Exclusionary Practices in Two-Sided Markets: The Effect of Radius Clauses on Competition between Shopping Centers[1]

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Abstract: This paper analyzes exclusionary conduct of platforms in two-sided markets. Motivated by recent antitrust cases against shopping centers introducing radius restrictions on their tenants, we provide a discussion of the likely positive and normative effects of exclusivity clauses, which prevent tenants from opening outlets in other shopping centers covered by the clause. In a standard two-sided market model, we analyze the incentives of an incumbent shopping center to introduce exclusivity clauses when faced by entry of a rival shopping center. We show that exclusivity agreements are especially profitable and detrimental to social welfare if competition is intense between the two shopping centers. We argue that the focus of courts on market definition is misplaced in markets determined by competitive bottlenecks.

Keywords: Platform competition, exclusive dealing, network effects, competitive bottlenecks

JEL codes: D43, D62, L13

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[1] The authors have been involved in one of the cases mentioned in the text as economic experts for one of the parties. The case is closed. None of the included information is confidential.

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1 Introduction

Exclusionary practices and their evaluation from a competition policy perspective are ongoing topics of academic discussion and of the activity of antitrust authorities and private enforcement. The question whether certain exclusive contracts and arrangements unduly restrain competition increasingly arises in the context of platform or two-sided markets (Armstrong and Wright: 2007, Doganoglu and Wright: 2010). Recently a number of cases have concerned radius clauses in contracts between shopping centers and their tenants. These contracts state that a retail chain operating a store in a shopping center must not open another outlet in a competing shopping center within the radius agreed upon in the exclusivity agreement. The distances specified in the contracts range from a few kilometers to 150 km in the case of so-called factory outlet centers.[4] While many of the cases are still pending[5], there have been a few final decisions. In these cases, the courts typically do not discuss market structure and the economic effects of radius restrictions on it, but rather focus solely on market delineation in order to determine market shares.[6] We provide a discussion of the economic effects in this article and show that market definition based on SNIPP-tests suffers serious shortcomings.

Shopping centers operate on markets with specific characteristics. Shopping centers are intermediaries between buyers and sellers. Buyers are typically one-stop shoppers who only visit one shopping center during a shopping trip. Retail chains typically

[4] In an Austrian case about a shopping center in the city of Salzburg, the radius is four kilometer (see http://goo.gl/2Dmm61). In the case of a German factory outlet the radius is 150 km (see http://goo.gl/dcJfm7).
[5] https://goo.gl/w5PtcQ
[6] The FTC's focus appears to be more on the effects of these clauses. It recently settled a merger case inter alia based on the removal of radius restrictions. See https://www.ftc.gov/news-events/press-releases/2010/11/ftc-puts-conditions-simon-property-groups-acquisition-prime

engage in multi-outlet strategies as shopping centers provide exclusive access to their buyers. In such markets with competitive bottlenecks, shopping centers compete for buyers to increase earnings on the seller side. They attract buyers by offering a preferable mix of shops and brands and by subsidizing them as they do not charge entrance fees. On the seller side, they skim off their tenants.

Sellers sign lease agreements as long as their profits are weakly positive. Prices may determine whether a seller signs a lease agreement with a given shopping center or not. But if sellers multihome, there is factually no price competition between rival shopping centers because retail chains do not see shopping centers as substitutes as long as each shopping center provides access to a unique group of buyers.

In this competitive bottleneck scenario, radius clauses significantly affect the competition between shopping centers because exclusive sellers may help to create a unique mix of shops and brands. As we will show below, this turns out to decrease social welfare as these clauses keep competitors from creating an optimal mix of brands and shops.

We analyze the welfare effects of radius clauses and the incentives to engage in exclusive dealing dependent on the strength of competition between the shopping centers, i.e., the extent to which catchment areas overlap. We find that the stronger the competition in the shopping center market and the stronger the indirect network effects, the more harmful radius restrictions are to society.

While our discussion of platform markets focuses on shopping centers, the analysis is of more general interest for the discussion of exclusivity clauses in platform markets. Similar issues, for instance, arose in the late 1980s in the market for video games, when Atari Corporation sued Nintendo because of exclusivity contracts with game developers (see Gilbert and Shapiro: 1997). We nevertheless keep our discussion focused on shopping centers as they provide a literal example of the spatial Hotelling framework employed in our model as well as in workhorse models of two-sided markets such as Rochet and Tirole (2003) and Armstrong and Wright (2007).

In what follows, we first describe the economics behind shopping centers (Section 2). Section 3 presents a derivation of the standard two-sided market framework as developed by Armstrong and Wright (2007) and discusses the various competitive scenarios arising in our Hotelling framework. While platforms are always competitive bottlenecks, the degree to which they can be contested differs greatly depending on the extent of their segment of loyal customers. Section 4 introduces and discusses exclusive dealing in the form of radius restrictions and evaluates the incentives to engage in exclusionary agreements as well as the likely effects on the market. Section 5 discusses the consequences of our analysis for the question of market definition in two-sided markets and concludes.

2 The Economics of Shopping Centers

The economics of shopping centers are characterized by externalities. On one side of the market, buyers choose their preferred shopping center based on the number and the variety of shops in a shopping center (Crosby et al.: 2004). Their utility typically increases with the number of shops and the fit between the actual and preferred mix of shops (Eisenmann et al.: 2006). On the other side of the market, sellers' utility typically increases with the number of buyers and their spending capacity.

Spillovers from buyers to sellers and from sellers to buyers are called indirect network effects. Shopping centers control and internalize those network effects by setting prices and selecting the mix of brands that matches the preferences of the target group (Gould and Pashigian: 2005). This determines a shopping center as a platform and distinguishes shopping centers from agglomerations like shopping streets and retail parks (Armstrong: 2006, Parker and Van Alstyne: 2005, Rochet and Tirole: 2003, 2006).

Competition between shopping centers is determined by buyers who take advantage of one-stop shopping, i.e., consumers get all they need in one shopping center and do not have to drive or walk around town. The agglomeration of products and services reduces search costs (Messinger and Narasimhan: 1997, Baumol and Ide: 1956).

It is crucial to understand that shopping centers provide monopolistic access to buyers.[7] Sellers have to operate a shop in a respective shopping center to get access to buyers who visit this shopping center. Otherwise there is no interaction. This situation is known as a competitive bottleneck and typically forces sellers to multihome (Armstrong and Wright: 2007). Retail chains open a shop in a given shopping center if they expect to earn weakly positive profits.

2.1 Cross Subsidization

To attract buyers, shopping centers subsidize them (Gould and Pashigian: 1998). Buyers do not pay for admission although they cause costs. Moreover, the operators create an appealing environment for customers (architecture, decoration, olfactory

[7] This is especially true for factory outlet centers.

design, shows, music and sounds, etc.) and provide an attractive mix of brands and shops. Competition for buyers is fierce. A marginal buyer attracted by the shopping center increases the revenues on the seller side and thus the average lease prices that can be charged from tenants. In contrast to buyers, sellers are skimmed off. Note that it is profit maximizing for shopping centers to charge sellers their reservation prices. There is no incentive to charge less because this would not have an effect on the number of sellers or buyers.

2.2 Exclusive Dealing

Shopping centers have strong incentives to introduce exclusivity clauses that are typically implemented through radius clauses. ‘A radius clause is a standard shopping center lease provision that prohibits a tenant from opening another similar business within a prescribed radius from its present location […]’ (Lentzner: 1993). From the shopping center’s viewpoint, radius restrictions are strategic instruments to differentiate themselves from competitors because a tenant mix with ‘exclusive’ sellers and brands may create a unique selling point for buyers.

Radius clauses may be ‘cheap’ to offer because of positive spillovers between sellers and buyers (Armstrong and Wright: 2007). Let us assume that managers of a shopping center convince a retail chain to accept an exclusivity clause. If this retail chain does not open (or closes) outlets in neighboring shopping centers, the shopping center that signs the contract becomes *relatively* more attractive to buyers, and the number of buyers in this shopping center increases. This drives up revenues of existing sellers and eventually the maximal lease prices charged by the shopping center.

However, in order to induce a retail chain to accept a radius restriction, the shopping center must compensate for potential profits in neighboring shopping centers. As shown below, this compensation decreases with the number of exclusive sellers due to lower attractiveness of rivals.[8]

3 The Model

In this section, we present the basic setup of the model, a derivation of the Armstrong and Wright (2007) model that fits to our application. We start with a symmetric setup with two established shopping centers. Asymmetry between the shopping centers and the possibility of exclusive contracts will be introduced in the next section. The setup is as follows. Potential buyers b visit shops of sellers s in two different shopping centers, labeled by $i = 1,2$. There is a distance of 1 between the shopping centers. Shopping center 1 (SC1) is located on position $x^1 = 0$. Shopping center 2 (SC2) is located on $x^2 = 1$. The mass of $M = 1$ potential buyers is assumed to be evenly distributed between the shopping centers. For expositional purposes we also assume that the mass of $M = 1$ heterogeneous sellers is uniformly distributed between the shopping centers. This assumption will be helpful when discussing exclusivity. We further assume that retail chains multihome. Retail chains open a shop in a certain shopping center whenever they expect to earn weakly positive profits. Buyers singlehome and only visit one shopping center; the one they prefer most.

[8] Divide-and-conquer strategies of firms require economies of scale (Rasmusen et al.: 1991, Segal and Whinston: 2000). Due to indirect network effects, there are economies of scale on the demand side in our application. For further analyses of such strategies in a two-sided market framework see Doganoglu and Wright (2010) and Jullien (2011).

3.1 Basic Model

When buyer b visits shopping center i, she receives $u_b^i(x_b,\, n_s^i)$. Utility reads as

$$u_b^i(x_b,\, n_s^i) = \beta_b n_s^i - t_b|x_b - x^i|.$$

As described above, we assume that there is free admission $(p_b^i = 0)$ to both shopping centers. The utility of a buyer is the sum of shopping experience and travelling costs. Shopping experience is denoted by the network effect $\beta_b n_s^i$. It is determined by the average utility β_b a buyer b receives from potentially visiting one of n_s^i shops in shopping center i. Travelling and transport costs, respectively, are denoted by $t_b|x_b - x^i|$. They arise when a buyer travels from her residence located on x_b to shopping center i located at x^i. This distance is multiplied by the travelling costs per unit of distance t_b. If a buyer located on x_b values shopping at shopping center i more than she incurs travelling costs $(\beta_b n_s^i \geq t_b|x_b - x^i|)$, she resides in the catchment area of shopping center i. If her residence is located in the catchment areas of both shopping centers, she visits the shopping center she prefers. So, she prefers SC1 over SC2 if $u_b^1(x_b,\, n_s^1) > u_b^2(x_b,\, n_s^2)$. Note that we also allow for buyers who do not visit a shopping center at all. These consumers would just consume an outside good as might be available at their local store.

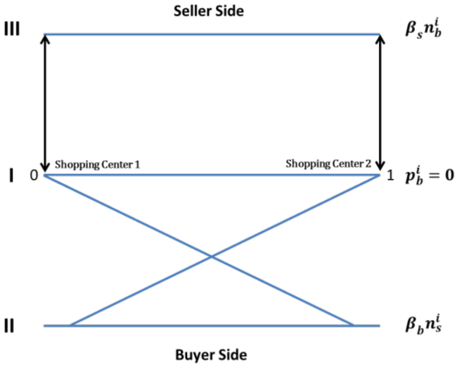
Contrary to buyers, retail chains do not incur transport costs $(t_s = 0)$. The utility of a seller $u_s^i(n_b^i, p_s^i)$ reads as

$$u_s^i(n_b^i, p_s^i) = \beta_s n_b^i - p_s^i.$$

Revenues are denoted by $\beta_s n_b^i$, with β_s as the average amount of money spend by each visitor on a shopping trip times the number n_b^i of buyers who visit shopping center i. The lease price is given by p_s^i. Taken together our reduced form approach abstracts from modelling any kind of price competition among shops and specific shopping decisions of buyers. It simply assumes that shops expect to earn higher profits in shopping centers with a larger number of consumers, and consumers expect to reach a higher utility level in shopping centers if there is a larger number of shops.

Figure 1 illustrates the basic set up. The two sides of the market are depicted by the areas above and below the central line (**I**). The central line (**I**) depicts the distance between SC1 and SC2.

FIGURE 1: BASIC SET UP



The area below the central line represents the buyer side. The vertical distance between the central line (**I**) and the lines originating at $x^1 = 0$ and $x^2 = 1$ depicts travelling costs for getting from location x_b to the respective shopping center i. The lower horizontal line (**II**) shows the (gross) utility associated with shopping experience. The distance between the diagonal lines and the lower horizontal line (**II**) represents the net utility a buyer receives if her residence is located on x_b and she travels to SC1 and SC2, respectively.

The area above the central line (**I**) represents the seller side. The upper horizontal line (**III**) depicts revenues earned by sellers. There are no diagonal lines because sellers transport costs are assumed to be zero.

3.2 Competitive Relation between Shopping Centers

Competition between shopping centers is determined by overlap of their catchment areas. Consider two shopping centers located nearby. Those shopping centers may rather compete for the same customers than shopping centers located far away from each other.

Catchment areas are defined by the ratio of shopping experience to marginal transport costs $\frac{\beta_b n_s^i}{t_b}$. A higher variety of available shops as well as a higher shopping experience β_b lead to a larger catchment area, higher transport costs to a smaller one. If there is no exclusivity and all sellers multihome $\left(n_s^i = 1\right)$, catchment areas are equal to $\frac{\beta_b}{t_b}$. To simplify the further analysis, we define three scenarios depending on the extent of these catchment areas:

Scenario a): 'Pure competition' ⇔ $\beta_b \geq t_b$.

Scenario b): 'Spatial Competition' ⇔ $2\beta_b \geq t_b > \beta_b$.

Scenario c): 'Separated Markets' ⇔ $2\beta_b < t_b$.

We illustrate the scenarios in Figure 2 and explain them subsequently.

FIGURE 2: COMPETITION BETWEEN SHOPPING CENTERS

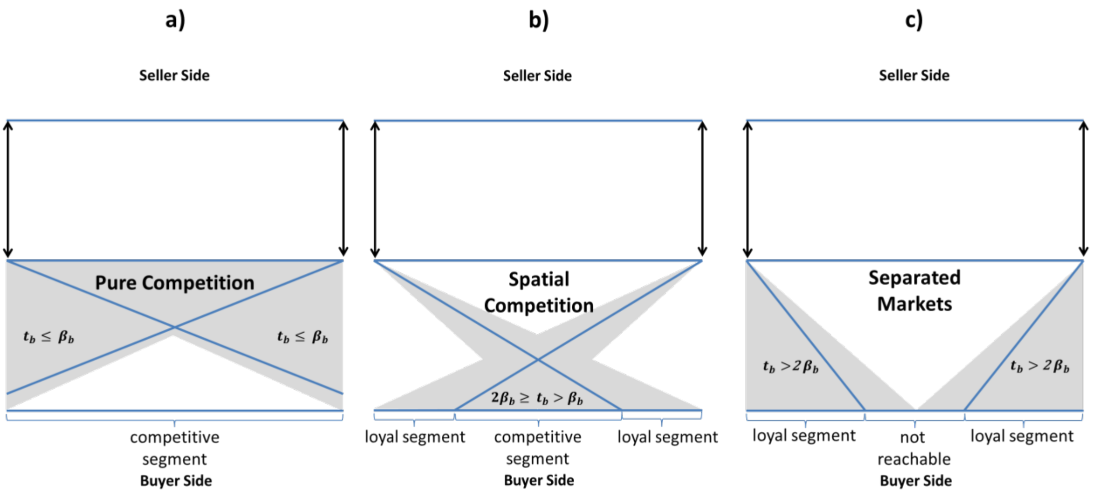


Figure 2a shows 'Pure Competition' ($\beta_b \geq t_b$). If the proportion of indirect network effects to marginal transport costs is $\frac{\beta_b}{t_b} \geq 1$, catchment areas totally overlap and shopping centers compete for the same customers. To see this, let us have a look at the transport cost curves that may appear within the highlighted areas. Among those potential transport cost curves, the blue lines depict specific ones. The interceptions of the transport costs curves with the lower horizontal line (shopping experience) are on the edges or outside the unit interval, i.e., both shopping centers may cover the whole customer market because each buyer may receive a non-negative surplus from visiting each of the shopping centers.

Figure 2b shows 'Spatial Competition' ($2\beta_b \geq t_b > \beta_b$). Given the catchment area has a length of $1 \geq \frac{\beta_b}{t_b} > \frac{1}{2}$, catchment areas of both shopping centers partially overlap and customers located on the interval $[1 - \frac{\beta_b}{t_b}, \frac{\beta_b}{t_b}]$ are located in the competitive segment.

Customers located between $[0, 1-\frac{\beta_b}{t_b}]$ cannot be reached by SC2, thus the interval determines a loyal segment for SC1. Customers located between $[\frac{\beta_b}{t_b}, 1]$ are located in SC2's loyal segment.

Figure 2c shows 'Separated Markets' $(2\beta_b < t_b)$. If the proportion of indirect network effects to marginal transport costs is $2\beta_b < t_b$, catchment areas do not overlap and shopping centers do not compete for the same customers. The buyer side of the markets is separated. Given $2\beta_b < t_b$, the catchment area of SC1 covers loyal customers located on $[0, \frac{\beta_b}{t_b}]$ and the catchment area of SC2 covers loyal customers located on $[1-\frac{\beta_b}{t_b}, 1]$.

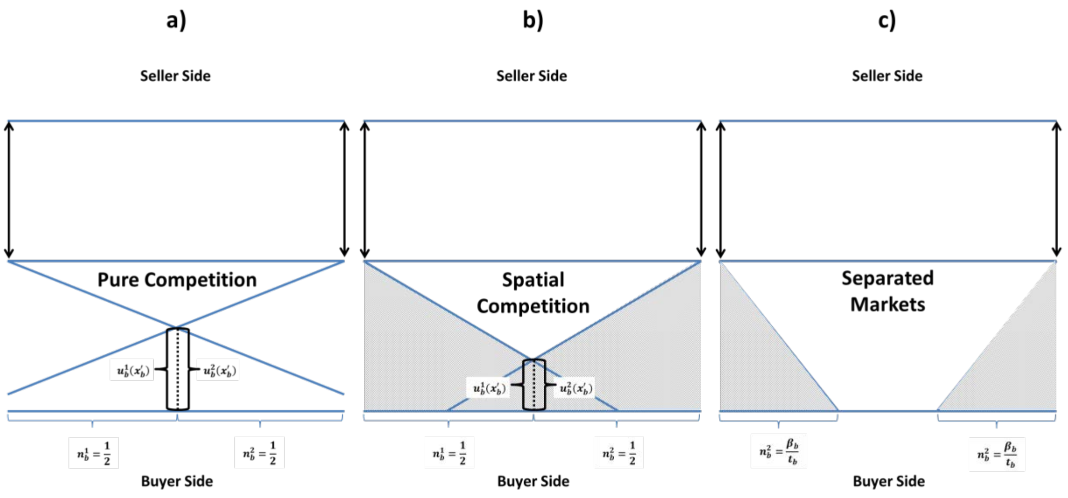
3.3 Competitive Bottleneck

The second factor that determines competition is a competitive bottleneck. Shopping centers are competitive bottlenecks, as they provide multi-homing sellers *monopolistic* access to single-homing buyers. It is crucial to realize that the price is no competitive factor in this competitive bottleneck market. On one hand, there is free admission for buyers $\left(p_b^i = 0\right)$. One the other hand, shopping centers offer retail chains monopolistic access to their buyers and have no incentive to charge sellers less than their reservation price $\bar{p}_s^i$. A decrease in retail prices $p_s^i < \bar{p}_s^i$ would not have an effect on quantities both on the seller and on the buyer side.

As a consequence, shopping centers use their market power and set prices equal to the revenues of shops $\pi^i = p_s^i = R_s^i$. Those prices extract all surplus from sellers

$(CS_s = 0)$. On the buyer side, surplus CS_b depends on the competitive scenario we are in.

FIGURE 3: COMPETITIVE BOTTLENECK AND CONSUMER SURPLUS



Buyer surplus CS_b is illustrated by the light grey areas (Figure 3). In the scenarios of 'pure' and 'spatial' competition, the market is fully covered as depicted in Figures 3a and 3b.

The demand pattern under 'pure' and 'spatial' competition is determined by the indifferent buyer, i.e., the buyer who receives the same utility from visiting each shopping center $(u_b^1(x_b, n_s^1) = u_b^2(x_b, n_s^2))$. Due to symmetry, this buyer is located on $x_b' = \frac{1}{2}$. The number of buyers splits evenly between shopping centers $(n_b^1 = n_b^2 = \frac{1}{2})$. Total buyer surplus reads as $CS_b = 2 * \int_0^{\frac{1}{2}} (\beta_b - t_b x) dx = \beta_b - \frac{t}{4}$. Given $p_s^i = \beta_s$, total seller surplus is $CS_s = 0$ as the sum of profits is equal to β_s, with profits equal to $\pi_s^i = \frac{1}{2}\beta_s$ in each shopping center.

If markets are 'separated' there is no competition between the shopping centers (Figure 3c), demand on the buyer side corresponds to the catchment areas $n_b^1 = n_b^2 = \frac{\beta_b}{t_b}$ and total buyer surplus reads as $CS_b = 2 * \int_0^{\frac{\beta_b}{t_b}} (\beta_b - t_b x) dx = \frac{{\beta_b}^2}{t_b}$.

Each shopping centers earns $\pi_s^i = \frac{\beta_b}{t_b} \beta_s$. Total profit is given $\sum_{i=1}^{2} \pi^i = 2 \frac{\beta_b}{t_b} \beta_s$ and sellers are left with no surplus $CS_s = 0$.

Total welfare in a market without exclusivity clauses reads as

$$W = \begin{cases} \beta_b - \frac{t_b}{4} + \beta_s & , for \frac{\beta_b}{t_b} > \frac{1}{2} \\ \frac{{\beta_b}^2}{t_b} + 2 \frac{\beta_b}{t_b} \beta_s & , for \frac{\beta_b}{t_b} \leq \frac{1}{2} \end{cases}.$$

If shopping experience is high relative to transport costs $\left(\frac{\beta_b}{t_b} > \frac{1}{2}\right)$, catchment areas of SC1 and SC2 overlap. The market is covered and welfare is equal to $\beta_b - \frac{t_b}{4} + \beta_s$. If catchment areas are smaller than $\frac{1}{2}$, markets are separated and welfare reads as $\frac{{\beta_b}^2}{t_b} + 2 \frac{\beta_b}{t_b} \beta_s$.

4 Exclusive Dealing

To analyze welfare effects of exclusive dealing in general and radius restrictions in particular, we deviate from Armstrong and Wright (2007) by introducing a sequential setup with asymmetry among the two platforms. In our Stackelberg model SC1 is the leader, which moves first to set prices and sign exclusive sellers through radius clauses. Those clauses *always* cover the location of the rival shopping center. SC2 is the second mover that sets its price and finally signs sellers.[9]

Next, we describe the timing of the game in detail:

Stage 0: Potential entrant SC2 offers all sellers a (renegotiable) contract with rental price p_s^2 which is determined later.

Stage 1: SC1 offers some sellers a lease contract with a price equal to their reservation price $\bar{p}_s^1 = \beta_s$. To a share of σ sellers, it offers an exclusive take-it-or-leave-it contract (incl. radius clause) with price $\hat{p}_s^1 = \beta_s - T$. The transfer $T(\sigma, p_s^2)$ accounts for the potential lost profit at SC2. Sellers accept or decline the offer and σ is determined.

Stage 2: SC2 decides about entry.

Stage 3: SC1 pays possible transfers $T(\sigma, p_s^2)$, contingent on SC2 entry decision. If SC2 decides to enter the market, it offers a non-exclusive take-it-or-leave-it contract to the remaining non-exclusive sellers with rental price p_s^2.

Before we solve this game, we comment on the setup: Stage 0 is necessary to credibly allow SC2 to 'fight' for the potentially exclusive sellers. Given our sequential structure, it would always be optimal for SC2 to charge the reservation price from any non-exclusive seller, once that decision is made. So some commitment is necessary in order to prevent this hold-up problem. This assumption also captures the dynamic nature of entry in that industry. Entrants try to attract

[9] Note that Jullien (2011) also assumes a Stackelberg setup, which however gives rise to a second mover advantage as – single-homing – users only enter platforms after both platforms have sequentially set their prices.

sellers as those are still contractually (and most likely exclusively) bound to existing shopping centers.

Stage 1 allows for discrimination between otherwise homogeneous sellers. All sellers have to pay the same price for their lease ($\bar{p}_s^1 = \beta_s$), but SC1 arbitrarily chooses to offer an exclusive contract with an associated transfer T to some sellers ($\hat{p}_s^1 = \beta_s - T$). The reservation price β_s is an immediate consequence of multi-homing by sellers in a competitive bottleneck setup and the assumption that SC2 cannot sign sellers exclusively.[10] The transfer T is determined by two strategic factors. The first factor is the share σ of exclusive sellers as it determines the demand pattern and the opportunity costs of signing the exclusivity agreement. The higher the share on exclusive sellers, the higher is the attractiveness of SC1 relative to SC2. This may increase (decrease) the number of buyers in SC1 (SC2) and hence decrease the opportunity costs of signing an exclusivity agreement with SC1 for any given rental price $p_s^2 < \beta_s$. The second factor is SC2s rental price p_s^2, as opportunity costs of signing the exclusivity agreement increase with lower lease prices p_s^2 in SC2.

Stage 2 does not require further comments.[11]

Stage 3 shows the equilibria of the game. As we will show below, SC1's dominant strategy is to sign as many exclusive sellers necessary to attract all customers within its catchment area. SC2 is not able to fight market entry, due to SC1's first mover advantage. So, SC2 is only willing to enter the market if there are at least some loyal

[10] We will relax this assumption below and discuss this case later on.
[11] We assume as a tie-breaking rule that sellers in case of indifference always accept offers by platforms. If they are indifferent between offers from the two platforms, they always accept the offer of SC1. This simplifies the analysis as we do not need to account for some marginal (ε) payments to make agents strictly better off.

buyers which cannot be reached by SC1. SC2 monetarizes this monopoly position by charging $p_s^2 = \beta_s$ from non-exclusive sellers. This leads to $T(\sigma, p_s^2) = 0$.

To solve for the equilibrium of the game, we first solve stage 3 by calculating the various effects a given share σ of exclusive sellers has. The effects on buyer and seller welfare determine the profitability of the exclusive contacts to be offered by SC1 at the earlier stage 1. Stage 3 also allows for the derivation of the equilibrium number of exclusively bound tenants σ^*.

4.1 Stage 3 – Analysis for a Given Number of Exclusive Sellers

Assuming a fraction of σ sellers who sign an exclusivity clause, buyers' utility in each shopping center is determined by the number of exclusive and non-exclusive sellers. SC1 provides buyers an exclusive access to σ sellers and a non-exclusive access to $(1-\sigma)$ sellers. Buyers in SC1 receive $u_b^1(x_b) = \sigma\, \beta_b + (1-\sigma)\, \beta_b - t_b x_b = \beta_b - t_b x_b$. SC2 only provides access to $(1-\sigma)$ non-exclusive sellers. Buyers who visit SC2 get a lower utility $u_b^2(x_b) = (1-\sigma)\, \beta_b - t_b(1-x_b)$ due to a lower variety of shops.

Utility on the buyer side also depends on the strength of competition between the shopping centers. If transport costs are relatively low, the number of attracted buyers is high if SC1 signs with a marginal seller. If transport costs are relatively high, a marginal exclusive seller only attracts a small number of buyers. We discuss the different competitive scenarios in turn.

Pure Competition

With 'pure competition' between shopping centers $\left(\frac{\beta_b}{t_b} > 1\right)$, the demand pattern on the buyer side is determined by the location of the indifferent buyer. We derive this location by setting the utility functions $u_b^1(x_b)$ and $u_b^2(x_b)$ equal and solving for x_b. The indifferent buyer x_b' splits consumers into two groups. Buyers to the left of x_b' prefer SC1 over SC2. Buyers to the right of x_b' prefer SC2 over SC1. The demand pattern reads as

$$n_b^1(\sigma) = x_b' = \begin{cases} \frac{1}{2} + \frac{\sigma\,\beta_b}{2\,t_b}, & for\ \sigma < \frac{t_b}{\beta_b} \\ 1 & for\ \sigma \geq \frac{t_b}{\beta_b} \end{cases},$$

$$n_b^2(\sigma) = 1 - x_b' = \begin{cases} \frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}, & for\ \sigma < \frac{t_b}{\beta_b} \\ 0 & for\ \sigma \geq \frac{t_b}{\beta_b} \end{cases}. \tag{1}$$

Equation 1 shows the effect of exclusivity clauses on the buyer side. Signing $\sigma < \frac{t_b}{\beta_b}$ sellers leads to $\frac{\sigma\,\beta_b}{2\,t_b}$ additional buyers in SC1 and a corresponding decrease of buyers in SC2. Signing $\sigma \geq \frac{t_b}{\beta_b}$ leads to full market coverage of SC1. SC2 is left with no buyers.

FIGURE 4: THE EFFECTS OF EXCLUSIVITY CLAUSES WITH PURE COMPETITON

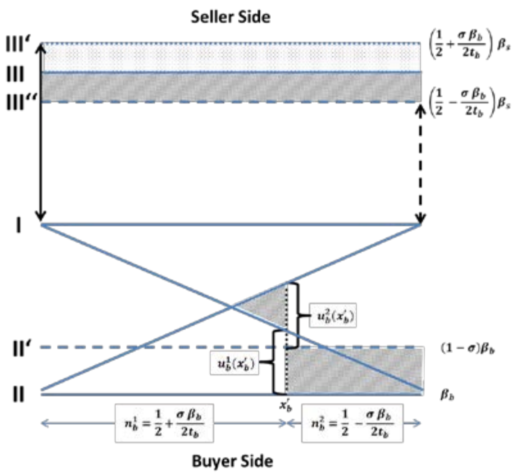


Figure 4 illustrates the effect for $\sigma < \frac{t_b}{\beta_b}$. Due to indirect network effects, the demand pattern of buyers affects the seller side. For any given $\sigma < \frac{t_b}{\beta_b}$, revenues are $R_S^1 = \left(\frac{1}{2} + \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$ in SC1. They increase by $\Delta R_S^1 = \left(\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$ compared to the initial scenario without exclusive dealing. In SC2, revenues are $R_S^2 = \left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$. They decrease by $\Delta R_S^2 = -\left(\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$ compared to the initial scenario. The redistribution of revenues is illustrated by the shift from **III** to **III'** and from **III** to **III'',** respectively.

On the buyer side, shopping experience differs between SC1 and SC2 because of variety of stores is lower in SC2 (**II'**) than in SC1 (**II**). Some buyers to the right of $x = \frac{1}{2}$ accept longer journeys to travel to the relatively more attractive SC1. In this asymmetric situation, the indifferent buyer x_b' receives a lower net utility compared to the scenario without exclusivity clauses. This is highlighted by the curly brackets.[12] Given $\sigma < \frac{t_b}{\beta_b}$, the shaded areas represent the loss of buyer surplus. The triangular area corresponds to a welfare loss $\left(\frac{\sigma^2 \beta_b^2}{4\, t_b}\right)$ of buyers who now incur higher travelling costs and have the same shopping experience as before. The rectangular area represents the welfare loss $\left(\frac{\beta_b \sigma}{2} - \frac{\beta_b^2\, \sigma^2}{2\, t_b}\right)$ of buyers that still prefer SC2. Although buyers incur the same travelling costs, they find a lower variety of shops in SC2. Given a number of $\sigma \geq \frac{t_b}{\beta_b}$ exclusive sellers, every buyer visits SC1. The aggregate travelling costs of those buyers who visited SC2 before increase by $\frac{1}{4}\ t_b$. The decrease in aggregate buyer welfare is

$$\Delta CS_b(\sigma) = \begin{cases} -\left(\frac{\beta_b \sigma}{2} - \frac{{\beta_b}^2 \sigma^2}{4\, t_b}\right) & , for\ \sigma < \frac{t_b}{\beta_b} \\ -\frac{1}{4}\, t_b & , for\ \sigma \geq \frac{t_b}{\beta_b} \end{cases}.$$

Between retail chains and shopping centers, rents are possibly redistributed. This is because SC1 has to compensate σ sellers for not having access to SC2. The compensation to a single retail chain is equal to the profit, an exclusive seller would make in SC2, i.e., $T = \left(\frac{1}{2} - \frac{\sigma\, \beta_b}{2\, t_b}\right) \beta_s - p_s^2$. The term $\left(\frac{1}{2} - \frac{\sigma\, \beta_b}{2\, t_b}\right) \beta_s$ represents potential revenues and p_s^2 denotes the lease price charged by SC2.

SC1's total transfers read as $\Delta CS_s^1 = \sigma \left[\left(\frac{1}{2} - \frac{\sigma\, \beta_b}{2\, t_b}\right) \beta_s - p_s^2\right]$. Revenue of sellers, and therefore also the lease price is equal to $R_s^1 = p_s^1 = \left(\frac{1}{2} + \frac{\sigma\, \beta_b}{2\, t_b}\right) \beta_s$ in SC1.

[12] The curly brackets capture the net utility/ utilities of the indifferent buyer.

The surplus of (non-exclusive) sellers operating a store in SC2 depends on p_s^2. For a given p_s^2, the aggregate surplus of nonexclusive sellers reads as $\Delta\, CS_s^2 = (1-\sigma)\left[\left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right]$.

Note that seller surplus will only be positive if $\sigma < \frac{t_b}{\beta_b}$ and $p_s^2 < \left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$. If the number of exclusive seller is weakly greater than $\frac{t_b}{\beta_b}$ there are no buyers left in SC2 and thus no revenues to compensate. In total, sellers benefit from exclusivity by

$$\Delta CS_s(\sigma) = \sum_{i=1}^{2} \Delta CS_s^i = \begin{cases} \left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\,, & \text{for } \sigma < \frac{t_b}{\beta_b} \\ 0\,, & \text{for } \sigma \geq \frac{t_b}{\beta_b} \end{cases}.$$

Contrary to sellers' profits, aggregate profits of shopping centers may decrease. For $\sigma < \frac{t_b}{\beta_b}$, SC1's profit is equal to

$$\pi_s^1(\sigma) = \left(\frac{1}{2} + \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - \sigma\left[\left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right],$$

with revenues $\left(\frac{1}{2} + \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s$ and transfers $\sigma\left[\left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right]$. SC2 earns $\pi_s^2(\sigma) = (1-\sigma)\,p_s^2$.

If SC1 signs $\sigma \geq \frac{t_b}{\beta_b}$ sellers, it is able to attract all buyers in the market. Revenues are limited to a maximum of β_s and the compensation is equal to 0.

If we compare the total profits in the scenario with and without exclusive dealing, exclusivity clauses decrease total profits by

$$\Delta\pi = \sum_{i=1}^{2} \Delta\pi^i =$$

$$\begin{cases} \left[\left(\frac{1}{2}+\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - \sigma\left[\left(\frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right] + (1-\sigma)p_s^2\right] - \beta_s\,, & for\ \sigma < \frac{t_b}{\beta_b} \\ 0 & ,\ for\ \sigma \geq \frac{t_b}{\beta_b} \end{cases}.$$

Adding up all effects, total welfare decreases by

$$\Delta W(\sigma) = \begin{cases} -\left(\sigma\left(\frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s + \left(\frac{\beta_b\sigma}{2}-\frac{{\beta_b}^2\sigma^2}{4\,t_b}\right)\right), & for\ \sigma < \frac{t_b}{\beta_b} \\ -\frac{1}{4}\,t_b & ,\ for\ \sigma \geq \frac{t_b}{\beta_b} \end{cases}.$$

For $\sigma < \frac{t_b}{\beta_b}$, the welfare decreases due to higher transport costs on the buyer side and (partial) single-homing sellers on the seller side. For $\geq \frac{t_b}{\beta_b}$, SC1 is a monopolist and welfare decreases arise in the form of higher transport costs.

Spatial Competition

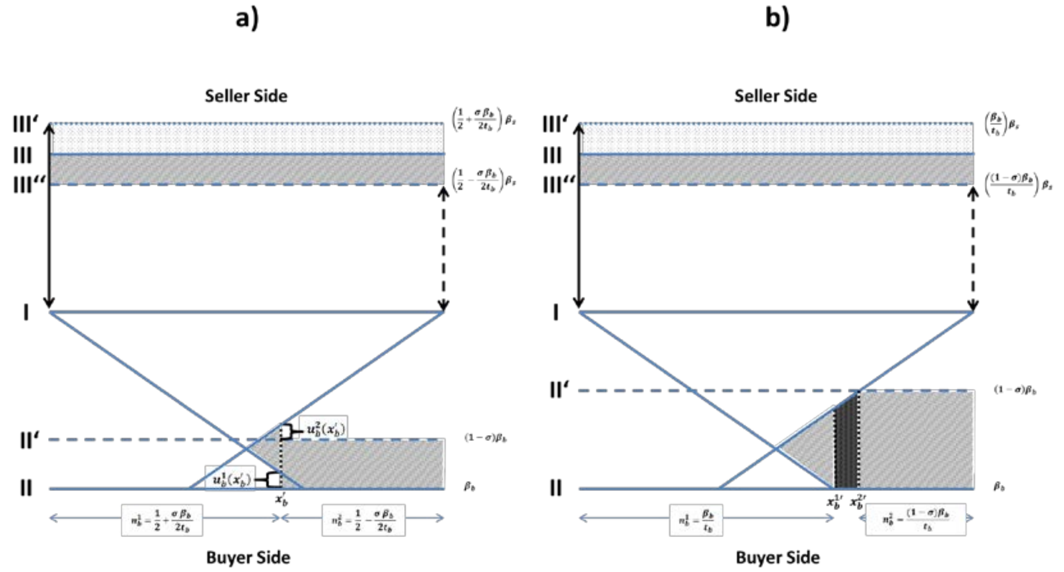
With 'spatial competition' between shopping centers $\left(1 \geq \frac{\beta_b}{t_b} > \frac{1}{2}\right)$, the demand pattern is given by

$$n_b^1 = x_b' = \begin{cases} \frac{1}{2}+\frac{\sigma\,\beta_b}{2\,t_b}\,, & for\ \sigma < 2-\frac{t_b}{\beta_b} \\ \frac{\beta_b}{t_b} & ,\ for\ \sigma \geq 2-\frac{t_b}{\beta_b} \end{cases},$$

$$n_b^2 = 1 - x_b' = \begin{cases} \frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\,, & for\ \sigma < 2-\frac{t_b}{\beta_b} \\ \frac{(1-\sigma)\beta_b}{t_b} & ,for\ \sigma \geq 2-\frac{t_b}{\beta_b} \end{cases}. \qquad (2)$$

Note that two possible market structures arise on the buyer side: A covered and a separated market, dependent on the number of exclusivity clauses. Exclusive deals signed with SC1 decrease the attraction of SC2's brand mix. The catchment area of SC2 shrinks. If there is 'spatial competition' in the initial market and the decrease of SC2's catchment area is significant, competition may turn from 'spatial competition' to 'separated markets' as illustrated in Figures 5a) and 5b).

FIGURE 5: THE EFFECTS OF EXCLUSIVITY CLAUSES WITH SPATIAL COMPETITON



The critical share of exclusivity clauses that turns the buyer market from covered into separated is given by $\sigma_{critical} = 2 - \frac{t_b}{\beta_b}$. $\sigma_{critical}$ is the necessary amount of exclusive sellers that SC1 must sign in order attract all buyers in its potential catchment area. We calculated $\sigma_{critical}$ by setting the n_b^1 equal to $\frac{\beta_b}{t_b}$ and solving for σ.

If $\sigma < 2 - \frac{t_b}{\beta_b}$ (Figure 5a)) the economic effects are equivalent to the ones derived in the analysis of the previous subsection. If $\sigma \geq 2 - \frac{t_b}{\beta_b}$ (Figure 5b)), there are again effects on variety of shops and transport costs plus an effect on market coverage. Some shoppers $\left(\frac{\beta_b}{t_b} - \frac{1}{2}\right)$ are willing to accept a longer journey and travel to SC1 that is relatively more attractive. A number of $(1-\sigma)\frac{\beta_b}{t_b}$ buyers lose surplus due to a lower variety of shops in SC2 and $1-(\sigma-2)\frac{\beta_b}{t_b}$ potential buyers decide to not visit any of the shopping centers. The triangular area $\int_{\frac{1}{2}}^{\frac{\beta_b}{t_b}}(t_b - t_b x_b) - t_b x_b \, d\, x_b = \frac{(t_b - 2\beta_b)^2}{4t_b}$ captures the decrease in welfare due to the increase of transport costs incurred by visitors of SC1. The rectangular area $\int_0^{\frac{(1-\sigma)\beta_b}{t_b}} \beta_b - (1-\sigma)\beta_b \, d\, x_b = \frac{{\beta_b}^2\,\sigma\,(1-\sigma)}{t_b}$ captures the welfare loss due to a lower variety of shops in SC2. The welfare loss of buyers that do not visit any shopping center reads as $\int_{\frac{\beta_b}{t_b}}^{1-\frac{(1-\sigma)\beta_b}{t_b}} \beta_b - (t_b - t_b x_b)\, d\, x_b = \frac{{\beta_b}^2\sigma^2 - (t_b - 2\beta_b)^2}{2\,t_b}$. In total, buyers lose

$$\Delta CS_b(\sigma) = \begin{cases} -\left(\frac{(t_b-2\beta_b)^2}{4t_b} + \frac{{\beta_b}^2\,\sigma\,(1-\sigma)}{t_b} + \frac{{\beta_b}^2\sigma^2-(t_b-2\beta_b)^2}{2\,t_b}\right) & ,\text{for } \sigma > 2 - \frac{t_b}{\beta_b} \\ -\left(\frac{\beta_b\sigma}{2} - \frac{{\beta_b}^2\sigma^2}{4\,t_b}\right) & ,\text{for } \sigma \leq 2 - \frac{t_b}{\beta_b} \end{cases}.$$

Total surplus of sellers is again determined by the transfer that SC1 pays to sellers who sign exclusivity contracts $CS_s^1 = \sigma\left[\frac{(1-\sigma)\beta_b}{t_b}\beta_s - p_s^2\right]$ and the surplus

$(1-\sigma)\left[\frac{(1-\sigma)\beta_b}{t_b}\beta_s - p_s^2\right]$ sellers in SC2 receive from a possible decrease in lease prices p_s^2. In total, sellers may win

$$\Delta CS_s(\sigma) = \begin{cases} (1-\sigma)\frac{\beta_b}{t_b}\beta_s - p_s^2 & ,for\ \sigma > 2-\frac{t_b}{\beta_b} \\ \left(\frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2 & ,for\ \sigma \leq 2-\frac{t_b}{\beta_b} \end{cases}.$$

SC1 makes profits equal to $\pi^1 = \frac{\beta_b}{t_b}\beta_s - \sigma\left[\frac{(1-\sigma)\beta_b}{t_b}\beta_s - p_s^2\right]$ determined by revenues $R^1 = p_s^1 = \frac{\beta_b}{t_b}\beta_s$ and transfers $T = \sigma\left[\frac{(1-\sigma)\beta_b}{t_b}\beta_s - p_s^2\right]$. SC2 earns $\pi^2 = (1-\sigma)\,p_s^2$. If we compare total profits in the scenario with and without exclusive dealing, exclusivity clauses decrease total profits by

$$\Delta\pi(\sigma) = \begin{cases} \left[\frac{\beta_b}{t_b}\beta_s - \sigma\left[\frac{(1-\sigma)\beta_b}{t_b}\beta_s - p_s^2\right] + (1-\sigma)p_s^2\right] - \beta_s & ,for\ \sigma > 2-\frac{t_b}{\beta_b} \\ \left[\left(\frac{1}{2}+\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - \sigma\left[\left(\frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right] + (1-\sigma)p_s^2\right] - \beta_s & ,for\ \sigma \leq 2-\frac{t_b}{\beta_b} \end{cases}.$$

Summing up buyer surplus $\Delta CS_b(\sigma)$, seller surplus $\Delta CS_b(\sigma)$ and total profits $\Delta\pi(\sigma)$, the effect on social welfare reads as

$$W(\sigma) = \begin{cases} \frac{t_b}{4} - 2\,\beta_b + \frac{\beta_b}{t_b}(\,(1-\sigma\,)p_s^2 + (1-\sigma)\,\beta_b + \beta_s + \,\beta_b\,\sigma^2) & ,for\ \sigma > 2-\frac{t_b}{\beta_b} \\ -\left(.\,\sigma\left(\frac{1}{2}-\frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s + \left(\frac{\beta_b\sigma}{2}-\frac{{\beta_b}^2\sigma^2}{4\,t_b}\right)\right) & ,for\ \sigma \leq 2-\frac{t_b}{\beta_b} \end{cases}.$$

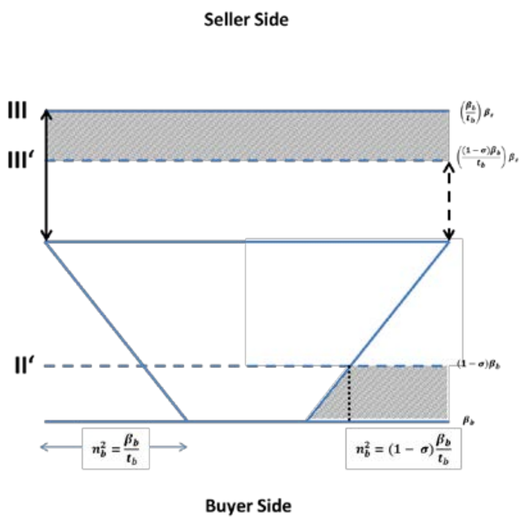
Separated Markets

With ‘separated markets’, the demand pattern is given by

$$
\begin{aligned}
n_b^1(\sigma) = x_b' &= \begin{cases} \dfrac{\beta_b}{t_b}, & for\ \sigma\ <\ 1 - \dfrac{t_b}{\beta_b} \\ \dfrac{\beta_b}{t_b}, & for\ \sigma\ \geq\ 1 - \dfrac{t_b}{\beta_b} \end{cases} \\
n_b^2(\sigma) = 1 - x_b' &= \begin{cases} \dfrac{(1-\sigma)\beta_b}{t_b}, & for\ \sigma\ <\ 1 - \dfrac{t_b}{\beta_b} \\ 0 & ,\ for\ \sigma\ \geq\ 1 - \dfrac{t_b}{\beta_b} \end{cases}
\end{aligned}
\tag{3}
$$

As is obvious from the illustration of the economic effects in Figure 6, SC1 would not gain any additional buyers and therefore no higher revenue. It therefore does not have incentive to introduce exclusivity clauses. We will not further discuss the details of the case here.

FIGURE 6: THE EFFECTS OF EXCLUSIVITY CLAUSES WITH SEPARATED MARKETS



4.2 Stage 1 – Incentives to Introduce Exclusivity Clauses

Up to this point, we have discussed how exclusive dealing affects demand, profits, and welfare for a given number of exclusive sellers. We now discuss SC1's incentive to introduce exclusivity clauses. Note that SC2's stage 2 decision of whether to enter is straightforward, given the competitive scenario as well as SC1's stage 1 decision.

We assume that SC1 introduces exclusivity clauses to retail chains by simultaneous offers. Its decision of how many exclusive sellers to sign, is based on a trade-off. On one side, exclusive deals may increase the attraction to buyers. Tenants generate higher revenues that can be skimmed off by a premium in lease prices. On the other side, SC1 must compensate the retail chains for signing exclusivity clauses as they give up their access to a competing shopping center. Again we discuss the different competition scenarios in turn.

Pure Competition

In the scenario of 'pure competition' ($\frac{\beta_b}{t_b} \geq 1$), SC1 earns a premium in lease prices equal to $\Delta p_s^1(\sigma) = \frac{\sigma\, \beta_b}{2\, t_b} \beta_s$ and has to pay aggregate transfers $\Delta\, CS_s^1 = \sigma \left[\left(\frac{1}{2} - \frac{\sigma\, \beta_b}{2\, t_b} \right) \beta_s - p_s^2 \right]$. Note that SC2 increases SC1's transfers if it lowers its lease price p_s^2. Due to pure competition, shopping center 1 may steal all buyers from shopping center 2 if it introduces exclusivity agreements. Thus, let us suppose that shopping center 2 fights and charges $p_s^2 = 0$. Given $p_s^2 = 0$, SC1's profit gain reads as

$$\Delta\pi^1(\sigma) = \Delta p_s^1(\sigma) - \sigma T(\sigma) = \frac{\sigma\, \beta_b}{2\, t_b} \beta_s - \sigma \left[\left(\frac{1}{2} - \frac{\sigma\, \beta_b}{2\, t_b} \right) \beta_s \right]. \tag{4}$$

For $t_b > 0$, $\beta_s \geq 0$, and $\beta_b \geq 0$, the profit gain (4) is weakly positive if SC1 is able to sign exclusive agreements with $\sigma \geq \frac{t_b}{\beta_b} - 1$ sellers. As $\frac{t_b}{\beta_b}$ is always equal or smaller than 1 in the scenario of 'pure competition', it is always beneficial to introduce exclusivity. See further, that the profit gain function is convex in σ $\left(\frac{\partial^2 \Delta\pi^1}{(\partial\sigma)^2} = \frac{\beta_b\beta_s}{t_b} > 0\right)$ for $\sigma < \frac{t_b}{\beta_b}$. If SC1 signs with $\sigma = \frac{t_b}{\beta_b}$ sellers, it covers the whole market $(n_b^1 = 1)$ on buyer side and maximizes lease prices. Opportunity costs of signing are 0 and so are the transfer $T(\sigma)$, as no buyers visit SC2. Any additional exclusive contract has neither an effect on transfers nor on the premium in lease prices as there is no quantity effect on the buyer side. Thus, SC1 maximizes profits if it signs with $\sigma \epsilon \left[\frac{t_b}{\beta_b}, 1\right]$ exclusive sellers. Signing $\sigma \epsilon \left[\frac{t_b}{\beta_b}, 1\right]$ tenants would squeeze out SC2 or, according to our assumptions, deters SC2 from entering the market.

We summarize these results in

Proposition **1***: In the scenario of pure competition, SC1 signs $\sigma \epsilon \left[\frac{t_b}{\beta_b}, 1\right]$ exclusive sellers and forecloses the market. Foreclosure is costless.*

In equilibrium, welfare is given by $W\left(\sigma \epsilon \left[\frac{t_b}{\beta_b}, 1\right]\right) = \beta_b - \frac{t_b}{2} + \beta_s$. It decreases by $\Delta W\left(\sigma \epsilon \left[\frac{t_b}{\beta_b}, 1\right]\right) = -\frac{1}{4}t$ compared to a scenario without exclusivity. SC1 achieves a monopoly position and steals all profits from SC2 ($\Delta\pi^1 = \frac{1}{2}\beta_s$, $\Delta\pi^2 = -\frac{1}{2}\beta_s$). Sellers still get no surplus $(\Delta CS_s = 0)$. Buyers who have visited SC2 in the scenario without exclusivity lose $\Delta CS_b^2 = -\frac{1}{4}t$ as they incur higher transport costs when travelling to SC1. Summarizing we obtain

Proposition **2***: Exclusivity and total market foreclosure decreases total welfare. The welfare decrease is equal to the higher transport costs of buyers switching from SC2 to SC1. Profits are redistributed from SC2 to SC1.*

Our results show that the logic of exclusion facilitated by scale economies as derived by Rasmusen et al. (1991), Segal and Whinston (2000) also extend to the demand-side network effects present in our framework. Different from the otherwise comparable results by Doganoglu and Wright (2010) the entrant is not more efficient and the efficient configuration is not one with just one active firm, but it is one with two active firms and more choice for consumers. We will comment on the differences in the allocation of the surplus among the three groups below in Subsection 4.3. They are important for the problem of how to deal with market delineation in this case. Next we turn to 'strong' product differentiation and will show that foreclosure as only partial in such a scenario.

Spatial competition

As shown above in Section 4.1 'spatial competition' ($1 \geq \frac{\beta_b}{t_b} > \frac{1}{2}$), two cases are to be distinguished depending on the number of exclusive sellers σ signed by SC1. If SC1 signs with $\sigma \leq 2 - \frac{t_b}{\beta_b}$ exclusive sellers, the market is covered. If SC1 signs with $\sigma > 2 - \frac{t_b}{\beta_b}$ sellers, some buyers are not willing to go shopping in either SC1 or SC2. It is straightforward to see that SC1 would never sign with more than $\sigma > 2 - \frac{t_b}{\beta_b}$ exclusive sellers as this strategy would not attract additional exclusive sellers, but increases transfers. So, the following analyzes only covered markets.

SC1's profit gain with a covered market is again determined by a premium in lease prices $\Delta p_s^1(\sigma) = \frac{\sigma\,\beta_b}{2\,t_b}\beta_s$ and transfers $T(\sigma) = \left[\left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - p_s^2\right]$ paid to each of the σ sellers signing an exclusivity agreement. Contrary to the 'pure competition' scenario, SC2 may charge a fighting price $p_s^{2,c}$ greater than 0. This is due to the positive profit it makes if it serves its loyal buyer segment $1 - \frac{\beta_b}{t_b}$ with the remaining $1 - \sigma$ non-exclusive sellers. The respective profit $\pi^2_{not\ fight}$ is

$$\pi^2_{not\ fight} = (1-\sigma)\left(1 - \frac{\beta_b}{t_b}\right)\beta_s.$$

It derives from the lease price $\left(1 - \frac{\beta_b}{t_b}\right)\beta_s$ paid by the remaining $(1-\sigma)$ sellers. The fighting price $p_s^{2,c}$ then derives from the constraint that π^2_{fight}, the profit when fighting for all sellers ($n_s^2 = 1$), is at least as much as $\pi^2_{not\ fight}$

$$\pi^2_{fight} = n_s^2 * p_s^{2,c} \geq \pi^2_{not\ fight} = (1-\sigma)\left(1 - \frac{\beta_b}{t_b}\right)\beta_s.$$

Therefore, the lowest fighting price SC2 might offer at stage 0 is

$$p_s^{2,c} = (1-\sigma)\left(1 - \frac{\beta_b}{t_b}\right)\beta_s.$$

It is now straightforward to derive the equilibrium number of exclusive sellers signed by SC1 as well as the market shares of the two shopping centers.

Proposition **3:** *SC1 signs* $\sigma = 2 - \frac{t_b}{\beta_b}$ *exclusive sellers and serves its whole catchment area* $\frac{\beta_b}{t_b}$*. SC2 does not fight. It serves its loyal buyers and charges the reservation price to the* $(1-\sigma)$ *non-exclusive sellers active on its platform. SC1's transfers to exclusive sellers are* 0.

Proof: We already argued above that SC1 does not have an incentive to sign more than $\sigma = 2 - \frac{t_b}{\beta_b}$ sellers. We show now that it also wants to sign no less than this number. To see this note that for the above derived lower bound on $p_s^{2,c}$, SC1's profit gain reads as

$$\Delta\pi^1(\sigma) = \Delta p_s^1(\sigma) - \sigma T(\sigma) =$$

$$= \frac{\sigma\,\beta_b}{2\,t_b}\beta_s - \sigma\left[\left(\frac{1}{2} - \frac{\sigma\,\beta_b}{2\,t_b}\right)\beta_s - (1-\sigma)\left(1 - \frac{\beta_b}{t_b}\right)\beta_s\right] =$$

$$= \frac{\sigma\,\beta_s}{2\,t_b}\big(t_b - \beta_b + \sigma(3\beta_b - 2t_b)\big)$$

Note that the profit gain is (weakly) positive for all $\sigma \in [0,1]$. This follows from the condition defining the scenario of 'spatial competition' ($1 \geq \frac{\beta_b}{t_b} > \frac{1}{2}$). Evaluating $\Delta\pi^1$ at the boundaries $\sigma = 0$ and $\sigma = 1$, respectively, the sign of $\Delta\pi^1$ is determined by $t_b - \beta_b$ and $2\beta_b - t_b$, respectively. Both expressions are (weakly) positive under spatial competition.

Note further that the derivative of the profit gain, $d\Delta\pi^1/d\sigma$ with respect to σ can be simplified to read

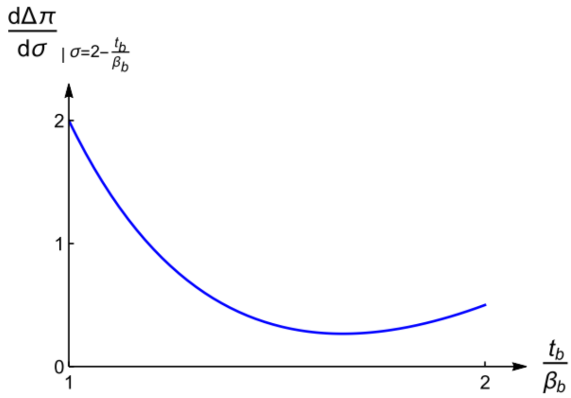
$$\frac{d\Delta\pi^1}{d\sigma} = \frac{(t_b - \beta_b)\beta_s}{2t_b} + \sigma(\frac{3\beta_b}{t_b} - 2)\beta_s.$$

This expression (as well as the second order condition) is strictly positive for all σ if $\frac{\beta_b}{t_b} > 2/3$. As the profit gain strictly increases with σ, SC1 will always choose the upper bound $\sigma = 2 - \frac{t_b}{\beta_b}$ in this case. While it is straightforward to solve the derivative for σ, the respective value is always above upper bound as can be seen from evaluating the derivative at the upper bound. One obtains

$$\left.\frac{d\Delta\pi^1}{d\sigma}\right|_{\sigma=2-\frac{t_b}{\beta_b}} = (\frac{1}{2}(-13 + \frac{4t_b}{\beta_b} + \frac{11\beta_b}{t_b})\beta_s).$$

This expression is always positive as can be seen from the Figure 7 which depicts $\left(-13 + \frac{4t_b}{\beta_b} + \frac{11\beta_b}{t_b}\right)$. Therefore we have established that SC1 will always choose the upper bound $\sigma = 2 - \frac{t_b}{\beta_b}$. Its customer base is equal to $\frac{\beta_b}{t_b}$, i.e., all buyers in its catchment area. SC2 serves only its loyal customers and, rather than fighting, charges the reservation price. The resulting profit for sellers is zero as is the transfer SC1 needs to pay. This concludes the proof.

FIGURE 7 Derivative of the profit gain w.r.t to σ evaluated at σ's upper bound of



The effects on the welfare of the agents as well as on profits are as follows. While sellers, both exclusive and non-exclusive ones are still left with no surplus $CS_s^1 = CS_s^2 = 0$, aggregate buyer utility decreases. They lose $\Delta CS_b = -2\,\beta_b + \frac{\beta_b}{t_b} - \frac{3}{4}t_b$ due to higher transport costs and lower variety of shops in SC2. SC1 increases its profits by $\Delta\pi^1 = \left(\frac{\beta_b}{t_b} - \frac{1}{2}\right)\beta_s$ due to attracting $\frac{\beta_b}{t_b} - \frac{1}{2}$ additional buyers. SC2 loses $\Delta\pi^2 = (\frac{\beta_b}{t_b} - \frac{1}{2})\beta_s - (2 - \frac{t_b}{\beta_b})\beta_s$. Total profits decrease by $\Delta\pi = -\left(2 - \frac{t_b}{\beta_b}\right)\beta_s + 2\left(\frac{\beta_b}{t_b} - \frac{1}{2}\right)\beta_s$ due to $2 - \frac{t_b}{\beta_b}$ exclusive sellers that multihomed in a world without exclusivity. The following proposition summarizes these results:

Proposition **4:** *Exclusivity and partial market foreclosure lead to a decrease in total welfare under spatial competition. While all buyers are served, both aggregate platform profits as well as buyer welfare decreases as a result of lower seller variety in $SC2$ and, in the case of buyers, increased transport costs.*

The above results show that the sequential framework allows for a straightforward analysis of exclusivity even under strong product differentiation.[13] In our setup strong relates to the fact that the platform's catchment area does not cover the whole market. Our results show that the platform, which signs exclusive sellers, does only partially foreclose the respective market side. In particular for the examples mentioned by Armstrong and Wright (2007) such as 'retailers in shopping malls, content providers for cable TV platforms' (p. 373) our setup with all buyers leaving a platform if all sellers leave it, might seem more appropriate than the case discussed in Armstrong and Wright (2007). Similarly the ability to abstract surplus from the buyer side might be limited as it is in our model due to the possibility of buying not at all. Therefore, while we establish that platforms, at least in a sequential setup, implement exclusivity, they do not corner one side of the market in the case of strong product differentiation. It remains to be shown whether this also holds if the follower platform is also able to make exclusive offers. We turn to this case in the next subsection.

4.3 Both shopping centers can offer exclusivity clauses

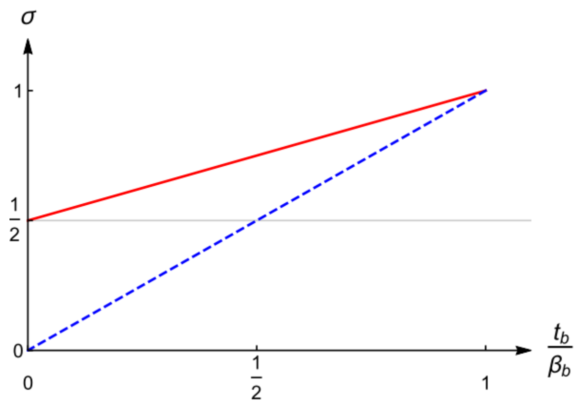
Up until now we did not account for the possibility that SC2 might offer exclusivity clauses to the non-exclusive sellers it signs. This might potentially increase demand for its platforms from the buyer side by reducing the variety of shops available at the other platform. We briefly examine this case in this subsection. To do this we slightly change the setup of the game by assuming that non-exclusive sellers only sign contracts in stage 3 rather than in stage 1.

[13] Note that we use the term 'strong' here in a different way than Armstrong and Wright (2007), who equate strong product differentiation with a case, in which a platform still finds buyers even though no sellers are active on the platform.

It is straightforward to show that this change does not lead to a different equilibrium outcome in the case of spatial competition. To see this note that in this case exclusive contracts between SC2 and sellers not exclusive to SC1 would not increase demand for SC2 but rather lead some buyers who would otherwise visit SC1 attending no shopping center at all. We would end up in a situation analogue to the one in the right panel of Figure 5 (Figure 5.b)) with a black region to the left of the catchment area of SC1. Given that signing those sellers would (weakly) reduce profits of SC2, the equilibrium derived in the previous section still holds under the assumption that SC2 can also offer exclusive contracts.

The situation concerning the incentive for SC2 to sign exclusive sellers is different in the case of 'pure competition'. If SC1 were to sign exclusive contracts with a share of sellers equal to $\frac{t_b}{\beta_b}$, the lower bound for σ determined in *Proposition* **1**, signing exclusive contracts would lead to positive buyer demand for SC2. While it is obvious from *Proposition* **1** that SC1 can always (costless) sign a sufficient number of sellers to still foreclose the market, it is interesting to see how the minimum share of sellers to achieve this changes. The following diagram shows how this lower bound increases if one assumes that SC2 would sign all sellers exclusively, which are not exclusively bound to SC1. The solid line, depicting the new lower bound is always above the 50% of sellers and is strictly above the lower bound in the case, in which SC2 cannot make exclusive offers (the dashed line). Only in the boundary case of high transport costs, in which the catchment area is equal to 1, both lines coincide.

FIGURE 8 Share of exclusive shops necessary to foreclose SC2 (if SC2 can offer exclusive contracts or not)



While the extension considered in this subsection need not lead to changes in the observed equilibrium, it might well have an effect in an environment, in which antitrust authorities put limits on the maximum share of contracts and sales, respectively, which can be tied exclusively by firms. Such limits exist at least implicitly in both the US and the EU.[14]

Further note that results in our sequential setup drastically differ from Armstrong and Wright (2007) in terms of the allocation of the surplus. While Armstrong and Wright also feature a single active platform, when platforms can offer exclusive contracts, sellers receive all surplus and platforms make zero profits. In our setup, the incumbent shopping center can foreclose the market costlessly and attract all surplus from the seller side. This also differs from the Doganoglu and Wright (2010), where complete foreclosure also arises but where sellers receive part of the surplus. This difference has important consequences for legal practice as it implies that using a hypothetical monopolist test to determine the relevant market inevitably suffers from the cellophane fallacy. We will discuss this point further in the concluding section.

[14] E.g. see https://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/single-firm-conduct/exclusive-supply-or or the EC's Guide on Vertical Restraints.

5 Discussion and Conclusion

Our article analyzes the impact of exclusionary conduct by platforms in two-sided markets. While our approach employs the standard Hotelling framework with spatially differentiated platforms, our interpretation focusses on the effect of radius clauses on competition between shopping centers and on social welfare. The shopping center market is determined by competitive bottlenecks, i.e., each (stand-alone) shopping center provides sellers with exclusive access to their visitors. In this competitive bottleneck situation, sellers are skimmed off and buyers are subsidized. We show that a first mover is able to increase profits by engaging in exclusionary conduct on the seller side if there is competition between shopping centers. Exclusive dealing is always detrimental to social welfare as the harm to the second mover and to buyers is greater than the first mover’s increase in surplus.

According to, for instance, EU block exemption rules certain business practices, in particular certain types of vertical restraints such as radius restrictions are only subject to antitrust scrutiny if the firm in question has a market share beyond a certain threshold. The question of market definition is therefore an important one and has been decisive in several cases. There is considerable discussion on how to apply standard methods such as the SSNIP test in order to arrive at an appropriate delineation in two-sided markets. Our results also contribute to this discussion for two-sided markets in which one-stop shopping and competitive bottlenecks matter, such as is the case for business models like factory outlet centers and other stand-alone shopping centers. From the fact that sellers have to pay a lease price equal to their reservation price it immediately follows that a SSNIP test applied to the seller side suffers from the cellophane fallacy. This will lead to too wide a market definition, underestimating the importance of the vertical constraint. Our analysis offers clear cut conclusions on the effects of the restrictions on consumer welfare and competition. Even though our static model does not account for possible efficiencies due to investments or for the possibility that the number of sellers might not be fixed, we are confident that our results apply to many of the actual cases involving radius restrictions. In these cases the vertical restraints typically not only apply in the initial contracts between platforms and outlets but also once they are extended after the initial lease, often capturing a ten-year or more period, expires. The given number of sellers does not seem to be an unrealistic assumption, taken into account that many retail segments, such as for instance drug stores are dominated by a small number of national chains. Given that often a high share of exclusively tied sellers appears to be necessary for foreclosure, it seems that recent steps by antitrust authorities to limit the spell of the exclusive contracts as well as the share of tenants, which is allowed to be tied, is not a bad policy after all.

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