Attention Oligopoly

Andrea Prat and Tommaso Valletti

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Attention Brokers

- Model digital platforms as attention brokers (Wu 2018) who find ways to get users to spend time on their platforms
- An attention broker:
  1. Exploits individual usage data to infer real-time consumption preferences of individual users (Agrawal et al., 2018).
     - eg learn that user wants to buy a refrigerator or needs a plumber
  2. Sells individually targeted advertising space to firms that supply the product needed (retail industry)
     - eg refrigerator manufacturers or local plumbers

Who Fits the Attention Broker Definition?

- Social media?
- Search engine?
- New York Times?
- Netflix?
- A billboard?
- ...
- The paper has both attention brokers and mass advertising outlets

Sketch of Model: Consumers

- Each consumer uses (exogenously) a certain set of digital platforms
- The type of the consumer is the product he is interested in (refrigerator, plumber)
- Consumer is (more) aware of incumbent/large/famous firms and (more) unaware of entrant/small/obscure firms
- If the consumer sees an ad about an entrant on at least one platform, he becomes (more) aware of the entrant's product

Sketch of Model: Platforms

- Larry Page, one of the founders of Google, in 2000: "Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing."
- Omniscient platforms who auction off targeted ads

Sketch of Model: Retail Industry

- Firms compete to buy ads that are targeted to consumers that want their product
- Entrants do it to get known
- Incumbents do it to prevent entrants to become known

Model: Advertising Channels

1. Mass media outlets: buy an ad seen by all buyers at flat rate a
   - Forget about them for now
2. Digital platforms: sell targeted ads
   - A set M of platforms
   - J: arbitrary subset of M
   - m_J: share of buyers who use exactly J
   - $\sum_J m_J = 1$

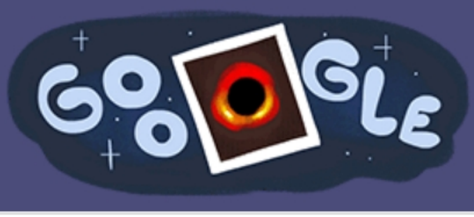
Example with Three Platforms

J	m_J
$\varnothing$	0.263
Facebook	0.459
Instagram	0.014
Twitter	0.011
Facebook, Instagram	0.094
Facebook, Twitter	0.070
Instagram, Twitter	0.005
Facebook, Instagram, Twitter	0.084
Total	*1.000*

Model: Preferences

- All buyers have identical (stochastic) preferences
  - wlog because preferences are perfectly known to platforms
- They only differ with respect to the platforms they use and the info they receive from platforms
- Buyer utility if aware of entrant (u_2). If unaware (u_1)
- Incumbent profit from a particular buyer if aware of entrant (π_2). If unaware (π_1)
- Entrant profit from a particular buyer if aware of entrant (π_E). If unaware (0)
- Interesting case:

$$u_1 < u_2; \pi_1 > \pi_2 + \pi_E; u_1 + \pi_1 < u_2 + \pi_2 + \pi_E$$



heinz ketchup

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What's On Your Menu?

People also search for

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12 ketchups tasted, ranked

1

Sir Kensington's Ketchup Classic

12 / 12

(E. Jason Wambsgans / Chicago Tribune)

Made with "vine-ripened tomatoes" and without high fructose corn syrup, Sir Kensington's far outscored the field to take first place. It was noticeably chunky, one taster likened it to tomato paste, and sported a flavor balanced between sweet and spicy. "One of the few with complexity," wrote a fan. Another taster noted there were other flavors at work in this ketchup, like onions, and compared it to "a good red pasta sauce." But a fourth taster who liked the brand still complained: "This is fancy people ketchup." $4.29 for 20 ounces.

We tasted 12 leading brands of ketchup in search of the best; they're ranked in the gallery above, from the lowest scoring to the highest. (Jason Wambsgans/Chicago Tribune; Shannon Kinsella/food styling)

Example 1

Three Social Media Platforms

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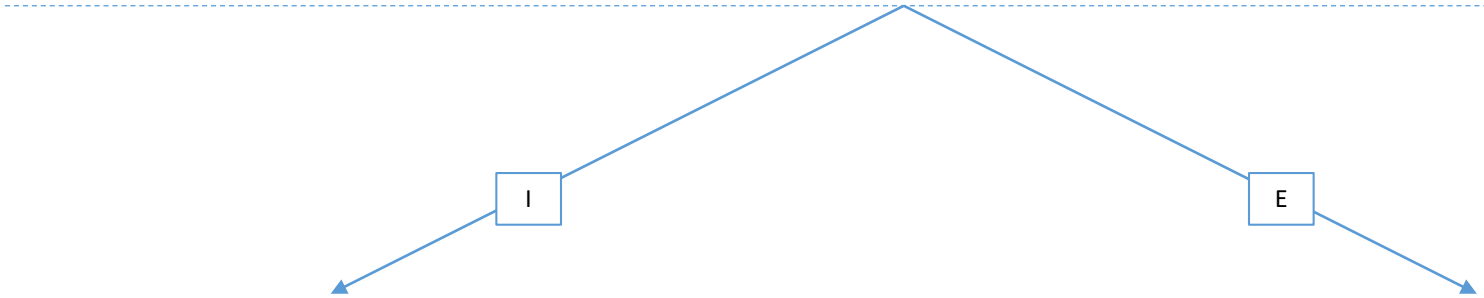
Three Social Media Platforms ($n_J = 3$)

Platform 1 Auction



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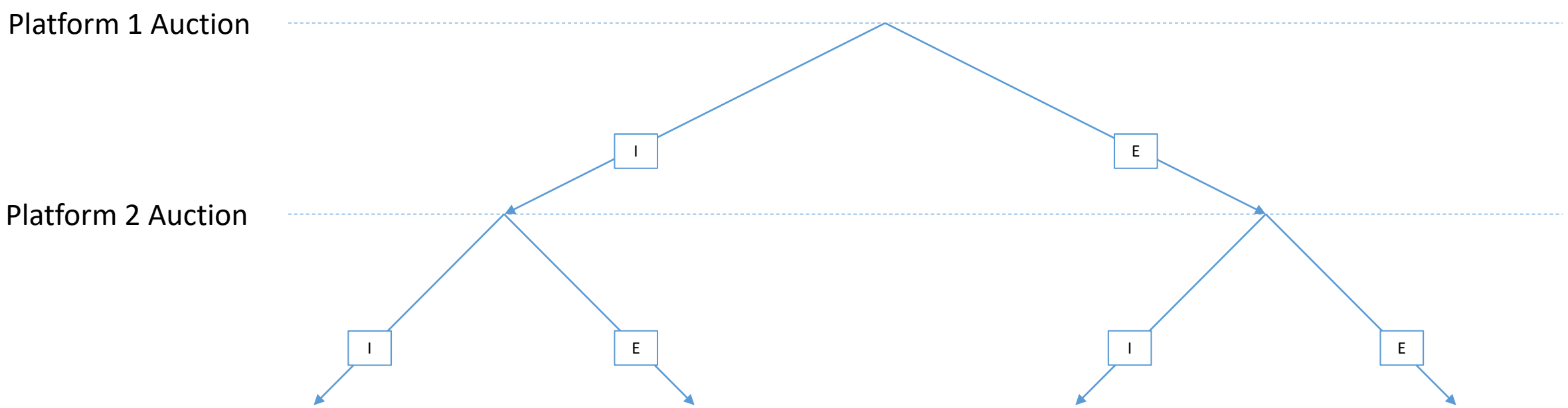

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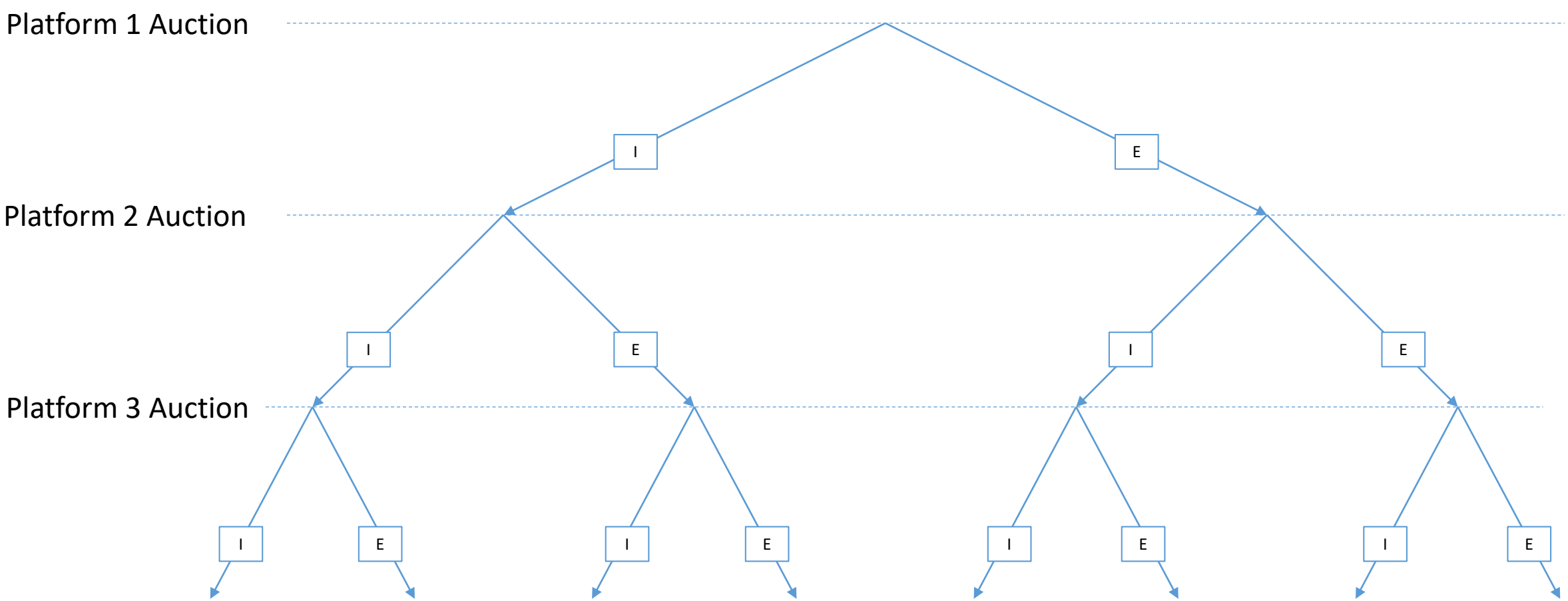
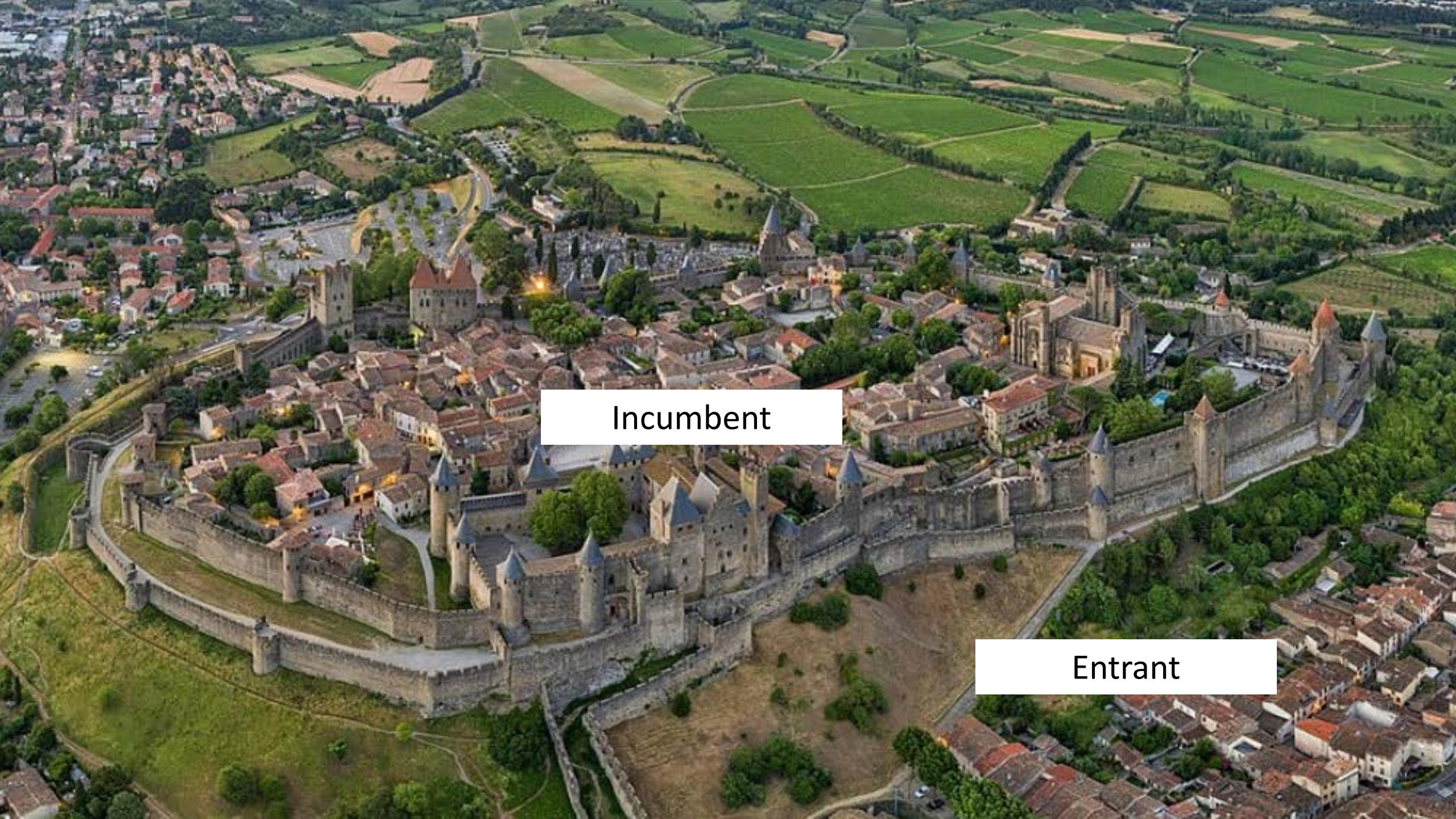
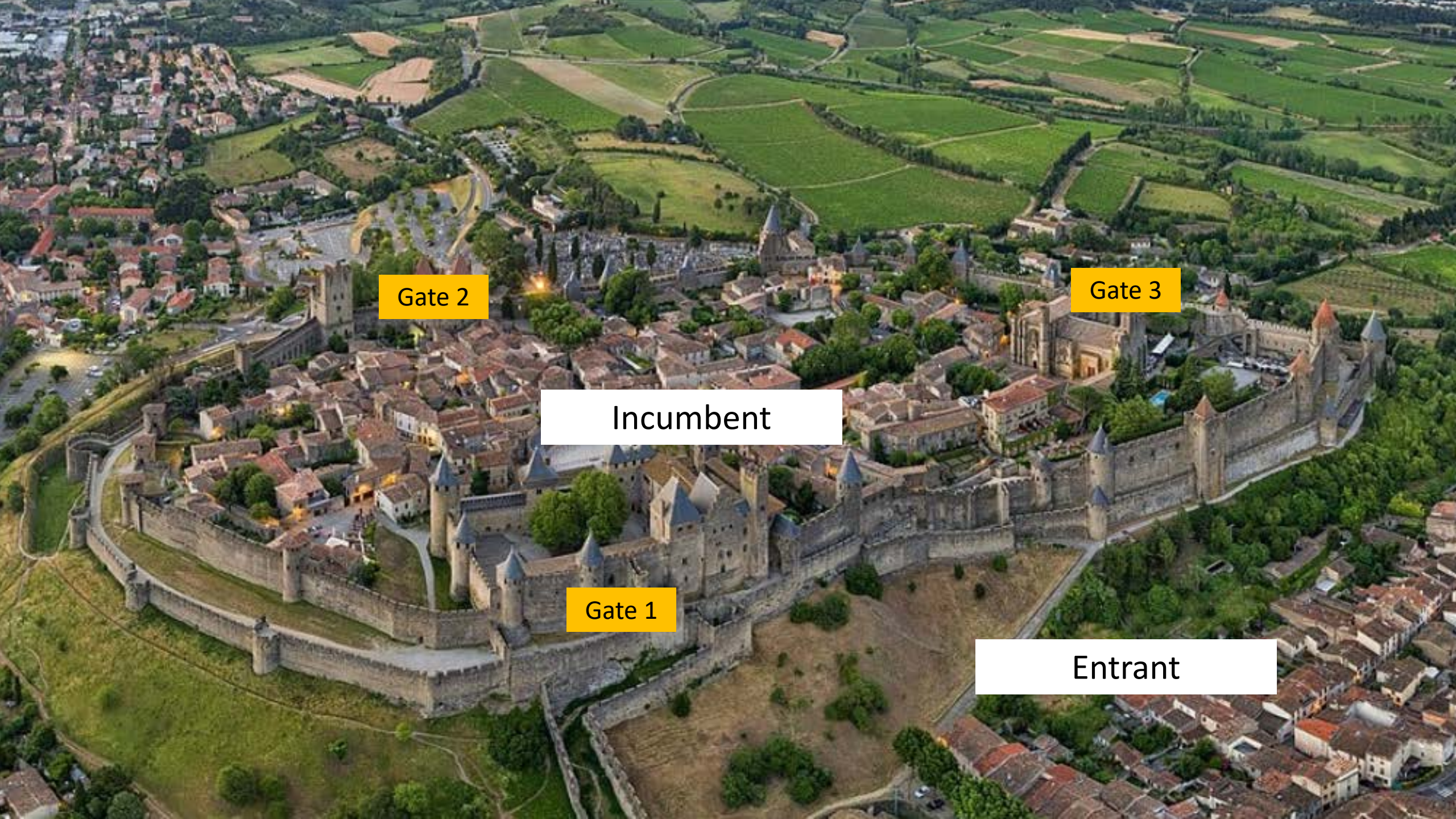
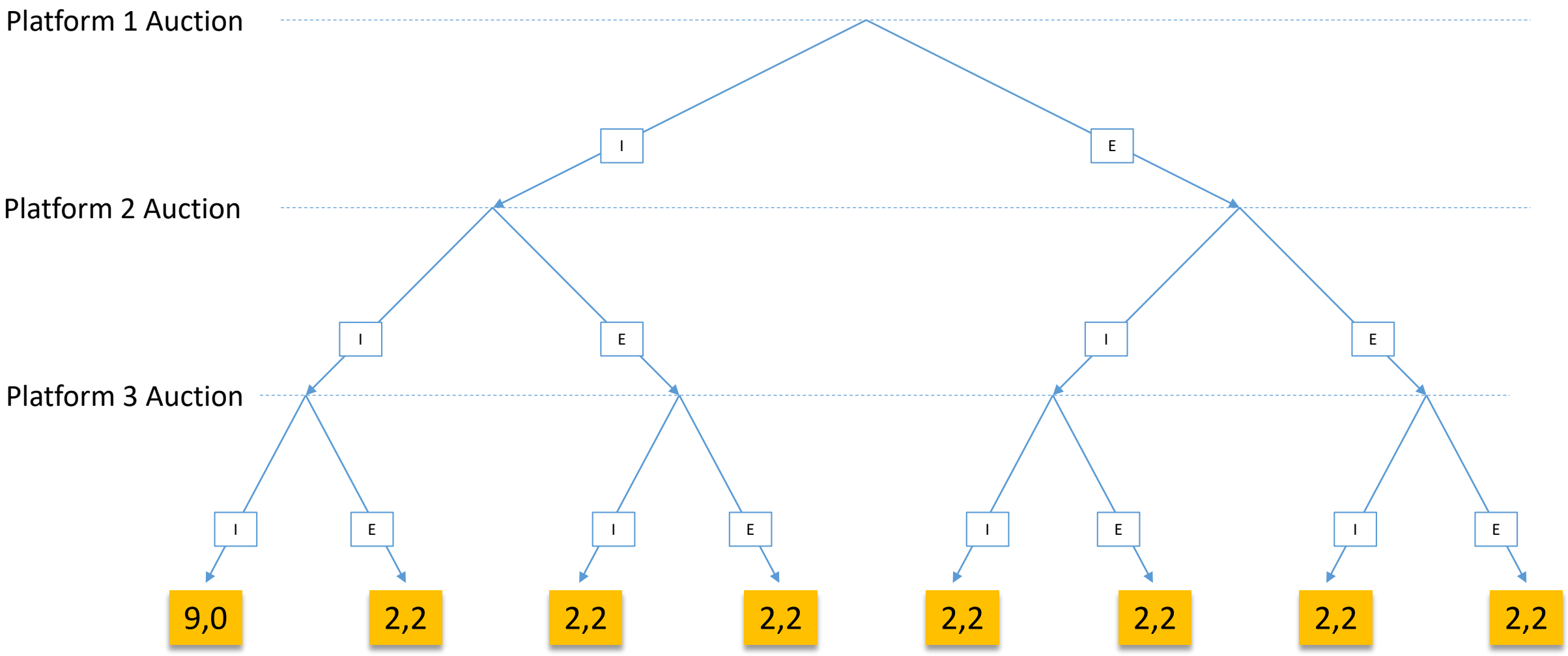



Incumbent
Entrant


Gate 2
Gate 3
Incumbent
Gate 1
Entrant

Example 1: $\pi_1 = 9, \pi_2 = \pi_E = 2$



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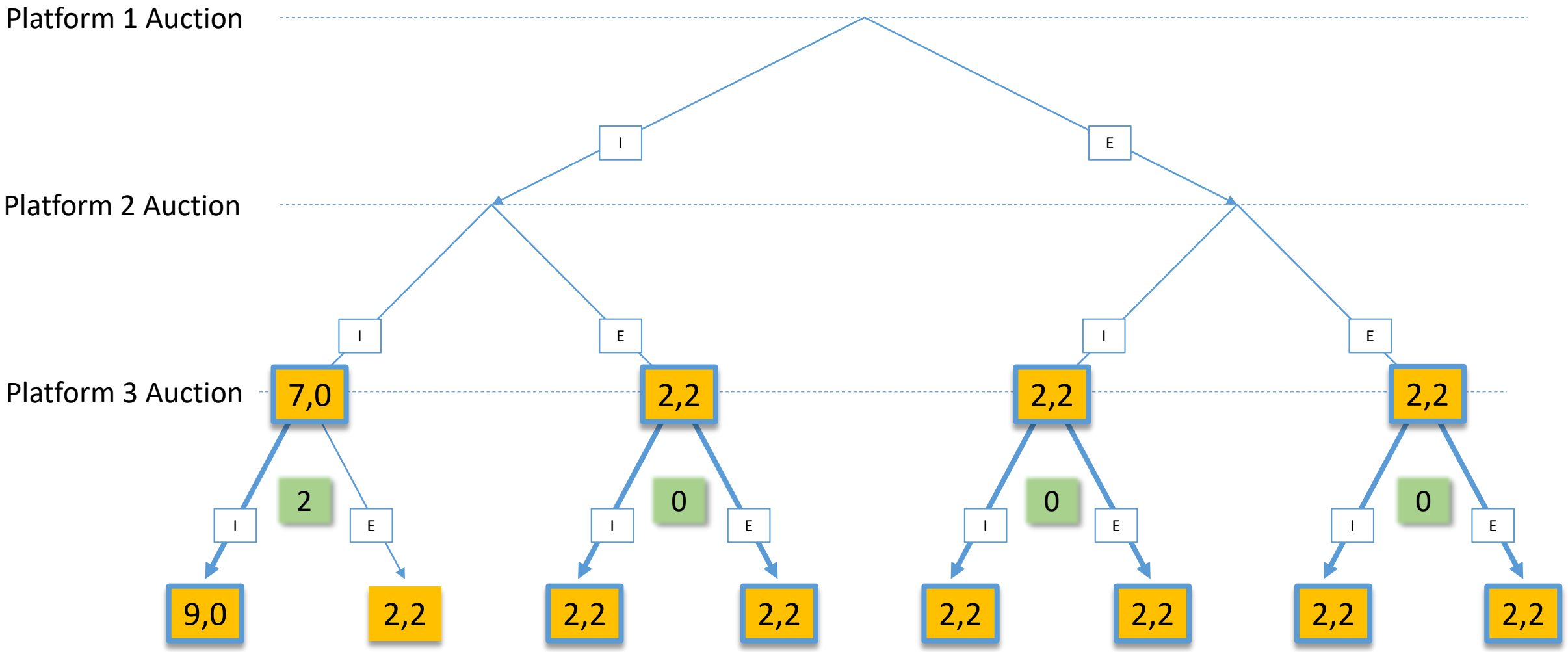

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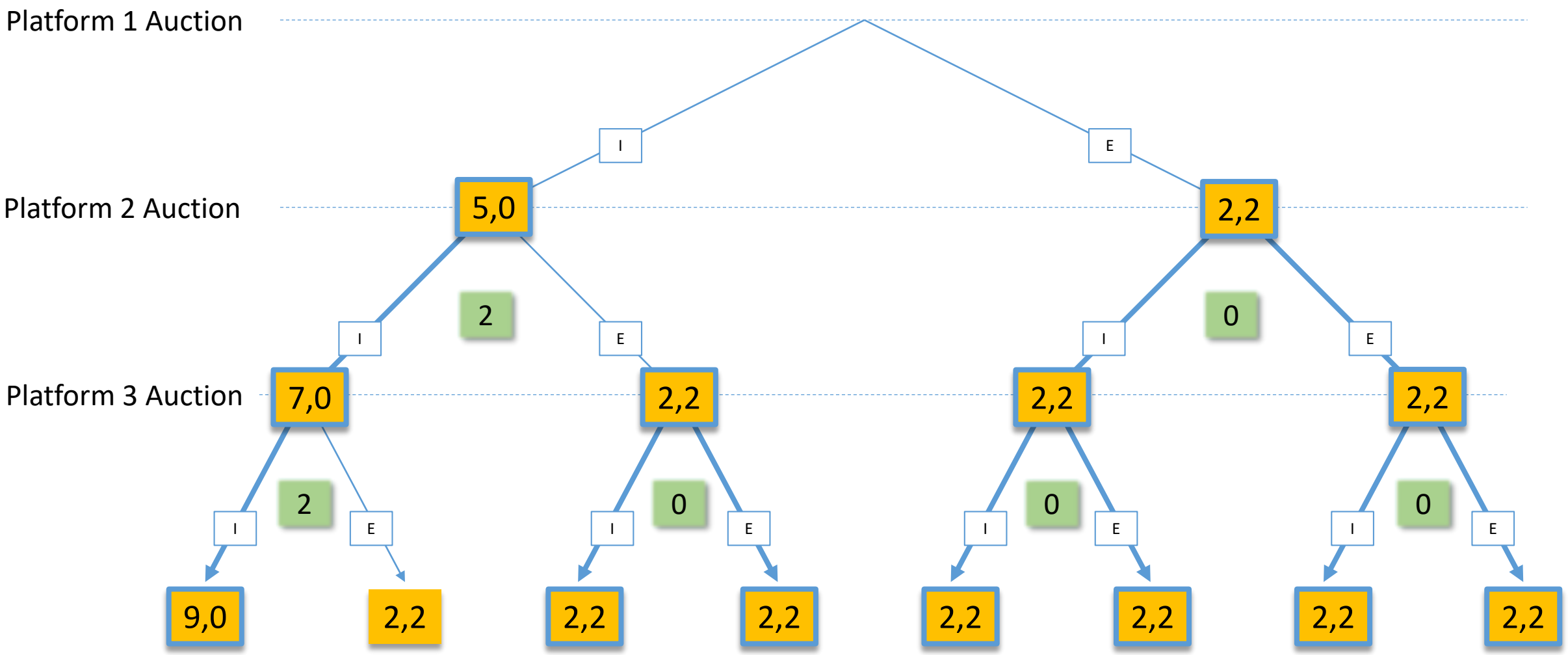

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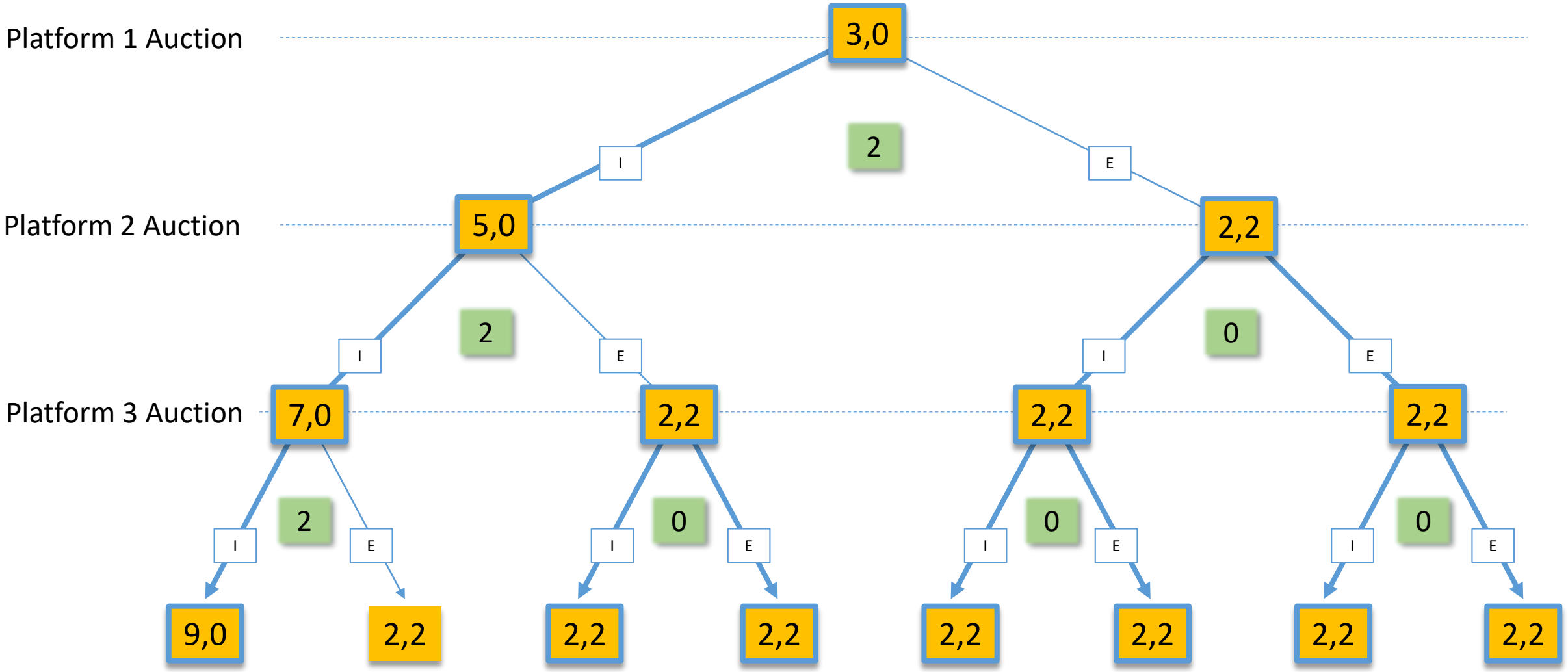
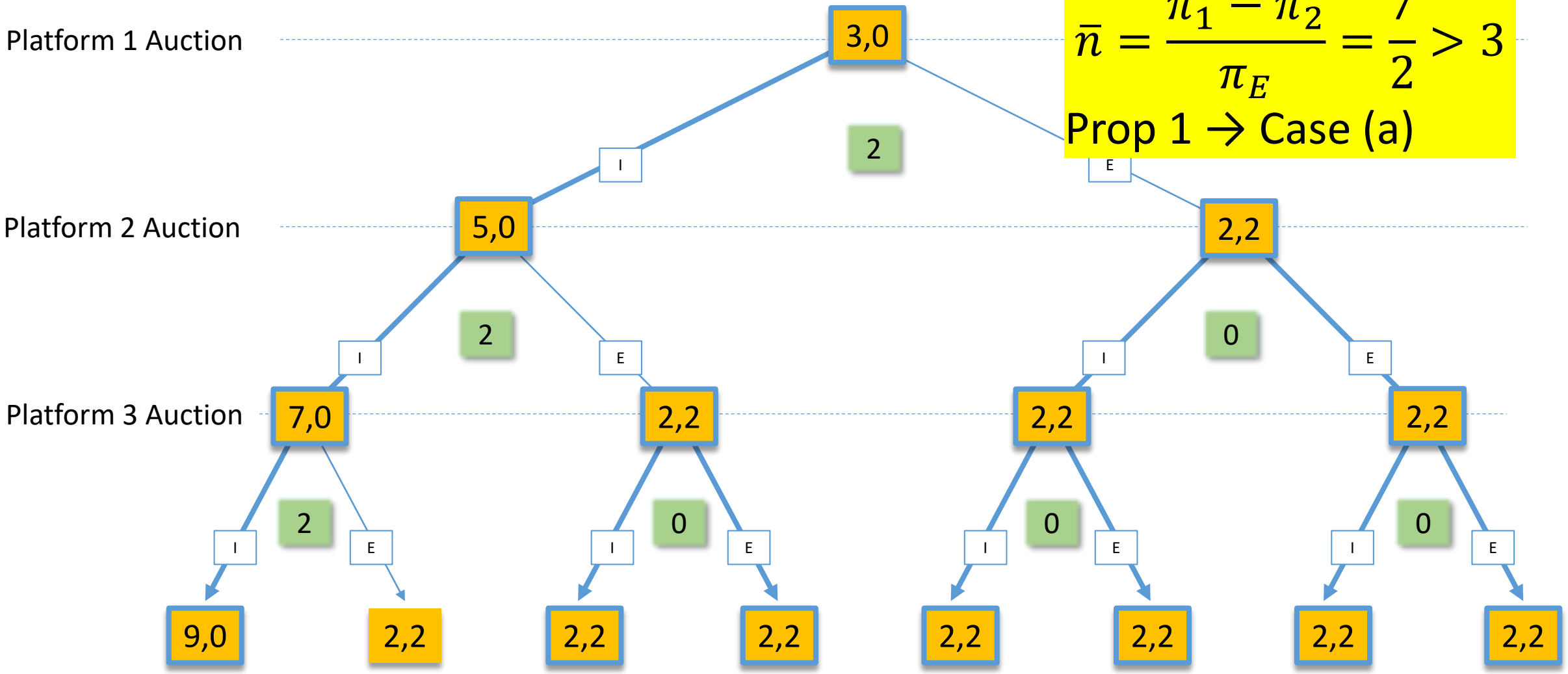


Example 1: $\pi_1 = 9, \pi_2 = \pi_E = 2 \rightarrow$ Incumbent Monopoly

$$\bar{n} = \frac{\pi_1 - \pi_2}{\pi_E} = \frac{7}{2} > 3$$

Prop 1 → Case (a)



Industry Analysis: Setup

Timing:

1. A potential entrant appears, whose profit in case of entry is π_E, a random variable drawn from a cumulative distribution F.
2. In every segment J, a random ordering of the platforms in J is selected and a sequence of auctions is run according to that order.
3. In every segment J, payoffs to consumers, platforms, the incumbent and two firms are made according to the outcome of the auction.

Special case

F is a uniform distribution with support on $[0, M]$ with $M > \pi_1 - \pi_2$.

Corollary

Expected consumer surplus is given by

$$\bar{U} = a - b \sum_J \frac{m_J}{n_J},$$

where a and b are constants.

Merger Analysis

- Platforms i and j merge.
- The only thing that changes is that now the new owner can – but does not have to – sell ads on the two platforms as a bundle.
- Three sets of consumers:
  - Those that used neither of the two merging platforms: no action
  - Those that used only one platform: no action
  - Those that used both platforms: choose whether to sell the two ads independently or as one bundle (with a second price auction)
    - in both case the auction order is still randomized
-
-

Benefit to Merging Entity

1. A big one. If the consumer was in (b – entry with positive profit) before, we now move to the monopoly case with much higher profits This creates a welfare loss to the consumer through entry reduction
2. A small one. If the consumer was in (c – entry with zero profit) but close to (b), we may be able to move to (b)

Proposition

The aggregate loss in consumer surplus due to a merger between platform i and platform j is given by:

$$\Delta \bar{U} = -(u_2 - u_1) \sum_{J \in M_{ij}} m_J \left(F\left(\frac{\pi_1 - \pi_2}{n_J - 1} \right) - F\left(\frac{\pi_1 - \pi_2}{n_J} \right) \right).$$

where M_{ij} is the set of segments where both platforms are present.

Corollary

If F is a uniform distribution, consumer surplus loss is given by

$$\Delta \bar{U} = -b \sum_{J \in M_{ij}} \frac{m_J}{n_J (n_J - 1)},$$

where b is a constant.

Computing the Welfare Effect through Usage Shares Only

- The welfare loss due a merger depends on usage patterns
- Can it be computed through usage shares (market shares, penetration rates) alone?
- NO – and the margin of error can be very large

Inaccuracy of Welfare Analysis with Market Shares

Proposition

Given σ_1 and σ_2, the welfare effect of a merger can take any value:

$$-\Delta \bar{U} \in \frac{b}{2}\left[m_{\min}, m_{\max}\right]$$

where

$$m_{\min} = \max\left(0, \sigma_1 + \sigma_2 - 1\right)$$

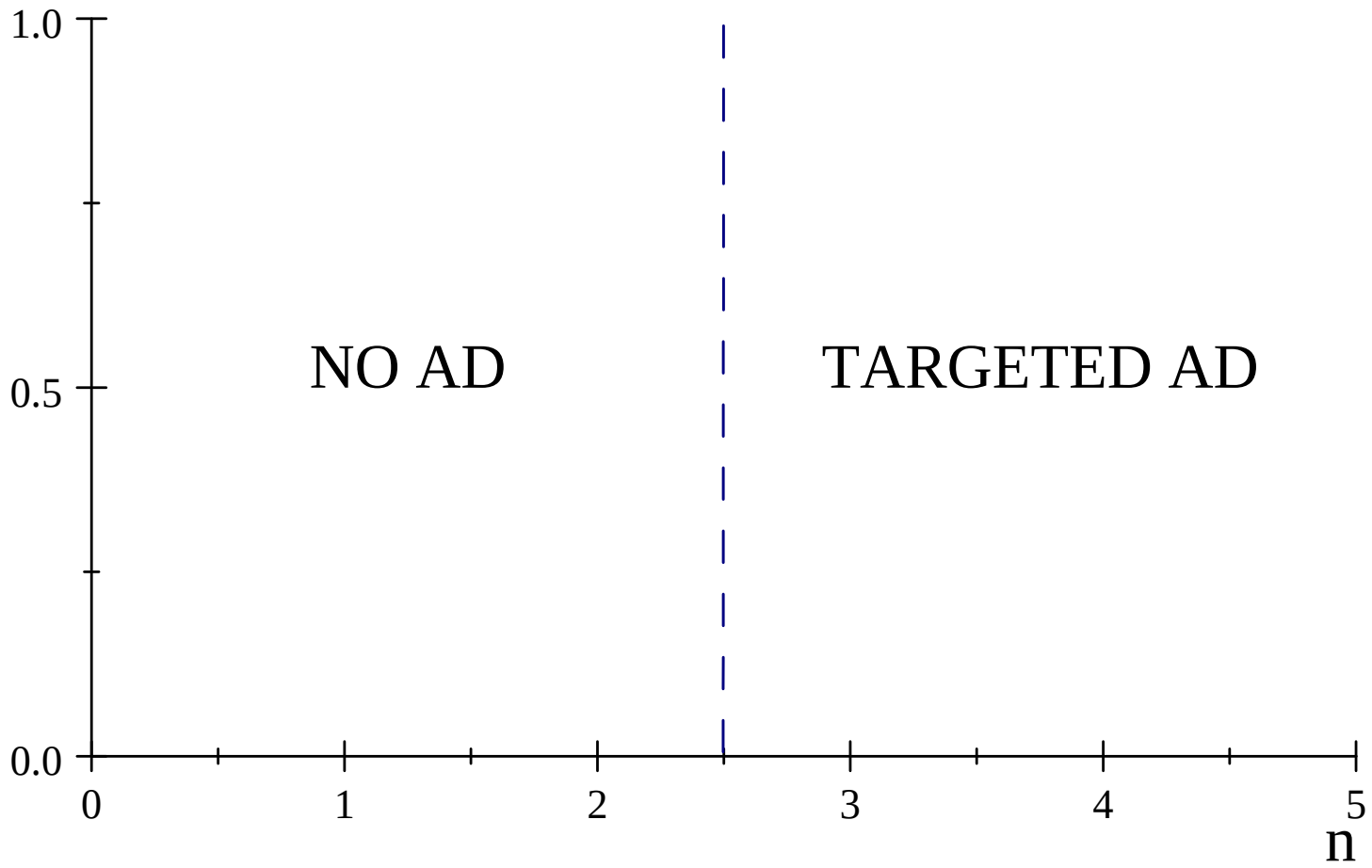
and

$$m_{\max} = \min\left(\sigma_1, \sigma_2\right).$$

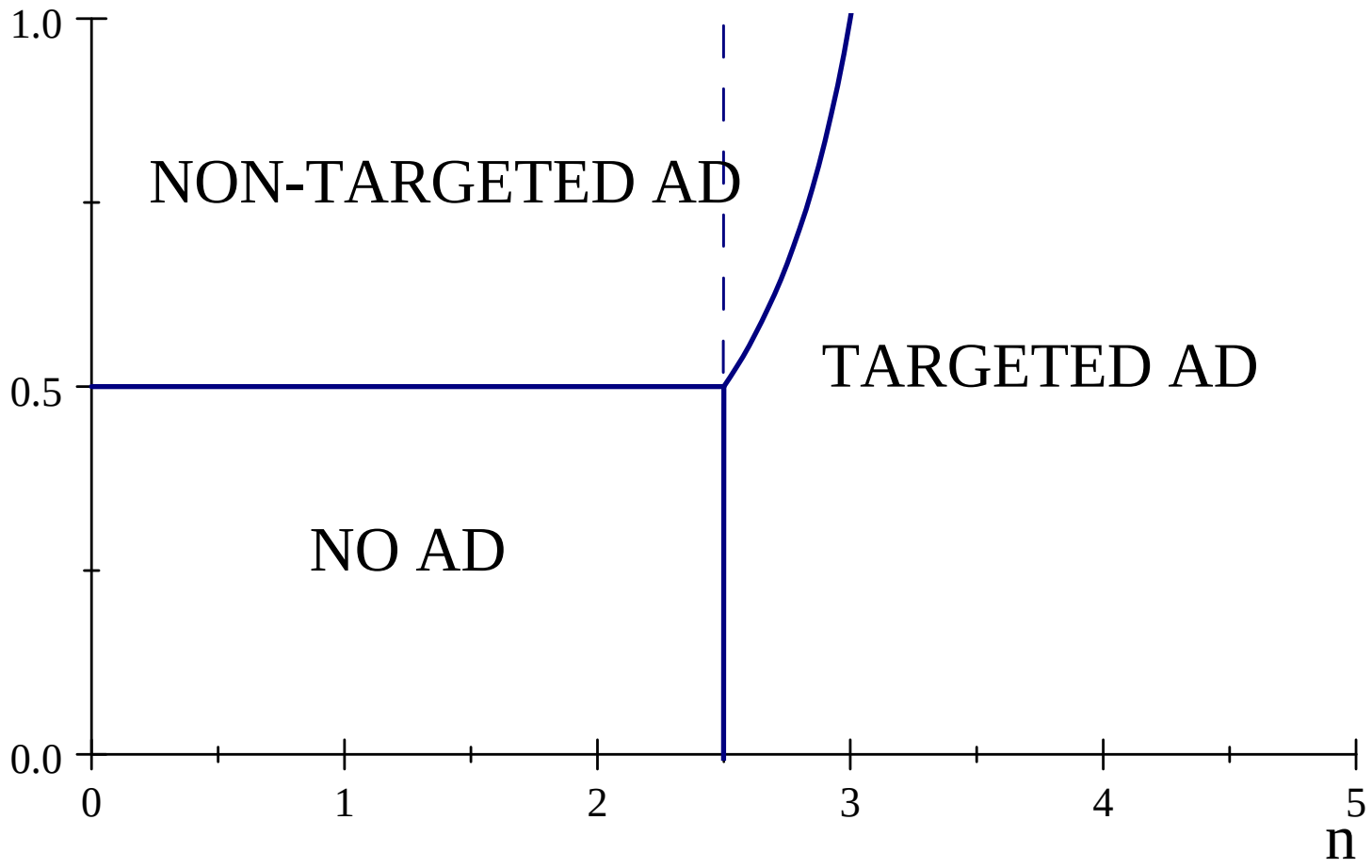
Application to US Social Media Platforms

- Pew Institute Survey on Social Media Trends.
  - July 12 to August 8, 2016 (wave 19).
  - 4,579 participants: online (4,165) and mail (414).
  - Drawn from the American Trends Panel
  - 899 people refused
- Usage of Facebook, Instagram, and Twitter

Merging Pair	(1) *Lower Bound*	(2) *Upper Bound*	(3) *Pairwise Overlap*	(4) *Three-way Overlap*	(5) *Welfare Effect*
Facebook-Instagram	0%	19.3%	9.4%	8.4%	6.1%
Facebook-Twitter	0%	17.3%	7.0%	8.4%	4.9%
Instagram-Twitter	0%	17.3%	0.5%	8.4%	1.7%



Presence of an Entrant Ad in Equilibrium: x-axis: number of platforms (n); y-axis: size of industry (γ_k/a).



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Conclusions

- Analysis of one aspect of competition between attention brokers
- No radical departure from standard competition assessment but highlights:
  - Potential anticompetitive effect on product knowledge and hence product competition
  - Importance of looking at individual attention patterns alongside aggregate usage shares
- To-do list:
  - Attention as a continuous variable
  - Endogenous mergers