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## Customer-side transparency, elastic demand, and tacit collusion under differentiation <sup>☆</sup>

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### ABSTRACT

Customer-side price transparency affects sustainability of collusion in a duopoly model of spatial product differentiation with elastic demand. When product differentiation is significant, more transparency facilitates collusion as measured by the critical discount factor. For the case where products are relatively homogeneous, the relationship is U-shaped. The level of transparency that optimally deters collusion is thus zero for intermediate to large degrees of product differentiation. Only when products are very moderately differentiated will full transparency be beneficial.

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## 1. Introduction

The question of whether ensuring that customers are better informed results in more competitive market outcomes is of great importance for both competition authorities and consumer protection agencies. Practitioners seem to consider an increased market transparency on the customer side as an appropriate means to promote competition. For example, the Bundeskartellamt (German Competition Authority) emphasizes the unambiguously positive effects of a higher degree

of customer information on competition.<sup>1</sup> In the same vein, it is often argued that the undesirable consequences of coordinated behavior stemming from an increased transparency among firms may be alleviated if customers gain access to more information at the same time. As Capobianco and Fratta (2005) report, the Autorità Garante per la Concorrenza ed il Mercato (Italian Competition Authority) holds the opinion that a higher elasticity of demand in a situation where customers are better informed “may, in a dynamic context, undermine any potential collusive practice” (p. 6) resulting from the exchange of information between firms.

In this article, we build on Schultz (2005) who sets up a Hotelling (1929) model with inelastic demand to analyze the implications of customer-side price transparency for

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<sup>1</sup> See, e.g., “Bundeskartellamt veröffentlicht bundesweiten Gaspreisvergleich für Haushaltskunden [German Competition Authority publishes countrywide gas-price comparison for households]”, press release, January 3, 2007 (document available from [www.bundeskartellamt.de](http://www.bundeskartellamt.de)).

the stability of tacit collusion. Generally speaking, increasing transparency has two opposing effects on the stability of collusion: on the one hand, deviation from the collusive outcome becomes more attractive as more customers learn about price cuts. On the other hand, there is tougher price competition if collusion breaks down, i.e., the potential punishment is harsher. He shows that a higher degree of transparency unambiguously destabilizes collusion.<sup>2</sup> Contrary to that, we find that increased customer transparency may not necessarily be the optimal solution to fight anti-competitive behavior. Our setup differs from his approach in that we set up a model of spatial competition where two horizontally differentiated firms face customers with elastic (heterogeneous) demand. Applying the concept of grim-trigger strategies, we show that for a relatively low degree of differentiation, the implications of an increase in market transparency are ambiguous and increasing transparency may be desirable in order to destabilize collusion. If, however, the degree of differentiation is sufficiently high, a greater market transparency—different from the inelastic-demand case—stabilizes collusion.

The reason behind this difference is that, with elastic demand, a change in the level of differentiation has an additional effect compared to the case with inelastic demand: beside a competition effect which leads to higher (competitive) prices as firms become more differentiated and which is also present in the inelastic-demand case, there is a (price) elasticity effect.<sup>3</sup> This price-reducing effect refers to the observation that customers' demand is lower, the higher the price and/or the greater the distance between the product's characteristics and their preferences. The competition effect dominates the elasticity effect for low and moderate levels of differentiation. Thus, the situations with elastic and inelastic demand are not different when it comes to the impact of differentiation on collusive stability. However, the elasticity effect dominates the competition effect if firms are highly differentiated. In this case, a deviating firm which needs to undercut its rival not only gains a larger market share from its competitor but also faces a higher local demand which comes as an additional benefit. As a consequence, deviation becomes more attractive. Moreover, the elasticity effect gains in importance as firms become more differentiated and thus, collusion is destabilized when the degree of differentiation increases.

As for the change in transparency, its impact on collusive stability is similar to a change in differentiation. Consider the situation where firms are very differentiated, i.e., the elasticity effect dominates. If transparency increases, a larger number of customers compares the prices set by the two firms which results in more intense competition such that the elasticity effect becomes less important. This is the same effect stemming from a decrease in differentiation and hence, collusion is stabilized.

If the degree of differentiation is low and if the market is rather transparent already, then a further increase in market transparency yields the same outcome compared to a decrease in differentiation when firms are close

substitutes: collusive stability is reduced due to the predominant competition effect. The opposite holds for an almost completely opaque market: even though firms are close substitutes, there is hardly any competition as customers are not aware of firms' prices which means that the elasticity effect dominates. Increasing market transparency then has the same effect compared to the case where, starting from a high level of differentiation, differentiation is reduced: collusion is stabilized.

Beside the contribution by Schultz (2005), there are only a few other contributions that analyze the implications of different levels of market transparency on the customer side.<sup>4</sup>

A very different approach to dealing with customer-side transparency is suggested by Nilsson (1999). He develops a model with unit demand and homogeneous products. In his model, the majority of customers account for the expected benefits from searching and decide whether to search or not on that basis. Contrary to that, a fraction of the customers always search. A higher degree of transparency here translates into lower search costs. Most customers thus no longer search if firms set the same price which is true for the (high-price) collusive phase. As a consequence, deviation leads to a moderate increase in demand only which stabilizes the collusive agreement. In the punishment phase of the collusive equilibrium, firms set different (mixed-strategy) prices which means that the majority of customers do search. Clearly, if transparency increases, there will be more search activity and hence tougher competition. Since an increase in transparency only affects the punishment profits, it helps stabilize the collusive agreement.

Møllgaard and Overgaard (2001) define market transparency as customers' ability to compare the products' characteristics or quality. Products are actually homogeneous but are perceived as differentiated due to a lack of rationality on the customer side. The authors show that for the case of trigger strategies, the optimal degree of transparency to make collusion as difficult to sustain as possible is interior in the duopoly case. The implication of their analysis to maintain some degree of opaqueness in the market in order to make collusion harder to sustain contrasts with the results in the present model for the case of high differentiation.<sup>5</sup>

From an empirical point of view, Albæk et al. (1997) as well as Wachenheim and DeVuyst (2001) provide two studies where a policy mainly directed at improving customers' level of information resulted in higher prices.<sup>6</sup> The argument often put forward to explain this outcome is that by giving customers more information, firms learn about competitors' prices at the same time. This makes it

<sup>4</sup> For an overview, see Møllgaard and Overgaard (2006) as well as Overgaard and Møllgaard (2008). Most articles deal with the implications of information exchange between firms for the stability of collusive agreements (see, e.g., Kühn and Vives, 1995; Kühn, 2001).

<sup>5</sup> Full transparency is shown to be optimal for five or more firms. Moreover, the authors find that full transparency is unambiguously optimal with two firms when applying optimal symmetric penal codes following Abreu (1986, 1988) and Abreu et al. (1986) (see also Møllgaard and Overgaard, 2002).

<sup>6</sup> Albæk et al. (1997) analyze the Danish market for concrete. Wachenheim and DeVuyst (2001) look at the US livestock and meat industries.

<sup>2</sup> See also Schultz (2009b).

<sup>3</sup> See Mérel and Sexton (2010).

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