Informational Intermediation and Competing Auctions

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1 Introduction

- **Matched data (general equilibrium and longitudinal)**

  labor, asset and product trade

- **Stylized facts**

  price dispersion, unstable relationships, and reputations matter

- **Research motivation (public policy, commercial, academic)**

  What are the consequences of third party actions in these markets?

Structural approaches to modelling matched data

1. **Undirected matching** (Diamond, Mortensen and Pissarides) The answers to basic questions:

   who meets with whom?

   who gets paid what?

   are largely imposed by the matching technology and sharing rule assumed.

2. **Directed matching** (Peters (1984), McAfee (1993) and Wolinsky(1988)). Above modelled as the outcome of a non-cooperative game.

A simple directed search model: Competing auctions

1. **Communications game** (Frogs croak for mates):

   Male frogs croak in the dark, female frogs listen and locate

2. **Pricing game** (Auction):

   Bidding by females

Informational Intermediation

Suppose:

(i) males are heterogeneous;

(ii) information partition available (to third party) at fixed cost F;

(iii) information can be sold as

1. **guidebooks** (to females)

2. **accreditations** (to males)

What we wish to find out?

1. Matching technology and price determination with infomediation
2. Public incentives to create information partition
3. Private incentives to pay for information partition (guidebooks and accreditations)
4. Monopoly incentives to create information partition
5. Trade-offs between business models (accreditations or guidebooks)

2 The model

- M buyers and $N = 1$ sellers, $\Phi \equiv M/N$.

- Two types of seller each with a single unit for sale:
  - Half are *good type* and have quality level 1 for sale.
  - Half are *bad type* and have quality level $\theta \in (0, 1)$ for sale.
  - Define average quality $\widetilde{q} = \frac{1}{2}(1 + \theta)$.

- Asymmetric information: Buyers know only $\widetilde{q}$.

- A good of quality q is worth q to a buyer and zero to a seller.

- Sellers advertise competing auctions.
  - Only quality information is relevant.

- Buyers simultaneously choose the auction of a single seller to visit $\Rightarrow$ search (coordination) frictions.

- Assume that buyers become perfectly informed of a seller's quality after turning up at the auction but before bidding $\Rightarrow$ effectively Bertrand competition among buyers.

- Concentrate on a mixed-strategy equilibrium where buyers randomize over seller locations.

- Can show that in a 'large' market with buyer-seller ratio x:
  - Prob. a buyer is alone at a seller: e^{-x}
  - Prob. a seller gets at least one buyer: $1 - e^{-x}$
  - Prob. a seller gets more than one buyer: $1 - (1 + x)\, e^{-x}$

3 Unguided benchmark

- If all buyers are uninformed about sellers' qualities, each buyer visits the location of every seller with equal probability.

- Equilibrium welfare: $\left(1 - e^{-\Phi}\right) \widetilde{q}$.

- Welfare losses due to search frictions: $e^{-\Phi} \widetilde{q}$.

4 Representing information

- The third party divides sellers into two 'submarkets' with expected qualities q_h and q_l, where $\theta \leq q_l < \widetilde{q} < q_h \leq 1$.

- The fraction of sellers in the q_l submarket is α.

- Define an *information partition* as (α, q_l), and note that $q_h = (\widetilde{q} - \alpha q_l) \,/\, (1 - \alpha)$.

- Let ϕ_l and ϕ_h be buyer-seller ratios. Fraction β of buyers are informed of the information partition (α, q_l). Uninformed buyers randomize over sellers. Informed buyers search more intensively in the high-quality submarket.

$$\phi_l = \begin{cases} (1-\beta)\,\Phi & \text{if EC} \\ \Phi - (1-\alpha)\ln(q_h/q_l) & \text{otherwise} \end{cases}$$

$$\phi_h = \begin{cases} \left(1+\frac{\alpha\beta}{1-\alpha}\right)\Phi & \text{if EC} \\ \Phi + \alpha\ln(q_h/q_l) & \text{otherwise} \end{cases}$$

- The *exclusion constraint* is satisfied:

$$e^{-\phi_h} q_h \geq e^{-\phi_l} q_l$$

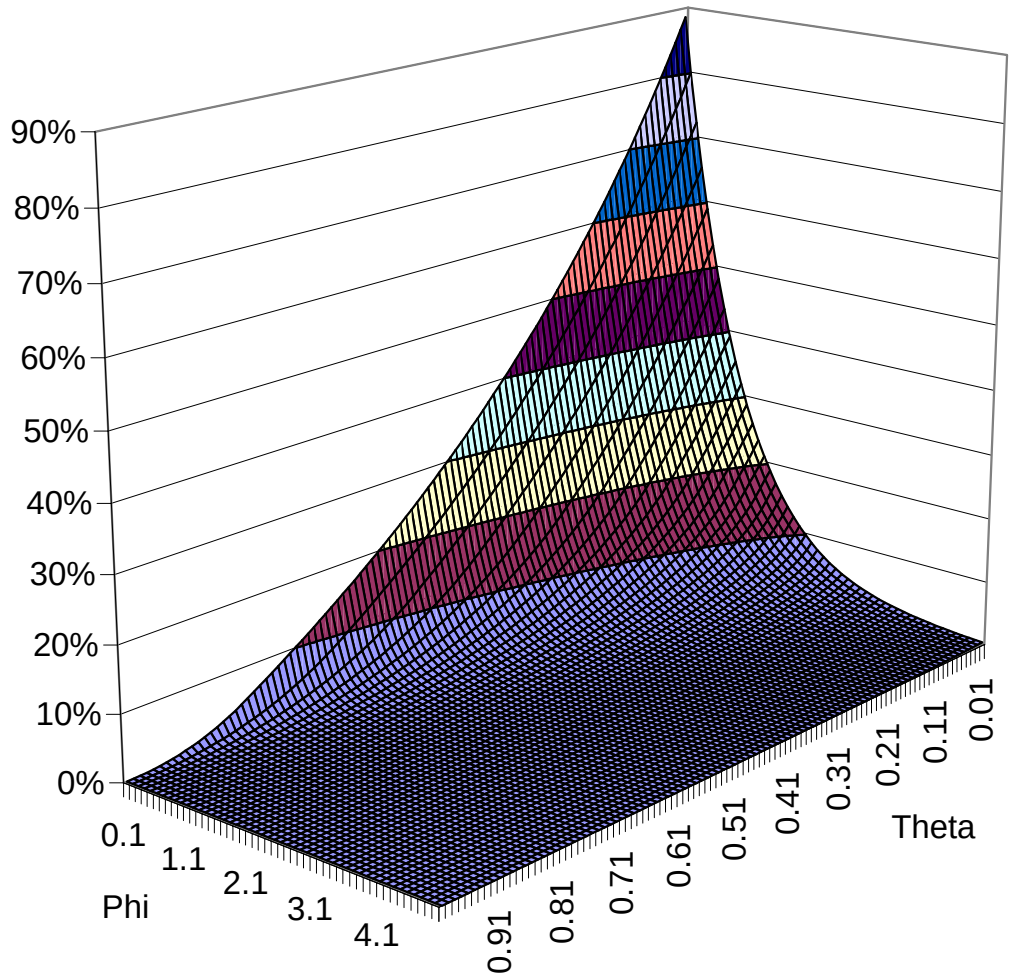
- In equilibrium, if $\beta > 0$, then $\phi_l < \Phi < \phi_h$ and $\partial\phi_l/\partial\beta \leq 0$, $\partial\phi_h/\partial\beta \geq 0$.

5 Welfare effects

- Welfare always increases with guided versus unguided search because search is directed more accurately and search frictions are reduced.

- The welfare gain is:
  - Non-decreasing in the number of informed buyers.
  - Increasing in the 'informativeness' of the information partition, i.e. decreasing in q_l and increasing in α.

- Assuming no costs of creating information, welfare is maximized when a perfect information partition $\left(\frac{1}{2}, \theta\right)$ is given to all buyers.



Maximum possible welfare gain.

- Distributional effects relative to unguided search:
  - Uninformed buyers are worse off.
  - Informed buyers are worse off if they do not exclude low quality sellers in equilibrium, otherwise they may be better or worse off.
    * The reduction in probability of getting a high quality product more than offsets the gains from being informed.
    * But it is an always equilibrium for the β informed buyers to actually use the information (prisoners' dilemma).
  - Bad sellers are worse off.
  - Most or all of the welfare gains accrue to good sellers.

6 Monopoly information provision

- Suppose a monopolist accredits a fraction σ of the good sellers, creating an information partition:

$$(\alpha(\sigma), q_l(\sigma)) = \left(1 - \frac{1}{2}\sigma, \frac{1 - \sigma + \theta}{2 - \sigma}\right)$$

- It charges a price p_A to good sellers to be accredited, and sells the resulting information partition to β of buyers at a price p_G.

- Generates equilibrium buyer-seller ratios $\phi_h(\beta, \sigma)$ among accredited (good) sellers and $\phi_l(\beta, \sigma)$ among unaccredited (good/bad) sellers.

6.1 Demand for guidebooks

$$p_G(\beta,\sigma) = \begin{cases} \alpha(\sigma)\left[e^{-\phi_h(\beta,\sigma)} - e^{-\phi_l(\beta,\sigma)} q_l(\sigma)\right] & \text{if EC} \\ 0 & \text{otherwise} \end{cases}$$

- Buyers are only willing to pay for a guidebook if it is sufficiently informative so as to enable them to exclude unaccredited sellers.

- Demand is well-behaved: Continuous, decreasing in β, increasing in σ.
  - More informed buyers increases competition in the accredited submarket and lowers the gains from being informed.

6.2 Demand for accreditations

$$p_A(\beta, \sigma) = p(\phi_h(\beta, \sigma)) - p(\phi_l(\beta, \sigma))$$

where $p(\phi) = 1 - (1 + \phi) e^{-\phi}$.

- Demand is not quite well behaved: Continuous, increasing in number of informed buyers, but demand slopes down ($\partial p_A / \partial \sigma < 0$) when EC holds and slopes *up* ($\partial p_A / \partial \sigma > 0$) when EC does not hold.

- An increase in σ has two effects:

  1. *Quantity effect:* The number of sellers in the high quality submarket increases and the number in the low quality submarket decreases.

  2. *Quality effect:* The expected quality of unaccredited sellers decreases ($q_l'(\sigma) < 0$).

- If EC holds only the quantity effect operates (informed buyers are searching among accredited sellers with maximum intensity) $\Rightarrow$ demand slopes down.

- If EC does not hold then both effects operate and the quality effect dominates $\Rightarrow$ demand slopes up (network effect).

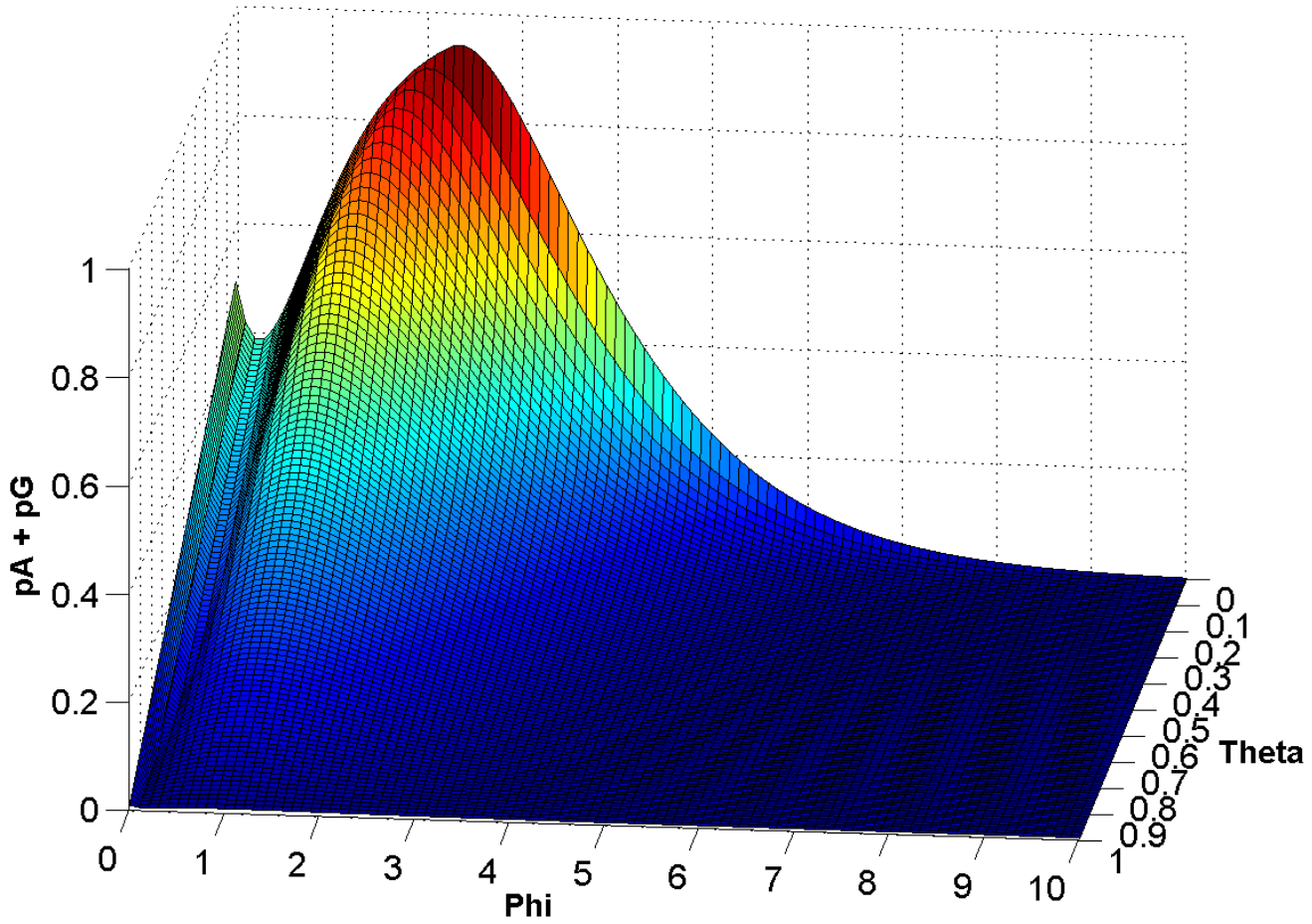
6.3 Monopolist's profit

$$\pi(\beta, \sigma) = \Phi p_G(\beta, \sigma)\beta + \tfrac{1}{2} p_A(\beta, \sigma)\sigma$$

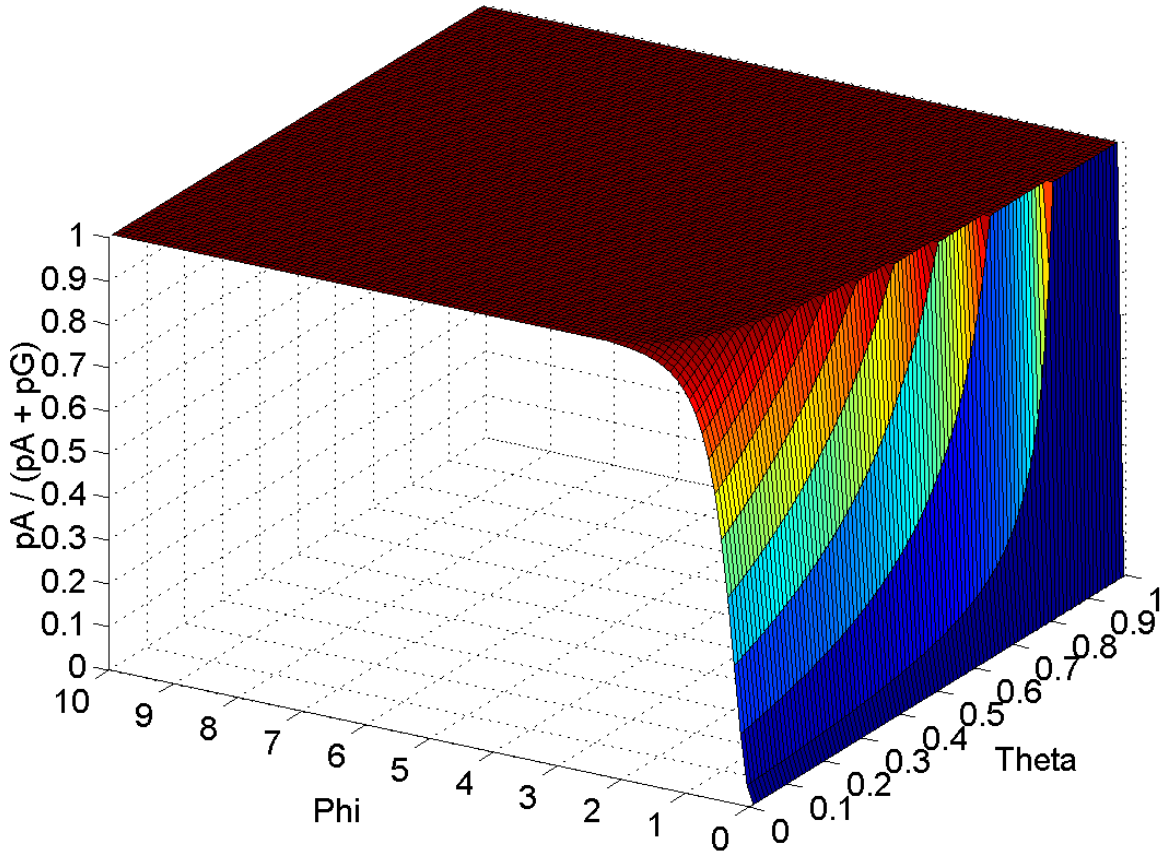
- Monopolist chooses β and σ simultaneously, taking into account the demand interdependence.

- Total revenue is maximized by accrediting all good sellers and providing this information to all buyers: $\beta = \sigma = 1$.
  - This is true even if it means receiving no revenue from buyers.
  - The monopolist replicates the social planner's solution.

6.4 Price level for informational services ($p_G + p_A$)

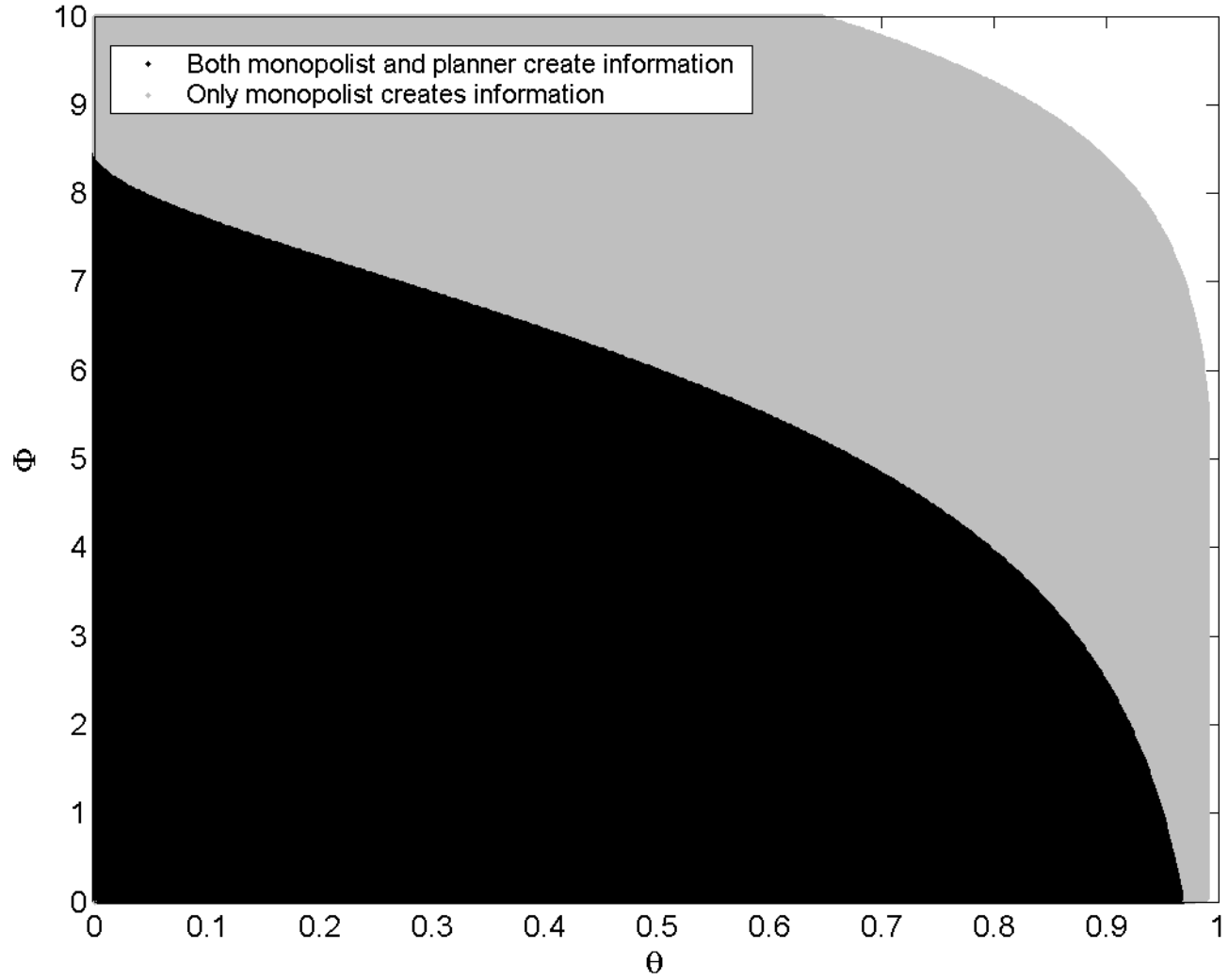


6.5 Price structure ($p_A/(p_A+p_G)$)



7 Incentives to invest in information

- Although the monopolist sets $\beta = \sigma = 1$, it is able to capture more surplus than the additional welfare that it generates.
  - Partly because of the upward-sloping demand for accreditations (when EC holds).
  - Thus assuming creation of information requires incurring a fixed cost F, the monopolist will choose to create information for fixed cost levels that a social planner would not.
  - Example ($F = 0.0001$)


Both monopolist and planner create information
Only monopolist creates information
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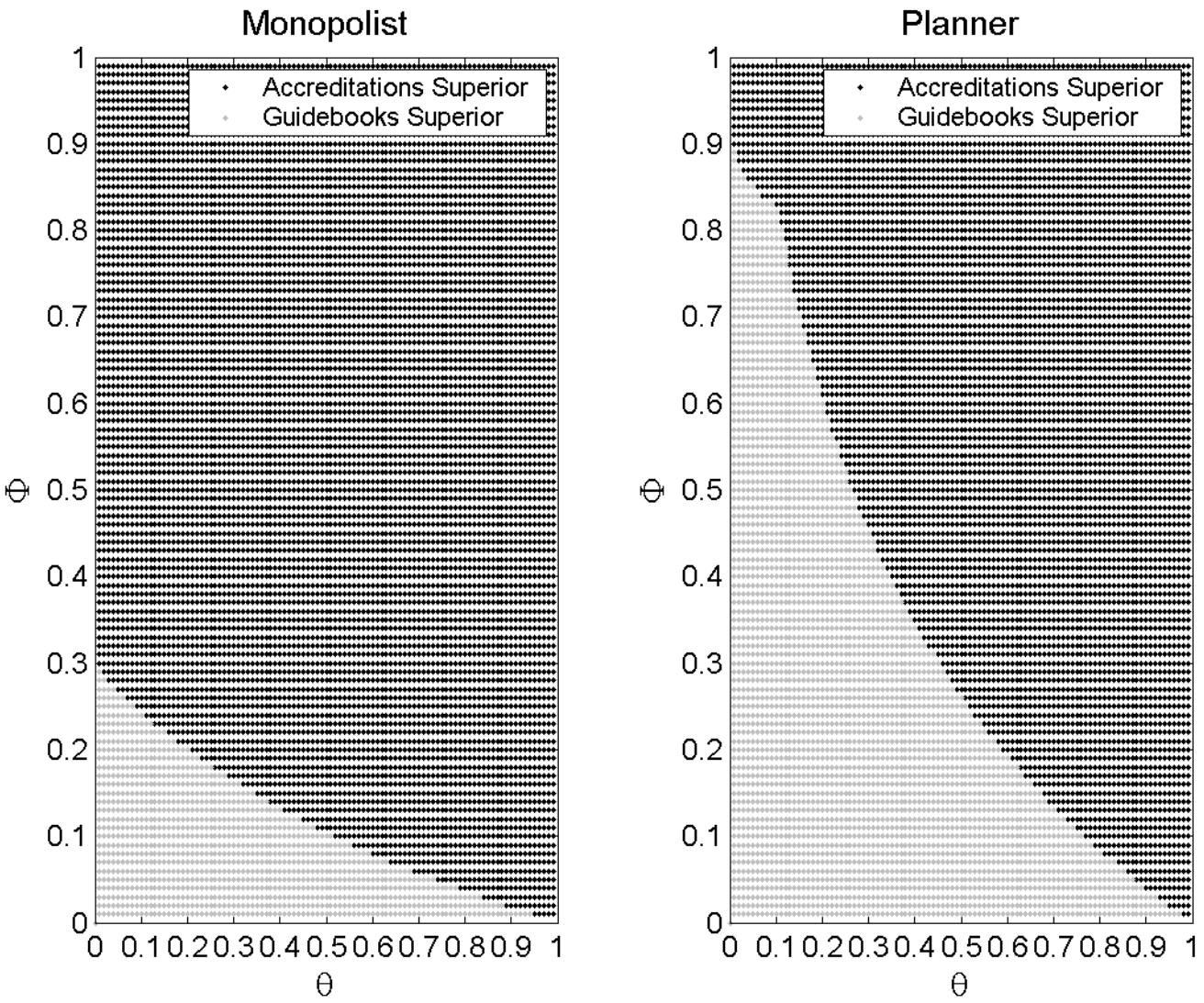
Monopolist
Accreditations Superior
Guidebooks Superior
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Guidebooks Superior
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- Conclusion
  - Informational intermediation in a matching game with directed search is a two-sided market.
  - The value of information is influenced by a network effect - the incentive to gain accreditation can increase with the number of accredited sellers.
  - The network effect can dominate other factors and thus a third party may have an incentive to market guidebooks for free and extract all revenues from seller accreditation.
  - The third party may have an incentive to overinvest in information compared to the social planner. No obvious market based solutions.
  - A trade-off between two methods of selling information