Welfare-Enhancing Collusion and Coupons*

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PRELIMINARY AND VERY INCOMPLETE

Abstract

This note applies a variant of Deltas, Salvo and Vasconcelos (2009) to a spatial setting in which retailers compete by issuing coupons. Coupons induce an excessive number of shoppers to travel to stores that are located at a distance from their residence, leading to an inefficient outcome. Were the retailers to collude, or merge to monopoly, couponing would be reduced, total welfare would increase and, for a sufficiently high travel cost, even consumers (in aggregate) would benefit.

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*This note recasts the model developed in our separate paper "Welfare-Enhancing Collusion and Trade" to a setting in which retailers selectively issue coupons according to location of residence. We thank Qihong Liu for a comment that led us to this application. All errors are our own. NOTE: WE ARE CURRENTLY SUBSTANTIALLY EXTENDING THIS NOTE/PAPER IN LIGHT OF THE COUPONING SETTING. PLEASE DO NOT CITE WITHOUT PERMISSION.

1 Introduction

This note applies a variant of Deltas, Salvo and Vasconcelos (2009) to a spatial setting in which retailers compete by issuing coupons. Coupons induce too many shoppers to travel to stores that are located at a distance from their residence. The (imperfectly) competitive outcome is inefficient. Were the retailers to collude, or merge to monopoly, couponing and thus cross-border shopping would be curbed, total welfare would increase and, for a sufficiently high travel cost, consumers in aggregate would benefit.

More specifically, there are two neighborhoods. Each neighborhood is home to a single-store retailer and to a unit mass of shoppers with unit demands. Shoppers who travel to the distant store rather than shopping at the home store incur a travel cost. In addition to physical differentiation, the two stores are horizontally differentiated and the distribution of consumer preferences is the same in each neighborhood. This second dimension to differentiation is modeled as a Hotelling interval, over which each neighborhood's residents are uniformly distributed, and with the two store offerings placed at opposite endpoints. A retailer sets only one list price, but it can (costlessly) mail coupons (rebates) to residents in the other neighborhood, whose brand preferences are unobserved (only the distribution is known). We find that, relative to the competitive duopoly, a perfect cartel (multiproduct monopolist) issues lower away-resident rebates and thus reduces cross-border travel. But the cartel still induces excessive travel: clearly, a social planner would not distribute coupons to cross-neighborhood residents, letting each consumer weigh her horizontal tastes against her physical travel cost. In our setup, coupons are wasteful, as they distort the allocation of shoppers to stores.

Our note relates to a broad literature on price discrimination. Recent "behavior-based" price discrimination models, in which firms' prices respond to consumers' previous purchase decisions, have typically followed either of two approaches.[1] In the "switching costs" approach, consumers initially view competing firms' products as perfect substitutes, but in a second period they incur a switching cost if they switch away (or are "poached" away) from their first-period supplier (Chen 1997). Purchase history can then disclose information about exogenous switching costs (Taylor 2003).[2] In the "brand preferences" approach (e.g. Fudenberg and Tirole 2000), consumers have persistent preferences over different brands, and purchase history discloses information about these preferences. Although predictions can differ across the two approaches (most notably the time path

[1] Discussions are provided by Armstrong (2006, Section 5), Stole (2007, Section 4) and Fudenberg and Villas-Boas (2007, Section 3).

[2] See Nilssen (1992) and Klemperer (1995) for other discussions of customer poaching in switching-cost models.

of prices), they exhibit common features, including (i) that (in later periods) firms price discriminate in favor of rivals' past customers (the "weak" market) relative to their own past customers (the "strong" market),[3] (ii) that firms would rather collectively commit to uniform pricing (i.e. set the same price in all markets) but find themselves in a prisoner's dilemma, where unilaterally price discriminating to entice one's weak market is a dominant strategy, and (iii) that there is socially excessive switching, with consumers buying less favored products attracted by poaching discounts.

The competitive outcome in our remarkably simple setup is reminiscent of the findings of this literature, with price discrimination in favor of cross-neighborhood residents (the "weak market"[4]) inducing wasteful travel by shoppers, i.e. "poaching" shoppers who live in the rival store's turf. We see our single-period model as returning to a classic literature on static price discrimination. However, in contrast to both the older and more recent (dynamic) literatures, our objective is *not* to compare prices, profits and welfare under price discrimination relative to a situation where uniform pricing is mandated.[5] Rather, we focus on possible (unconventional) price and welfare effects on moving from competition (duopoly) to collusion (monopoly) in a context where retailers can price discriminate, through couponing, based on location of residence. Bester and Petrakis' (1996) static model also considers the role of coupons as a discriminatory device but the authors are concerned, like much of the literature, on the effects of price discrimination in a duopoly vis-à-vis uniform pricing.

2 A model of wasteful couponing

We apply a (slight) variant of the model developed in Deltas, Salvo and Vasconcelos (2009) to a setting in which neighborhood retailers compete by distributing coupons to attract ("poach") physically-distant customers. There are two neighborhoods. Each neighborhood is home to a unit mass of shoppers ("residents", say). Each neighborhood is also home to a single retail outlet, with retailer A located in one neighborhood and retailer B located in the other. Residents who

[3] In a static third-degree price discrimination setup, Corts (1998) introduces the concept of "best-response asymmetry", where one firm's weak market is its rival's strong market.

[4] Unlike brand preferences, consumers' residences are observed, so this is the natural dimension along which to apply the classification in Corts' (1998).

[5] Taylor (2003) is a notable exception, as he compares oligopoly (with two or more firms) to monopoly: "deadweight loss would be minimized (and equal to zero) in this model under monopoly. Specifically, no switching would be possible, and the monopolist would, therefore, extract all the social surplus" (p.232). In his setup, and unlike our result, consumer surplus is always lower under monopoly (and equal to zero: the monopolist charges the consumer's reservation price along the equilibrium path of the game).

travel to the other neighborhood to shop incur a transport cost $t > 0$ relative to shopping at their home store. In addition to this physical dimension, the "shopping experience" is differentiated horizontally, with preference space modeled as a unit interval of product characteristics over which each neighborhood's mass of residents is uniformly distributed. Letting x denote the distance from the left endpoint of this taste interval, retailer A's offering is located at $x = 0$ (the left endpoint) and retailer B's offering is located at $x = 1$ (the right endpoint): irrespective of where she resides, a shopper of type $x \in [0, 1]$ incurs a taste disutility of θx when shopping at retailer A and $\theta(1 - x)$ when shopping at retailer B, with $\theta > 0$. The two retailers have the same constant marginal cost of production, which we normalize to zero.

Shoppers shop at one retailer or another (we assume that, relative to the outside good, the reservation value for one's ideal offering, denoted V, is large enough—see below). A retailer sets only one price, but it can (indiscriminately) mail non-transferable coupons (rebates) to residents in a neighborhood, effectively discriminating according to neighborhood of residence, i.e. a shopper's residence is observed (but not her preferences). Without loss of generality, let p_A and p_B denote "list" prices set by retailers A and B respectively, and r_A and r_B denote rebates mailed by retailers A and B respectively to residents of the *away* neighborhood. Consider residents in retailer A's neighborhood: a shopper of type $x \in [0, 1]$ shops at the home store rather than the substitute store if

$$V - \theta x - p_A \geq V - t - \theta(1 - x) - (p_B - r_B)$$

from which the location of the "marginal resident" in retailer A's neighborhood (for an interior outcome) follows:

$$\tilde{x}_A(p_A, p_B - r_B) = \frac{1}{2} + \frac{t - p_A + (p_B - r_B)}{2\theta} \tag{1}$$

Analogously, the location of the marginal resident in retailer B's neighborhood is given (symmetrically) by

$$\tilde{x}_B(p_A - r_A, p_B) = \frac{1}{2} - \frac{t - p_B + (p_A - r_A)}{2\theta}$$

We next consider equilibrium outcomes under alternative competitive regimes, namely price competition and full collusion. Our focus is the case where, in these equilibrium outcomes, a retailer attracts some residents of the away neighborhood and all residents shop at a store. Thus, we restrict the space of parameters as follows (these constraints are easily verified):

Assumption A1 ("'poaching' occurs under collusion") $t < 2\theta$

Assumption A2 ("the market is covered under competition") $2V > t + 3\theta$

2.1 Price competition

Since a retailer can price discriminate based on neighborhood of residence (and marginal cost is flat in output), the problem is separable in and analogous across the two sets of residents. Consider residents in retailer A's neighborhood and denote retailer B's "net" price to these residents by $p_B^* \equiv p_B - r_B$. In a competitive equilibrium, p_A and p_B^* solve the system

$$\begin{cases} \max_{p_A} p_A \tilde{x}_A \left(p_A, p_B^*\right) \\ \max_{p_B^*} p_B^* \left(1 - \tilde{x}_A \left(p_A, p_B^*\right)\right) \end{cases}$$

List prices and "away-resident" rebates in equilibrium are thus

$$p_A^C = p_B^C = \frac{1}{3}t + \theta, \quad r_A^C = r_B^C = p_A^C - p_A^{*C} = p_B^C - p_B^{*C} = \frac{2}{3}t \tag{2}$$

(where the superscript C denotes the competitive equilibrium, and the net price paid by residents in retailer B's neighborhood who shop at retailer A is defined analogously: $p_A^* \equiv p_A - r_A$), and the (symmetric) locations of marginal residents are

$$\tilde{x}_A^C = \frac{1}{2} + \frac{1}{6}\frac{t}{\theta}, \quad \tilde{x}_B^C = \frac{1}{2} - \frac{1}{6}\frac{t}{\theta}$$

2.2 Full collusion

As in Deltas, Salvo and Vasconcelos (2009), we assume that firms' discount factors are sufficiently high that at the fully collusive outcome—denoted by the superscript JM (joint-profit maximizing)—incentive compatibility constraints do not bind. The perfect cartel sets prices such that the marginal resident in each neighborhood is left with zero surplus. Again considering residents in retailer A's neighborhood, this means that prices satisfy $V - \theta\tilde{x}_A(p_A, p_B^*) - p_A = 0$, which from (1) can be rewritten as $2V - t - \theta - p_A - p_B^* = 0$. This locus of prices collapses the perfect cartel's problem

$$\max_{p_A, p_B^*} p_A \tilde{x}_A (p_A, p_B^*) + p_B^* (1 - \tilde{x}_A (p_A, p_B^*)) \quad \text{subject to} \quad V - \theta \tilde{x}_A (p_A, p_B^*) - p_A \geq 0$$

to the univariate problem

$$\max_{p_A} p_A \frac{V - p_A}{\theta} + (2V - t - \theta - p_A) \left(1 - \frac{V - p_A}{\theta}\right)$$

In equilibrium, list prices and away-resident rebates are then given by

$$p_A^{JM} = p_B^{JM} = V - \frac{1}{4}t - \frac{1}{2}\theta, \quad r_A^{JM} = r_B^{JM} = \frac{1}{2}t \tag{3}$$

and the locations of marginal residents are

$$\tilde{x}_A^{JM} = \frac{1}{2} + \frac{1}{4}\frac{t}{\theta}, \quad \tilde{x}_B^{JM} = \frac{1}{2} - \frac{1}{4}\frac{t}{\theta}$$

We thus obtain that $r_A^{JM} < r_A^C$ and $\tilde{x}_A^{JM} > \tilde{x}_A^C$, stating the result in the following proposition:

Proposition 1 Relative to the competitive duopoly, the perfect cartel issues lower away-resident rebates and induces less cross-border shopping (i.e. local shopping as a share of total shopping rises).

2.3 Welfare effects

In this subsection, we restate the welfare results of Deltas, Salvo and Vasconcelos (2009) (Propositions 2 and 3) in the present context. Start by comparing social welfare—the sum of consumer surplus and producer surplus—across the competitive and fully collusive regimes. Given our focus on the case where the market is covered, we can restrict our welfare comparison to (i) the different total physical transport cost from cross-border shopping, which is higher under competition: $2t\left(1 - \tilde{x}_A^C\right) > 2t\left(1 - \tilde{x}_A^{JM}\right)$ (recall the symmetry); and (ii) the different total taste disutility from shopping at a store other than one's ideal, which is higher under collusion:

$2\left(\int_0^{\tilde{x}_A^C}\theta x dx+\int_{\tilde{x}_A^C}^1\theta(1-x)\,dx\right)<2\left(\int_0^{\tilde{x}_A^{JM}}\theta x dx+\int_{\tilde{x}_A^{JM}}^1\theta(1-x)\,dx\right)$. By computing these expressions, one can verify that component (i) dominates component (ii), yielding the following result:

Proposition 2 Social welfare under full collusion exceeds social welfare under price competition.

Next, a comparison of consumer surplus across the two regimes reveals that, relative to competition, collusion can be good even for *consumers*:

Proposition 3 Consumer surplus under full collusion may exceed consumer surplus under price competition. In particular, collusion can bring gains to consumers relative to competition when t, the cost of cross-border travel, is sufficiently high.

Proof See Deltas, Salvo and Vasconcelos (2009), Proposition 3. Formally, consumer surplus under collusion exceeds consumer surplus under competition iff Assumption A2 is within $5t^2/(72\theta)$ of binding. ■

It is easy to show that whenever shifting from competition to collusion raises consumer surplus, it is also the case that the list price declines, i.e. $p_A^{JM}=p_B^{JM}<p_A^C=p_B^C$. (However, the net price paid by cross-border shoppers rises, as the list price cut is more than offset by the rebate reduction.) It turns out that the collusive gains from reducing wasteful couponing are also enjoyed by consumers in aggregate.

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