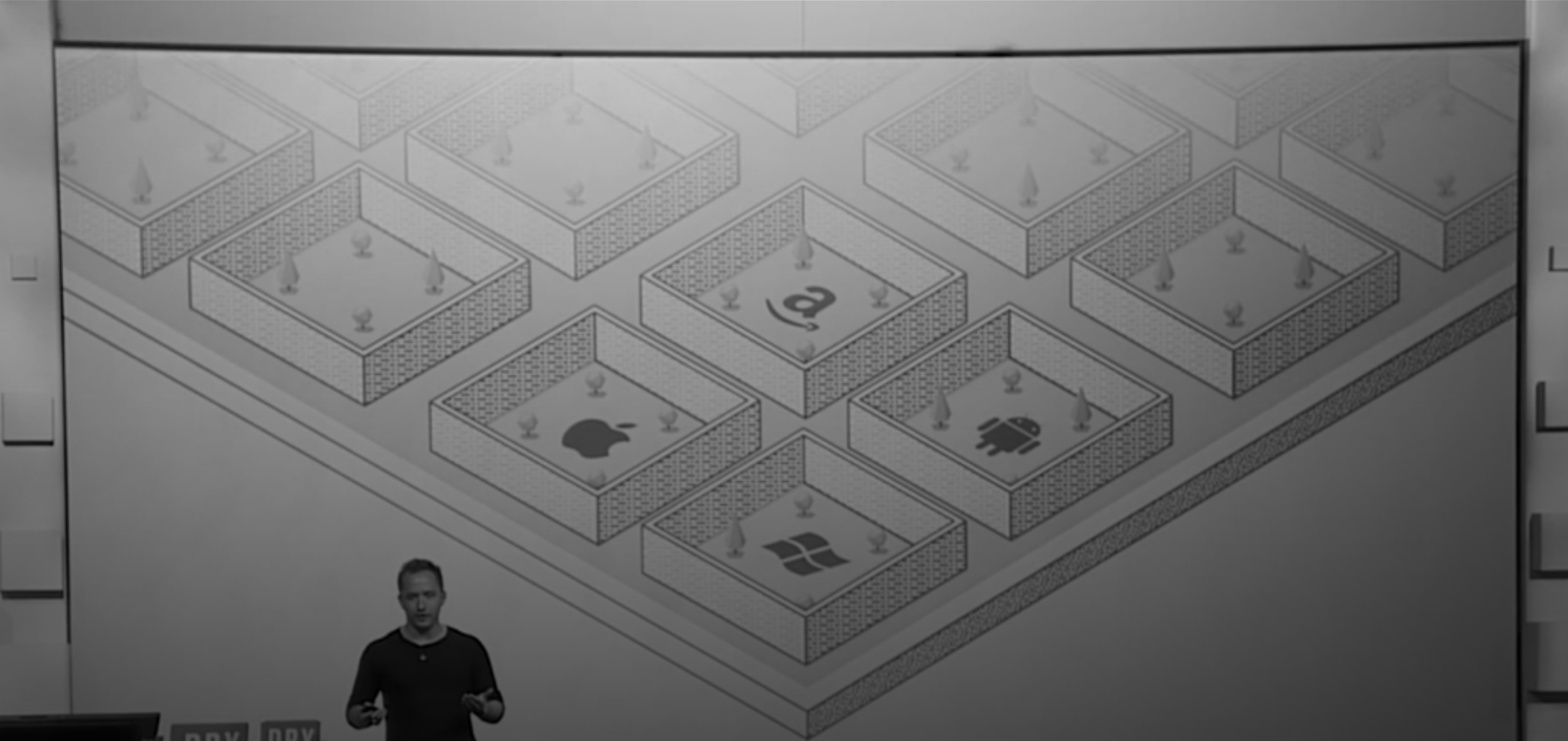
"The Internet was made in universities and it was designed to interoperate. And as we've commercialized it, we've added more of an **island-like** approach to it, which I think is a somewhat a shame for users."
— Larry Page CEO of ~~Google~~ Alphabet




*"Consumers are **trapped** in each platform."*

— Drew Houston CEO of Dropbox

# Walled garden

## I Personal computing (AAPL, GOOG, MSFT)

- *lock-in* consumers by making it hard to *transfer data* (health data, apps, music, log-in info …) to another platform or by providing some *benefits exclusively* to those who use everything from the same ecosystem (continuity, notification sync, …)

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- enterprises would incur a huge *cost* if they wish to transfer their data from one vendor to another due to *incompatible* technologies

## III Advertising (GOOG, FB)

- marketers are *forced* to buy and measure through the platform, if they want to integrate their own data (first-party/third-party) with the platform's.

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## IV Messaging (GOOG, FB, TWTR, AAPL, WeChat, Line)

- users *can't connect* to other platforms or use their services.

## V Publishers (FB, GOOG, SnapChat, AAPL)

- *different* format of content for each platform

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**Our approach**

- we consider a ***dynamic*** (two-period) model: consumers should upgrade products or renew subscriptions
- we show that symmetric firms have an incentive to choose ***incompatibility*** in both periods if
  - the weight of the second-period payoff is large enough
  - the switching cost is significant

# Model

**2 Firms** $\in \{A,B\}$

**2 Products** $j \in \{x,y\}$ either independent or perfect complements

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- **A two-dimensional Hoteling model:** a mass one of consumers are uniformly distributed over a square
- **Unit demand:** Marginal cost is large enough that a consumer buys only one between $A_j$ and $B_j$ for given $j = x,y$
- **Full coverage:** $v^e$ (expected value per product) is large enough
- Linear transportation cost $t = t_x = t_y$

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**2nd Period**

- At the end of period one, a consumer discovers the true value of the product she consumed; $v \sim U[v^e - 1/2, v^e + 1/2]$
- A **switching cost** of $s > 0$ per product; homogenous for all consumers
- **Poaching:** behavior-based price discrimination
- Common discount factor; $\delta > 0$

# Stage game for each period

**1. Compatibility choice:** each platform simultaneously chooses between compatibility and incompatibility. If at least one firm chooses incompatibility, incompatibility prevails

**2. Pricing:** each platform simultaneously chooses prices

**3. Consumers** make purchase decisions

# Second-period poaching competition

Lemma 1. **Compatibility in period two**

- Four submarkets: $A_x$, $B_x$, $A_y$, $B_y$
- In each submarket, say $A_x$, because of the switching cost, one is dominant $(A)$ and the other $(B)$ is dominated

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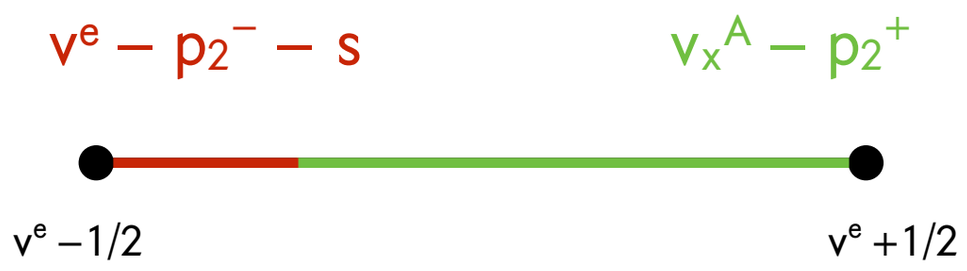

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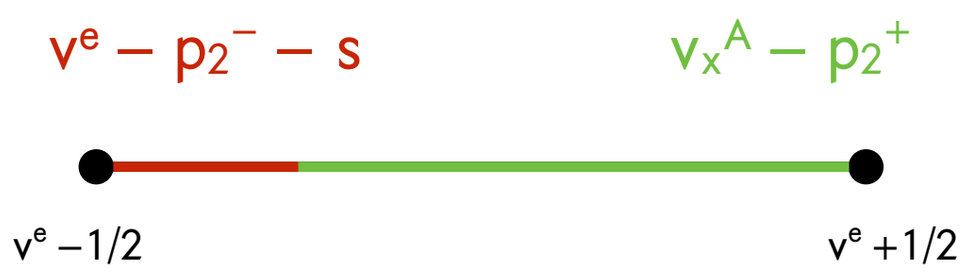


- Equilibrium profits: $\pi_2^-$, $\pi_2^+$

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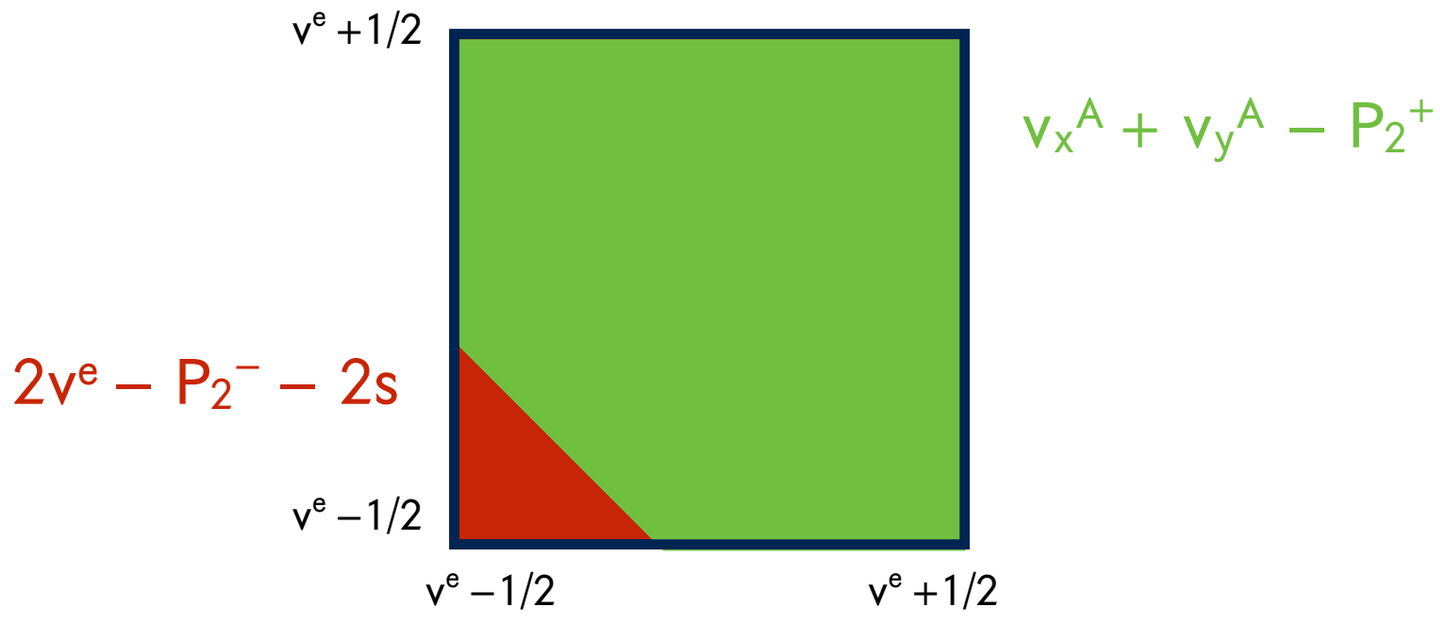

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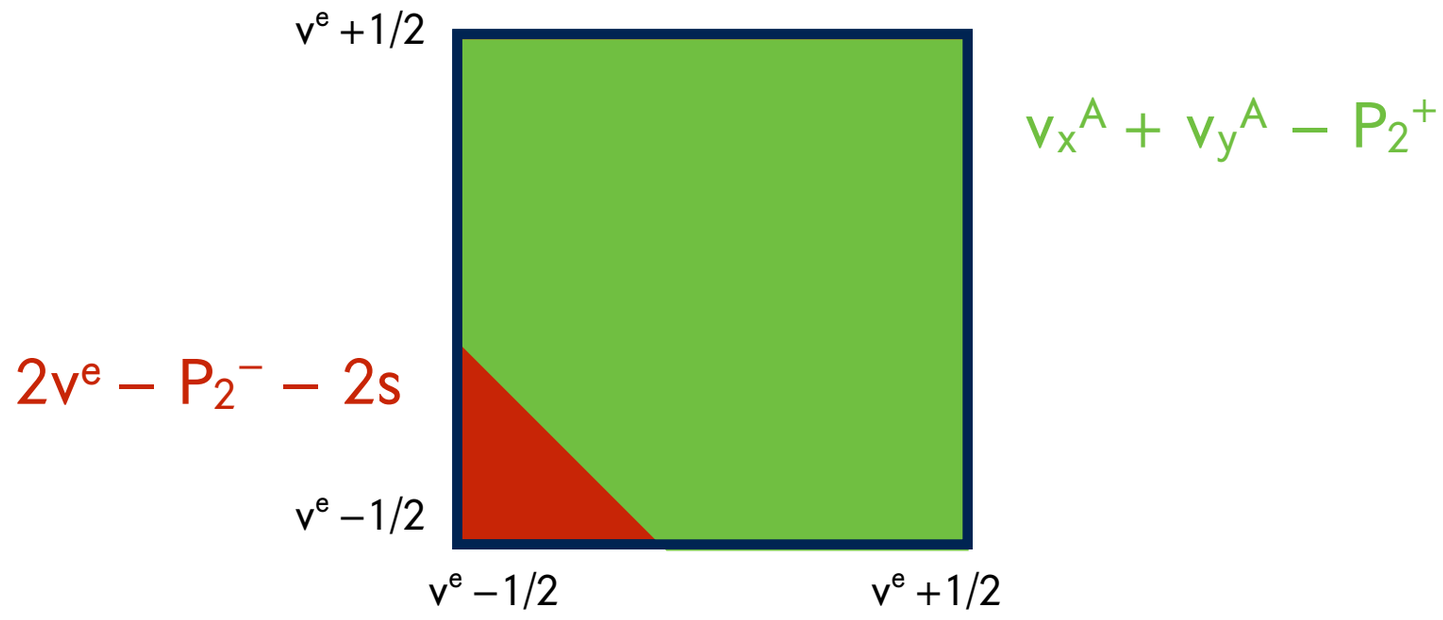


- Equilibrium profits: $\Pi_2{}^-$, $\Pi_2{}^+$

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Lemma 3. **Compatibility in 1st period and incompatibility in 2nd period**

- Four submarkets: $A_xA_y$, $B_xB_y$, $A_xB_y$, $B_xA_y$
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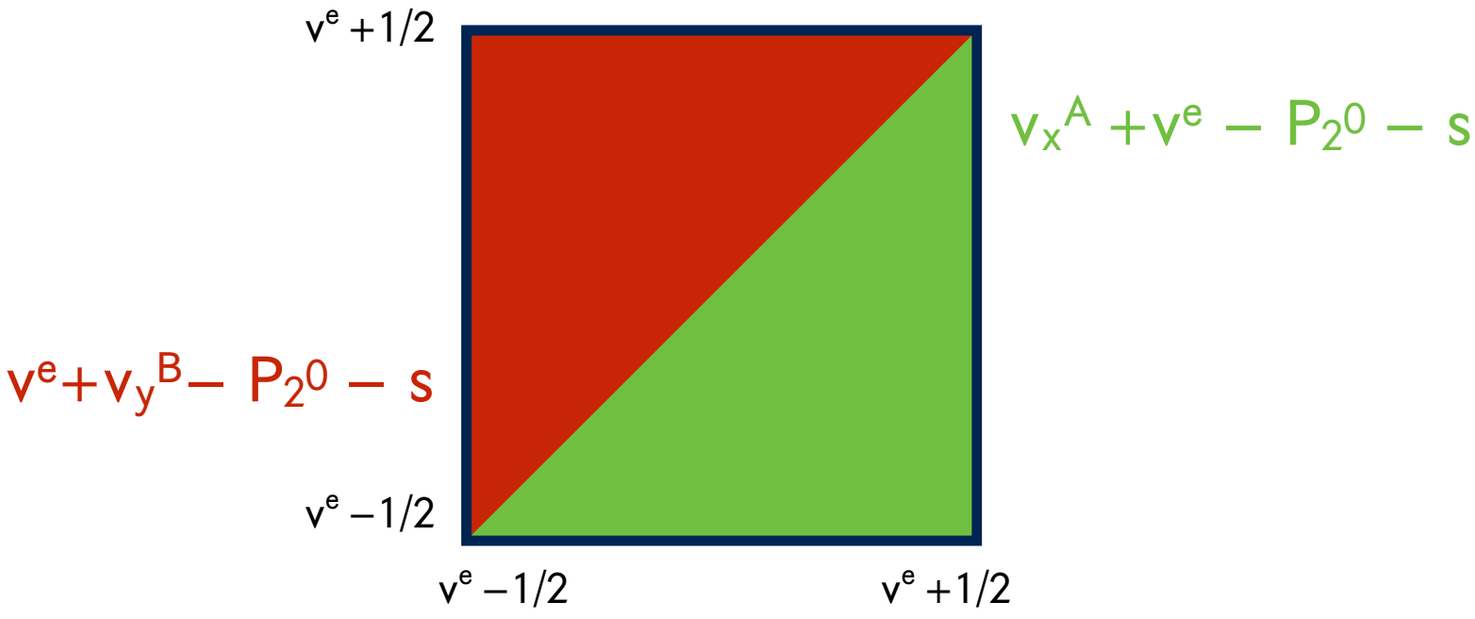

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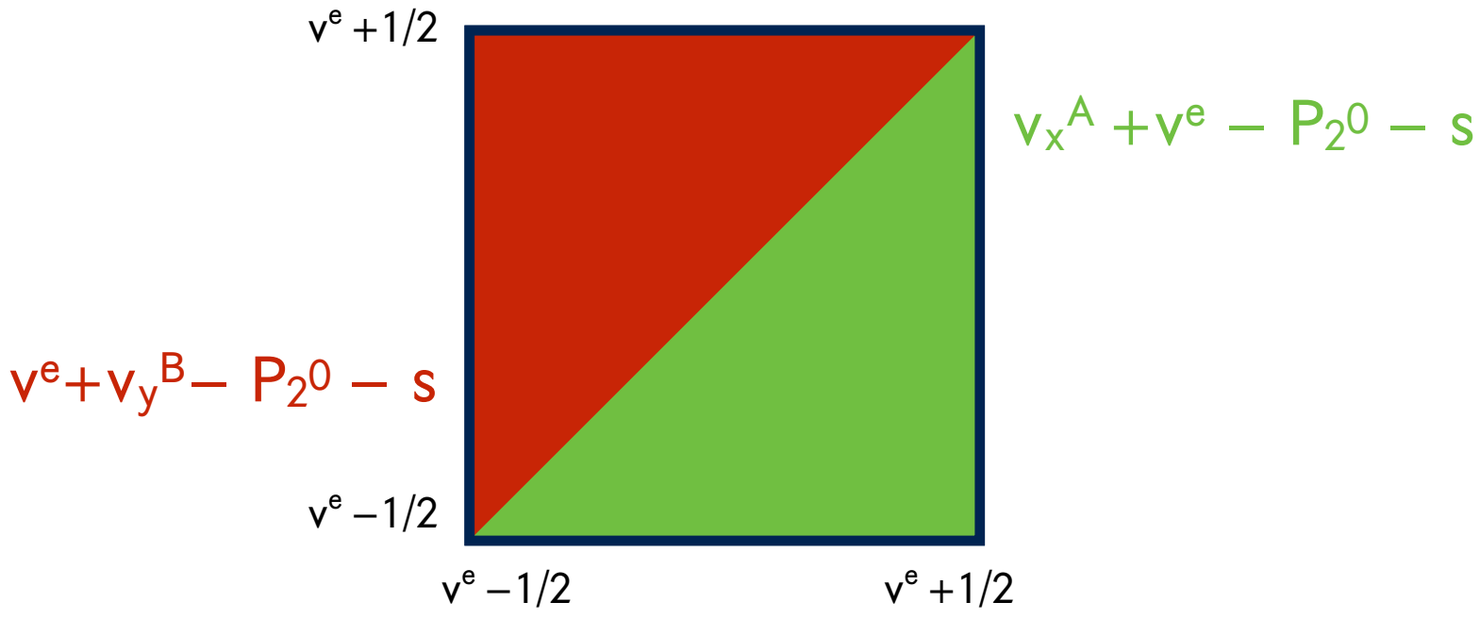


- Equilibrium profits: $\Pi_2^0$, $\Pi_2^0$

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Corollary. **Hurkens-Jeon-Menicucci (2013)**

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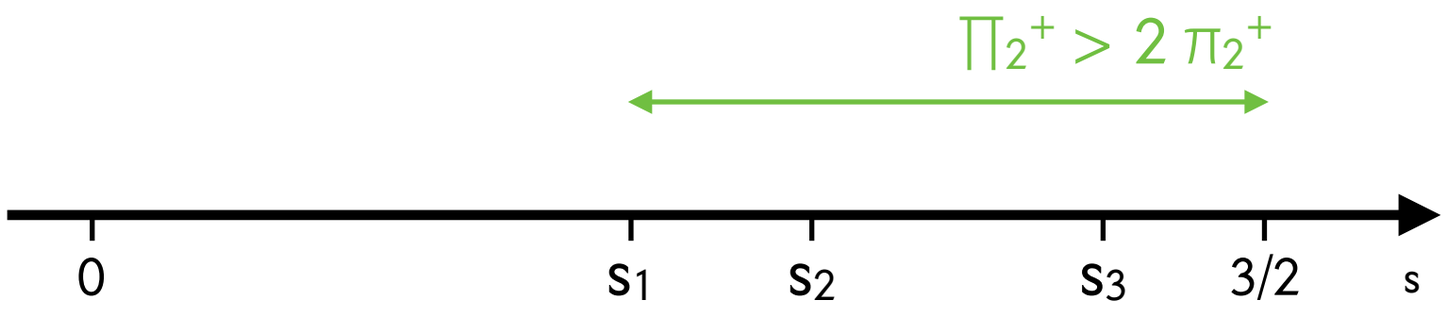

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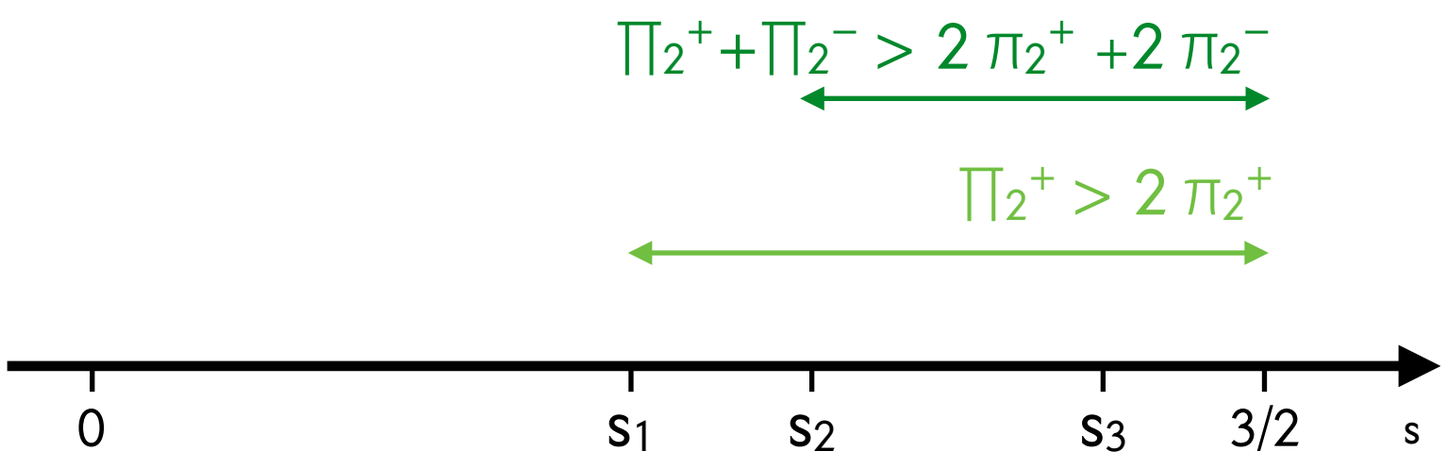

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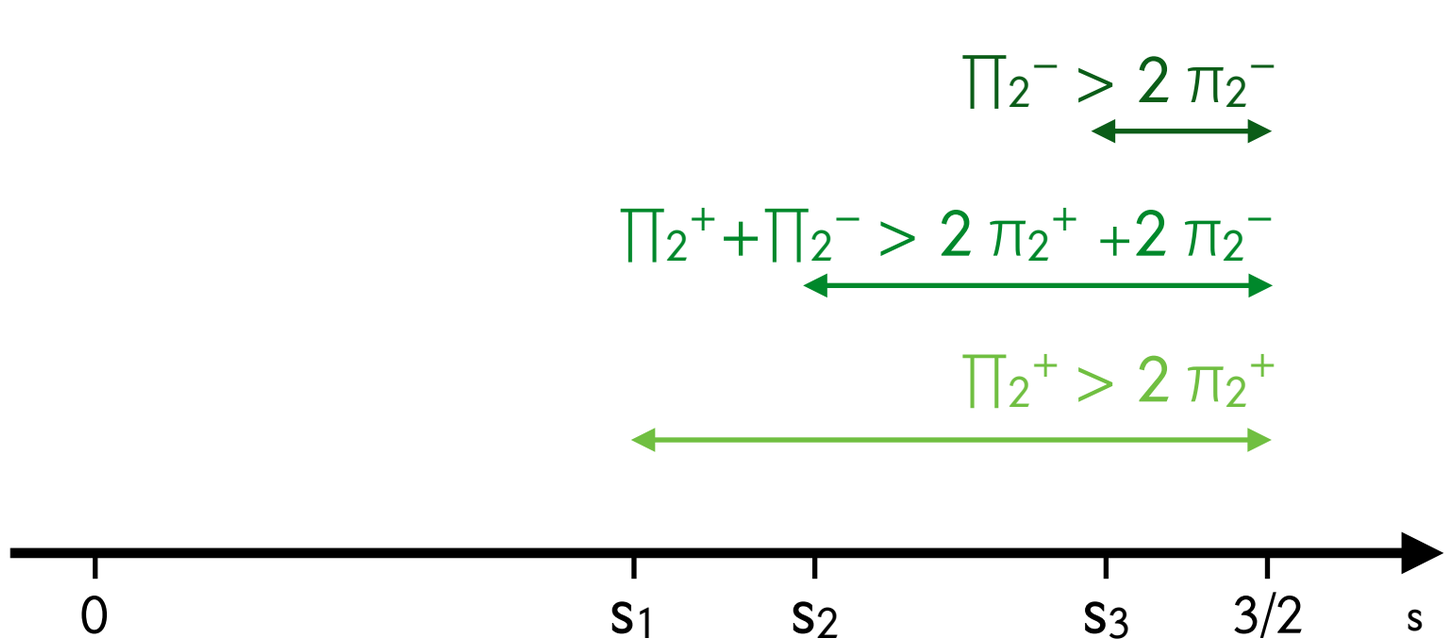
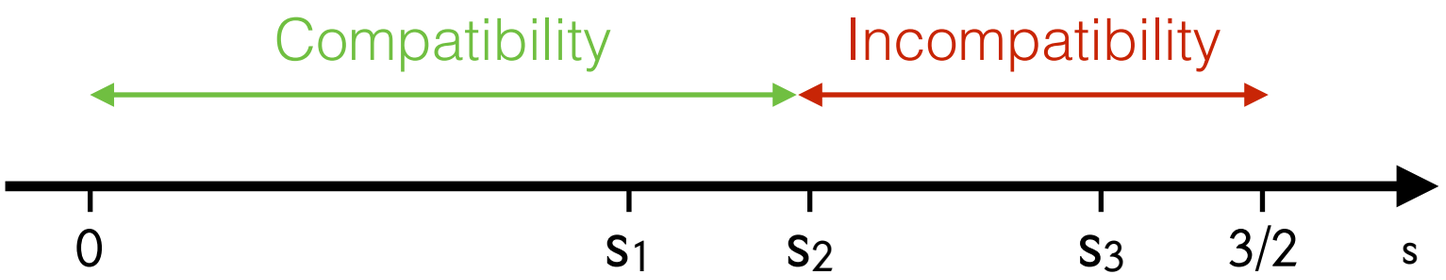


# Second-period compatibility choice

(given **symmetric** first-period market shares)

Lemma 4. **Given incompatibility in 1st period**



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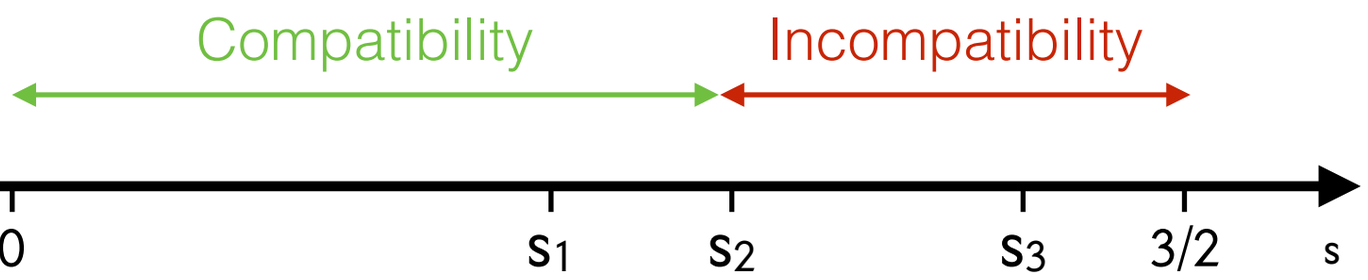
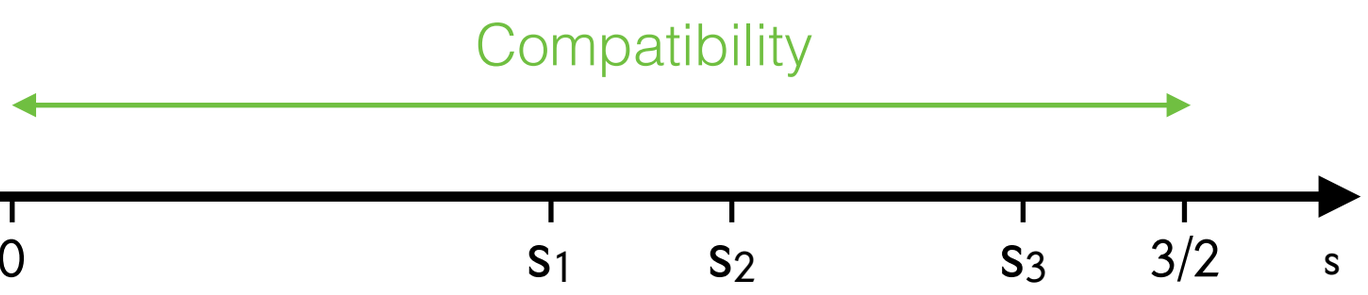
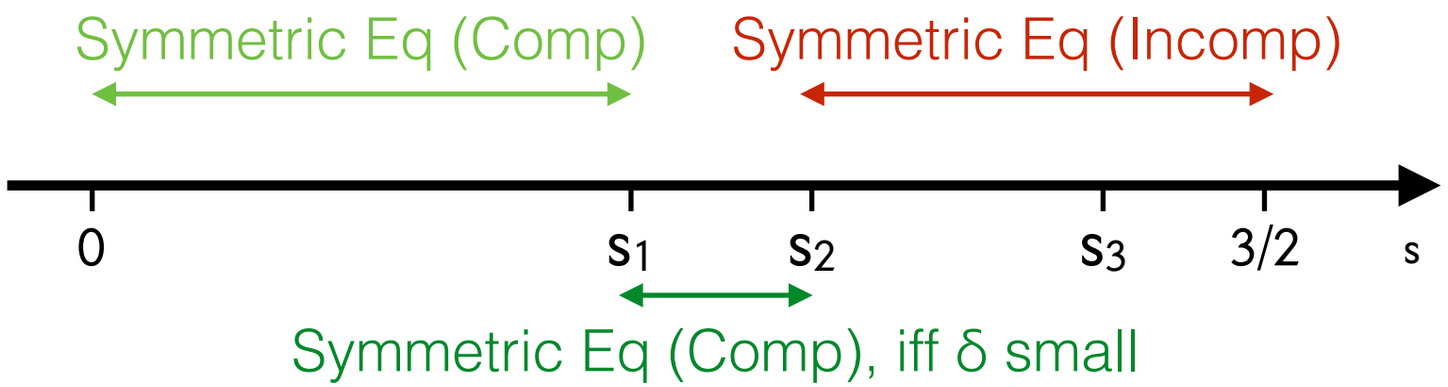



Lemma 5. **Given compatibility in 1st period**



# First-period pricing equilibrium

Propositions 1 & 2. **Given incompatibility in 1st period**




Symmetric Eq (Comp), iff δ small

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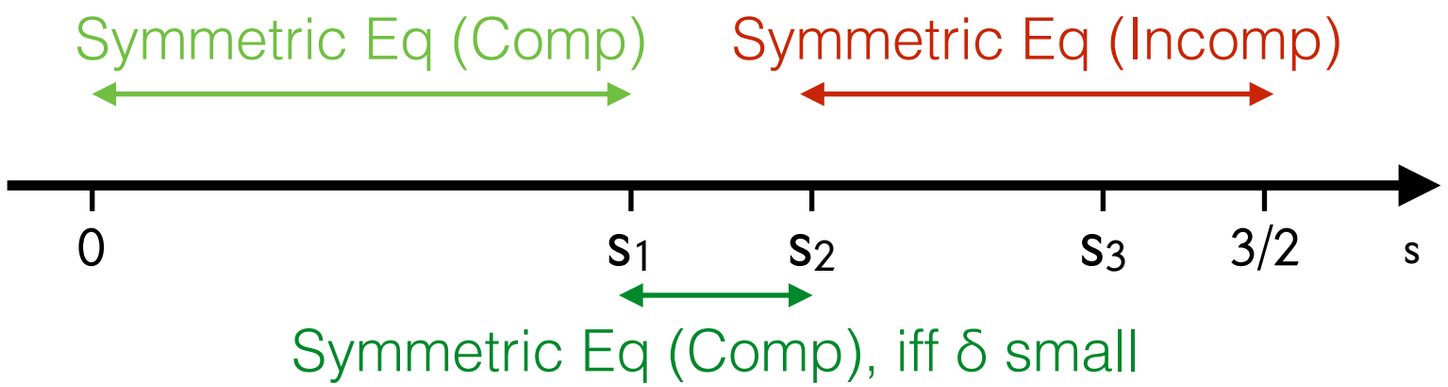


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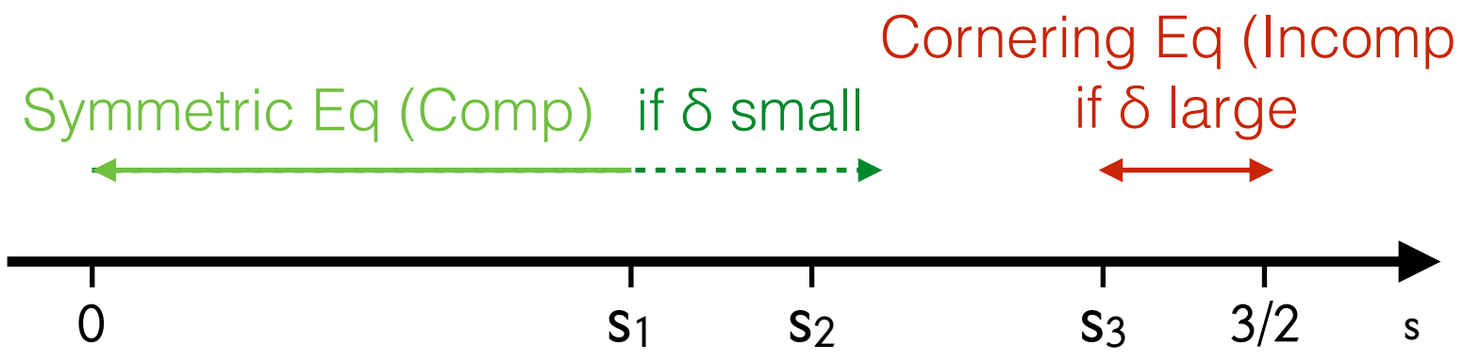

# Main result

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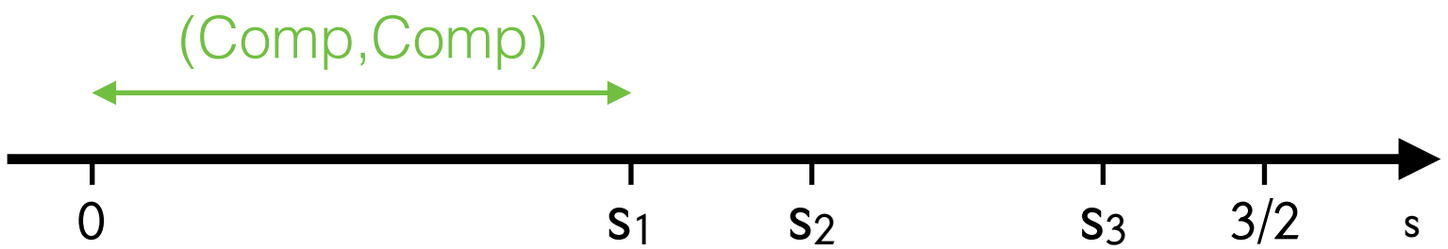


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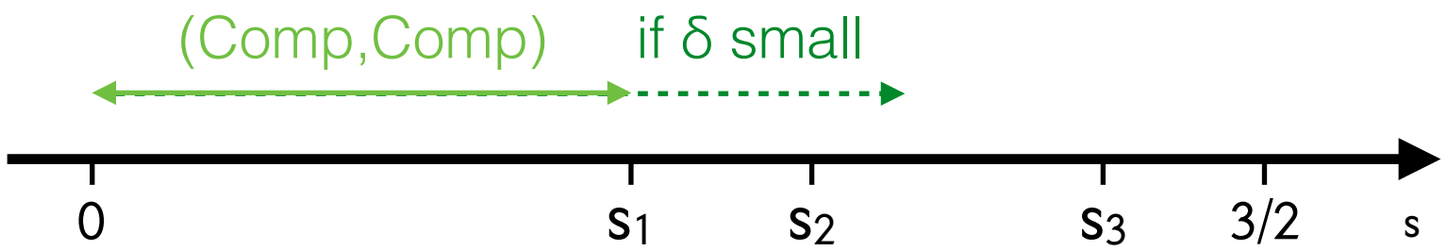


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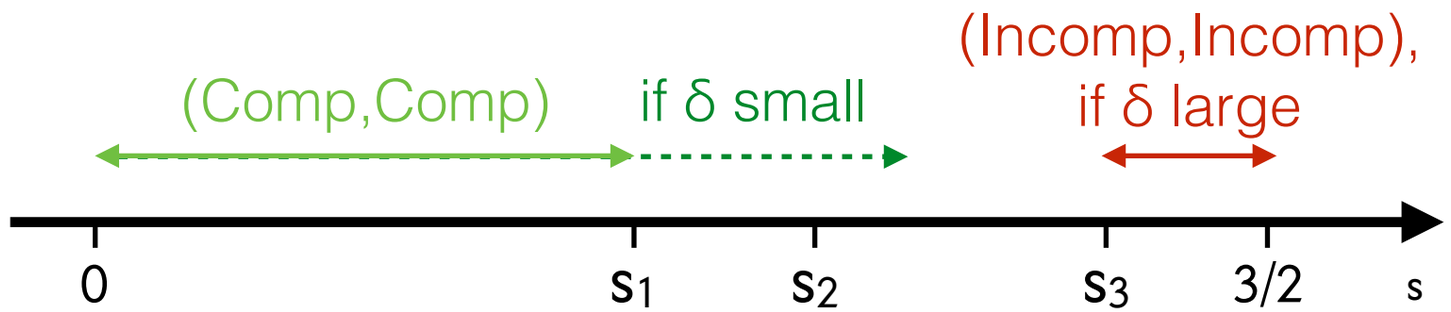


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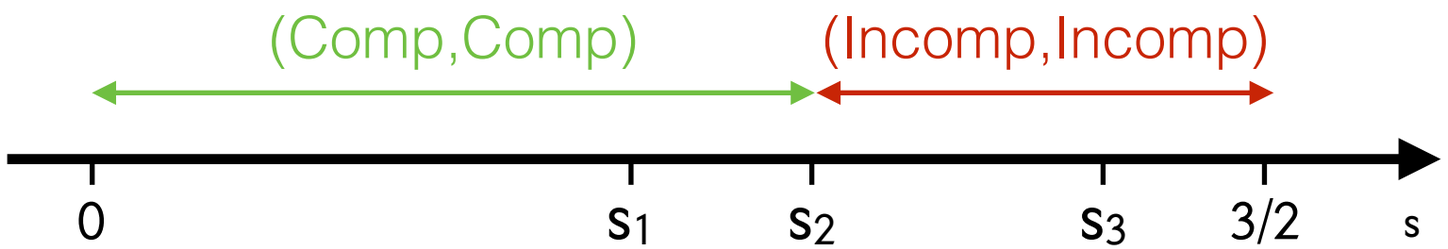
- **δ small:** Prop 5 generalised Matutes and Régibeau (1988), since second-period profits are relatively unimportant.
- **δ large, and s large:** Matutes and Régibeau (1988) is reversed. Even if the first-period incompatibility intensifies competition in 1st period, the firms choose it as this leads to the second-period incompatibility which softens competition in period two.

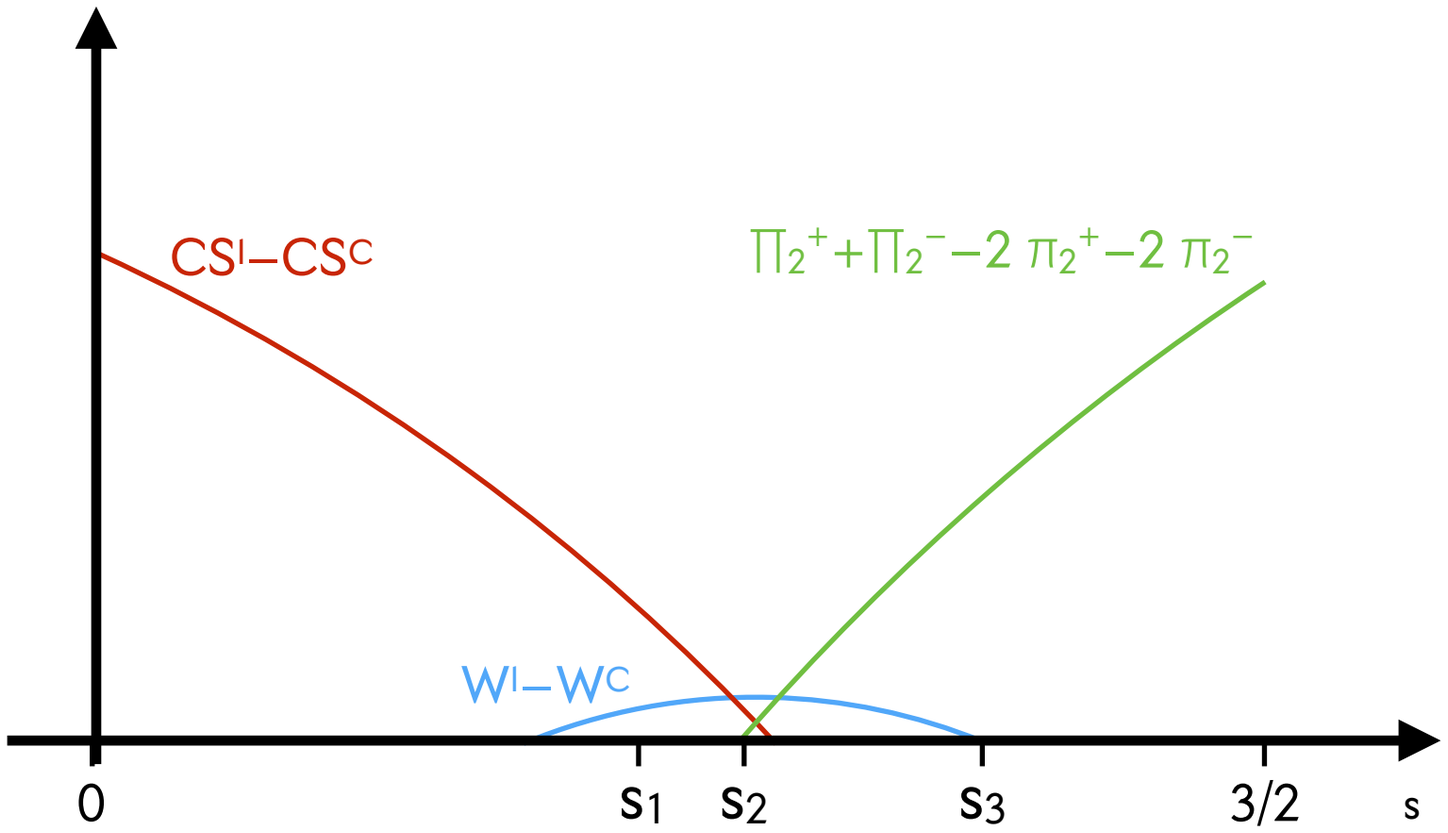
# Non-negative prices

Proposition 6. **For δ large enough**




- Each firm charges **zero** price for in the first period.

# CS and welfare: non-negative pricing




- Striking conflict between consumer surplus and industry profit.

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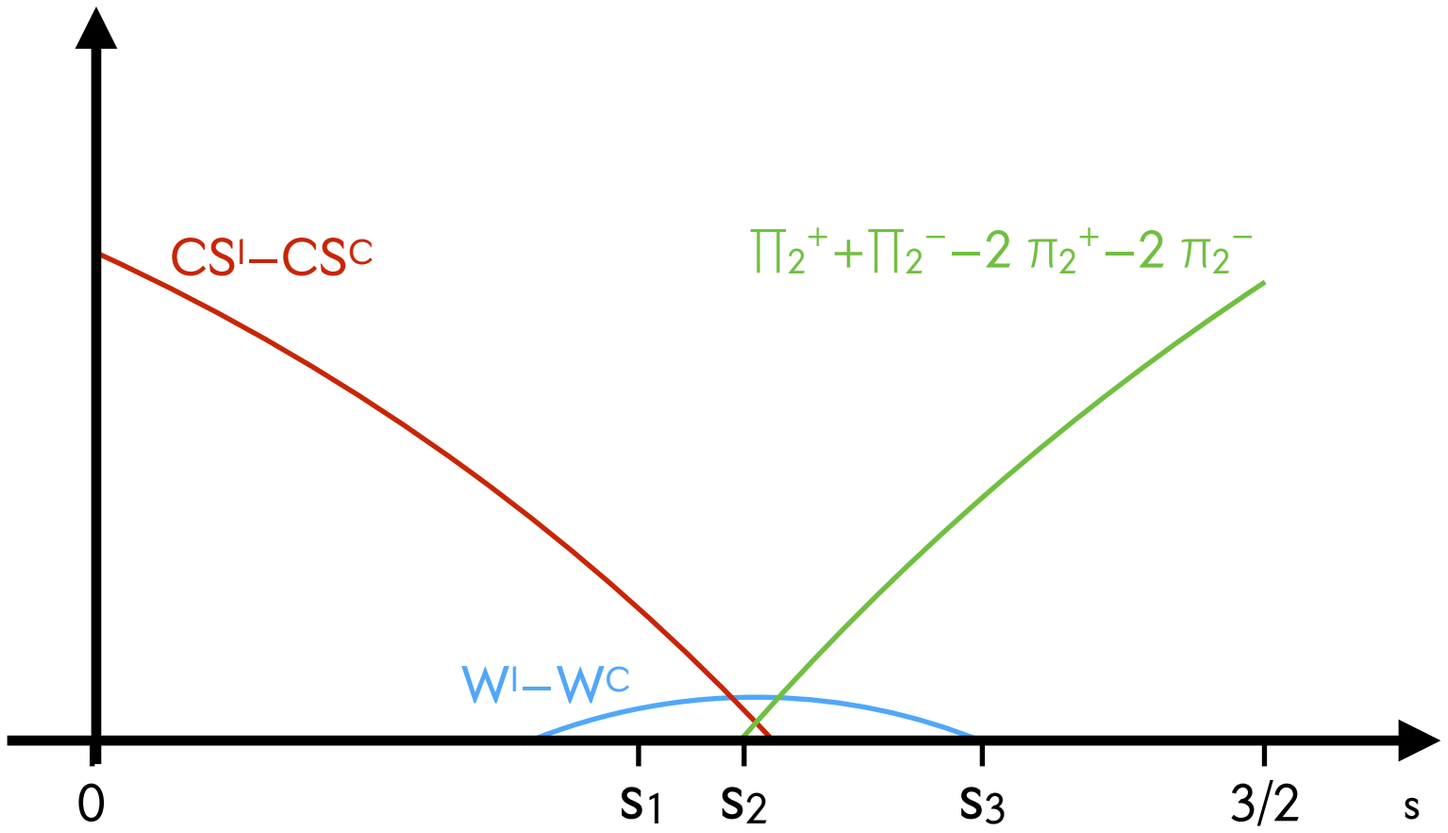


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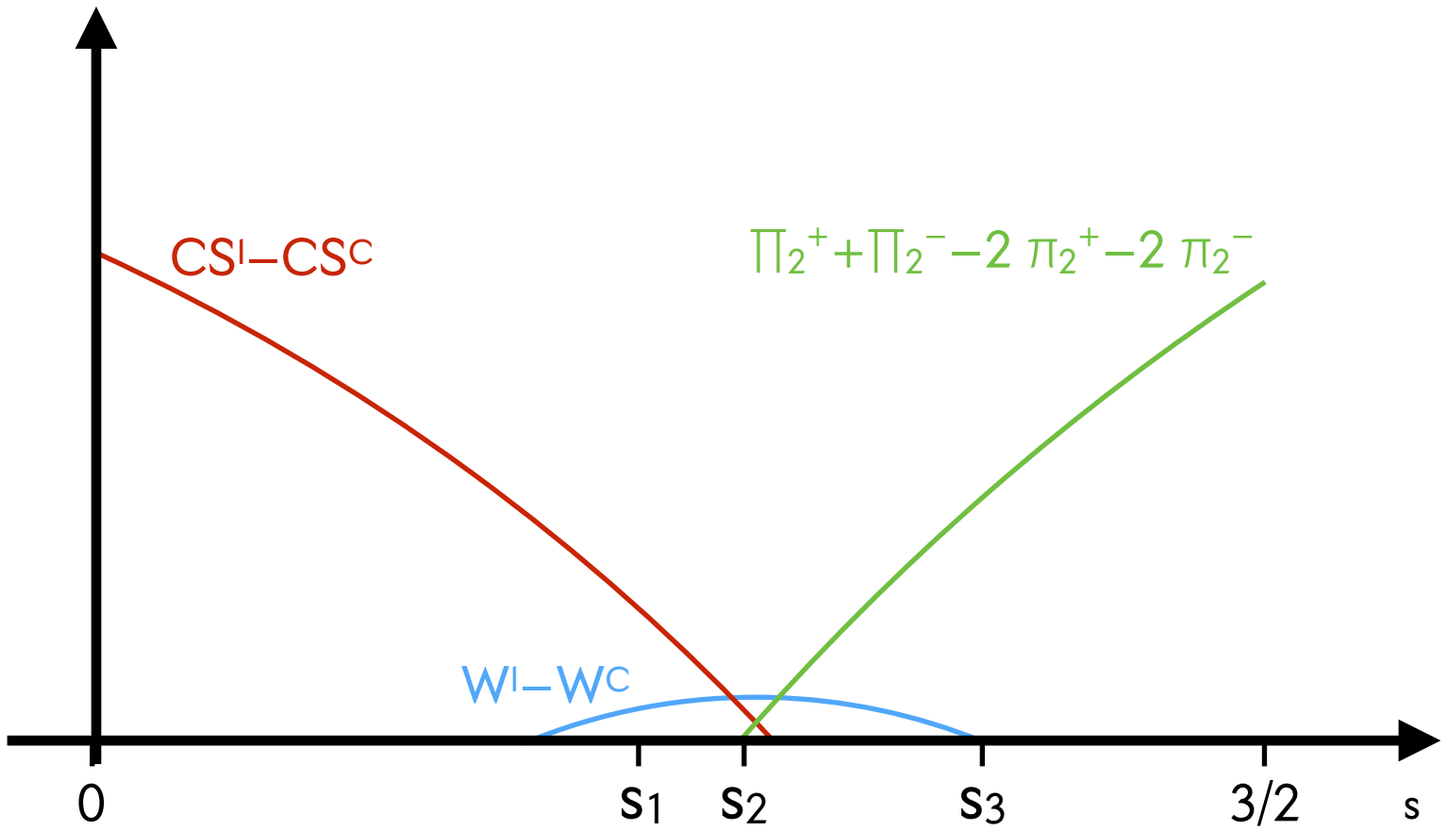


- Striking conflict between consumer surplus and industry profit.
- **s** small enough because consumers can make switching decision only at the system level
- **s** high enough, no switching is socially optimal, but under incompatibility more poaching arises.

# Conclusion

- Consumers' product-specific investment makes lock-in very likely
- Then, we find that platforms choose incompatibility today to soften future competition; intensive competition will be followed by weak competition
- Internet platforms behave like islands
- This hurts consumers and is likely to reduce welfare