



Competing through information provision[☆]

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ABSTRACT

This paper studies the symmetric equilibria of a two-buyer, two-seller model of directed search in which sellers commit to information provision. More informed buyers have better differentiated private valuations and extract higher rents from trade. When sellers cannot commit to sale mechanisms, information provision is higher under competition than under monopoly. In contrast, when sellers commit to both information provision and sale mechanisms, I identify simple conditions under which sellers post auctions and provide full information in every equilibrium, ensuring that all equilibrium outcomes are constrained efficient. Sellers capture the efficiency gains from increased information and compete only over non-distortionary rents offered to buyers.

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(Christie's and Sotheby's) embarked on cutthroat competition to get goods for sale (... and) provide ever more luxurious services. Catalogues became ever fatter, printed in colour, on glossy art paper. (...) On the inside page of Sotheby's catalogue of the Old Master paintings sale held in London on Dec. 13 (2001), six "specialists in charge" are listed. (...) They identify the paintings, research them, know which world specialist on this or that painter needs to be contacted, and, more mundanely, which client is most likely to be interested in what painting, etc.¹

1. Introduction

What leads buyers to visit particular sellers is more than simply the terms of trade on offer. In particular, since the quality of buyers' information about goods affects their gains from trade, sellers may try to attract buyers by offering better information. This paper considers a market in which sellers post levels of information provision and buyers sort into selling sites *ex ante*, drawn by promises of being better informed once on-site. A buyer's information about his private valuation

for a good consists of (a) private knowledge of some personal attributes, along with (b) an understanding of how these characteristics relate to the good's properties. By controlling the information about their goods through, say, the quality and knowledge of their sales staff, sellers do not affect or acquire information about the buyers' private tastes. Instead, they shape the precision of buyers' understanding of how the good matches these tastes. In the art auction market described in the quote above, the clients of Christie's and Sotheby's know their own tastes and would know how they value the objects on offer at these firms were they to have all relevant information about them. However, as this information is specialised and difficult to acquire, these buyers rely on the information provided by the firms' experts.

Privately informed buyers gain informational rents through trade and, as noted by Bergemann and Pesendorfer (2007), by providing less information to buyers *before* trading, sellers give out fewer informational rents *during* the exchange process. A monopolist's choice of information provision trades off informational rents against efficiency, since more information provision better identifies the buyers that most value the goods. However, and this is the novel insight of this paper, if sellers compete for buyers, the latter may shun low-information selling sites. Competing sellers still face the post-sorting efficiency-rents trade-off but also face a pre-sorting trade-off between market share and the rents promised to buyers.

I present a model of directed search in which two sellers with unit supplies compete for the unit demands of two buyers. Sellers commit to information structures and may or may not commit to (ex post) incentive compatible and individually rational sale mechanisms, buyers

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¹ International Herald Tribune, 12/01/2002.

choose which seller to visit and sales take place.² With information provision interpreted as quality of customer service, my assumption that sellers can credibly commit to information structures captures the fact that the number, training and availability of sales staffs is observed by potential buyers. Terms of trade, on the other hand, can either be proposed by sellers after buyers have interacted with their sales staff or credibly posted beforehand. As in Peters and Severinov (1997), sorting occurs ex ante; buyers obtain their private information only once they choose a seller. Following the sellers' announcements, buyers sort into sale sites according to that subgame's (in most cases) unique symmetric mixed strategy equilibrium. Buyers compete for the good when both visit the same seller and this selection, common in directed search, rules out equilibrium coordination among buyers. In equilibrium, sellers face a random demand, whose distribution they affect through their choice of information provision and sale mechanisms. In both cases, I restrict attention to symmetric equilibria of the game between the sellers.

Once at a selling site, buyers' information is mediated by the information structures offered by sellers, which, as described by Bergemann and Pesendorfer (2007), map signals controlled by sellers into buyers' private inferences about their valuations for goods. If fully informed, buyers either have (independent and private) high or low valuations for both sellers' objects. As in Damiano and Li (2007), Ganuza and Penalva (2010), Johnson and Myatt (2006) and Ivanov (2008), I consider information structures ordered by the precision with which they allow buyers to access their true private valuations. For tractability, I assume that information structures have a symmetric correlated structure; sellers commit to a randomisation between two information states for their site: informed or uninformed. The realisation of this information state is commonly known. While ex post all buyers visiting a particular seller are informed or uninformed, ex ante sale sites are differentiated by the probability with which all buyers get access to their private valuations for the goods upon visiting.

I show that the effect of information provision depends on its role in competition. First, when sellers cannot commit to sale mechanisms and propose ex post optimal terms of trade after buyers have made their visit decisions, I show that the unique symmetric equilibrium in information provision has both sellers commit to full information. By setting ex post optimal mechanisms once buyers have sorted, the sellers' fix their ex ante trade-off between information provision and buyer visits. The full information result highlights that sellers' incentives for traffic-stealing are high since ex post optimal mechanisms (a) maximise allocative efficiency, so that information provision increases site surplus, and (b) minimise buyers' rents, so that their visit decisions are more sensitive to information provision.

Second, when sellers commit to both sale mechanisms and information provision, they can disentangle their rent and information provision decisions and they channel competition away from inefficient restrictions on information and into redistributive rent transfers to buyers. Under a condition guaranteeing that a monopolist seller would serve low-valuation buyers, I fully characterise the model's symmetric equilibria. In these equilibria, sellers provide full information, hold auctions and compete over the rents offered to buyers by setting appropriate (non-exclusionary) reserve prices. Since sellers provide full information and allocate goods efficiently based on that information, equilibrium outcomes are constrained efficient. Closely related to Coles and Eckhout (2003), who present a two-buyer, two-seller model of directed search with sale mechanisms under perfect information, a continuum of symmetric equilibria exist that are differentiated by the sharing of a fixed level of surplus between buyers and sellers. In all

equilibria, competition equates the marginal cost in rents of attracting additional visit probability with its marginal benefit in additional site surplus. The full information result exploits the fact that sellers post their offers of information provision and sale mechanisms before buyers sort into selling sites. I show that profiles in which sellers do not offer full information are vulnerable to deviations in which they provide more information, adjust buyers' rents through transfers to keep their visit decisions fixed and pocket the extra surplus generated by the additional information. The intuition that a seller can exploit efficiency gains through ex ante offers is very general. The key to my result is that this arises as a competitive outcome. Sellers endogenously harness the complementarity between information provision and efficiency by channeling all competition for buyers through non-distortionary transfers.

Recent work in mechanism design, auctions and optimal pricing has found that monopolists have incentives to manipulate their customers' access to information about their private valuations. In a model in which a seller designs a sale mechanism ex post, Bergemann and Pesendorfer (2007) characterise optimal information structures, which take a discrete monotone partition form. Ganuza and Penalva (2010) study information provision in second-price auctions when buyers' ex post distributions of valuations are ordered by dispersion and show that the seller's incentive to limit buyers' information vanishes as the number of buyers grows and the competition between them for the good wipes out their informational rents (see also Board (2009)).³ In a model of monopoly pricing, Johnson and Myatt (2006) have information provision order buyers' ex post distributions of valuations by sequences of rotations and in a result recalling that of Lewis and Sappington (1994), they find conditions under which a seller will always optimally release either all or none of the available signals.⁴

In contrast, when a monopolist designs a mechanism ex ante and can 'sell' information to buyers, Esö and Szentes (2007) show that the seller can capture all rents accruing from the information it controls by setting appropriate entry fees and hence provides full information. Their result shows that sellers will have an incentive to manipulate information only in those environments in which they cannot charge entry fees before any information about the goods is revealed. I impose that all buyer participation decisions are made ex post and hence my full information result when sellers can commit to mechanisms does not rely on entry fees but on sellers' ability to channel rents to buyers through means other than information provision. The interpretation of information provision as quality of customer service is consistent with ex post participation constraints as buyers typically discuss terms of trade only after they have received the sales staff's input about a product.

The question of how the incentives to provide information extend to a competitive market has received little attention to date. A later paper by Valverde (2011) studies a model related to mine in which sale mechanisms are restricted to auctions, but in which sellers provide information prior to buyers making their sorting decisions. In that case, while information provision can reduce visits from low-valuation bidders, Valverde (2011) provides conditions that guarantee the existence of a full-information equilibrium. Damiano and Li (2007) present a model of two-seller competition with information provision and ex post price competition which generalises that of Moscarini and Ottaviani (2001) (see also Huang (2010)). With a single buyer and price competition, information does not enhance surplus and in equilibrium sellers provide information to differentiate goods ex post and soften competition. Ivanov (2008) studies a related model with any number of sellers and continuous type distributions and shows that as the number of

² For models of directed search with price posting, see Burdett et al. (2001), Coles and Eckhout (2003), Moen (1997), Peters (2010), Shi (2001) and Shimer (2005), as well as Delacroix and Shi (2007) for a model in which prices provide information about good quality. For models of directed search with competing auctioneers, see Burguet and Sákovic (1999), McAfee (1993), Hernando-Veciana (2005), Pai (2009), Peters and Severinov (1997) and Virág (2010).

³ For random variables X and Y with distribution functions F and G , Y is said to be more dispersed than X if $F^{-1}(\beta) - F^{-1}(\alpha) \leq G^{-1}(\beta) - G^{-1}(\alpha)$ for all $0 < \alpha < \beta < 1$. See Shaked and Shanthikumar (2007).

⁴ Continuous distribution function G is said to be obtained from distribution F by (clockwise) rotation around z if $F(x) \leq G(x)$ for all $x \leq z$ and $F(x) \geq G(x)$ for all $x \geq z$.

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