

Gu, Yiquan; Rasch, Alexander; Wenzel, Tobias

Working Paper

Price-sensitive demand and market entry

DICE Discussion Paper, No. 165

Provided in Cooperation with:

Düsseldorf Institute for Competition Economics (DICE), Heinrich Heine University Düsseldorf

Suggested Citation: Gu, Yiquan; Rasch, Alexander; Wenzel, Tobias (2014) : Price-sensitive demand and market entry, DICE Discussion Paper, No. 165, ISBN 978-3-86304-164-9, Heinrich Heine University Düsseldorf, Düsseldorf Institute for Competition Economics (DICE), Düsseldorf

This Version is available at:

<https://hdl.handle.net/10419/103374>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

DISCUSSION PAPER

No 165

Price-sensitive Demand and Market Entry

Yiquan Gu,
Alexander Rasch,
Tobias Wenzel

November 2014

IMPRINT

DICE DISCUSSION PAPER

Published by

düsseldorf university press (dup) on behalf of
Heinrich-Heine-Universität Düsseldorf, Faculty of Economics,
Düsseldorf Institute for Competition Economics (DICE), Universitätsstraße 1,
40225 Düsseldorf, Germany
www.dice.hhu.de

Editor:

Prof. Dr. Hans-Theo Normann
Düsseldorf Institute for Competition Economics (DICE)
Phone: +49(0) 211-81-15125, e-mail: normann@dice.hhu.de

DICE DISCUSSION PAPER

All rights reserved. Düsseldorf, Germany, 2014

ISSN 2190-9938 (online) – ISBN 978-3-86304-164-9

The working papers published in the Series constitute work in progress circulated to stimulate discussion and critical comments. Views expressed represent exclusively the authors' own opinions and do not necessarily reflect those of the editor.

Price-sensitive Demand and Market Entry*

Yiquan Gu^{1,†}

Alexander Rasch^{2,‡}

Tobias Wenzel^{2,§}

¹University of Liverpool

²Duesseldorf Institute for Competition Economics (DICE), University of Duesseldorf

November 2014

Abstract

This paper revisits the optimal entry decision in a differentiated product market where customer demand is price-sensitive and depends on a per-unit transport cost. We show that too few firms may enter for high entry cost and high transport cost compared to the socially optimal outcome.

JEL classification: L11; L13.

Keywords: Circular city; Horizontal product differentiation; Market entry; Price-sensitive demand.

1 Introduction

Spatial models of horizontal product differentiation, such as Hotelling (1929) or Salop (1979), have become workhorse models in regional science, spatial economics as well as in industrial organization. Given this popularity,

*We would like to thank two anonymous referees and Philippe Gillen for their very helpful comments and suggestions.

[†]Email: yiquan.gu@liv.ac.uk. Address: University of Liverpool, Management School, Chatham Street, Liverpool, L69 7ZH, United Kingdom.

[‡]Email: rasch@dice.hhu.de. Address: Duesseldorf Institute for Competition Economics (DICE), University of Duesseldorf, Universitaetsstrasse 1, 40225 Duesseldorf, Germany.

[§]Email: wenzel@dice.hhu.de. Address: Duesseldorf Institute for Competition Economics (DICE), Universitaet Duesseldorf, Universitaetsstrasse 1, 40225 Duesseldorf, Germany.

spatial models have been applied to a wide variety of applications, and numerous variants of such models have been studied.¹

In this context, an important question is whether free entry leads to the optimal level of product variety. In spatial models of product differentiation, such as Vickrey (1964) and Salop (1979), a well-known result is the so-called excess entry result suggesting that the equilibrium level of entry exceeds the socially optimal level.²

Recently, a number of contributions have challenged this view. In their article, Matsumura and Okamura (2006b) analyze a spatial model of product differentiation under various assumptions on transport costs and production cost functions. They show that, although there is excessive entry under many circumstances, an insufficient level of product variety can also arise. Matsumura (2000) shows that insufficient entry can arise if the integer problem is taken into account. Moreover, Gu and Wenzel (2009, 2012) show that the excess entry result may not hold in a framework where customer demand is price-sensitive and transport costs come as a fixed cost to customers, independent of the quantity that is purchased.³ Finally, delivered-price competition is considered in Matsumura and Okamura (2006a) in a setting with a linear demand function. They find that entry can be insufficient when the entry cost is large.

As van der Weijde et al. (2014) point out, one limitation in these contributions is that, although the distance between customers and the product they buy brings about disutility, the quantity a customer demands is independent of the transport costs. In many applications, however, customer demand depends naturally on both the selling price and the degree of matching between the customer and the product. For example, consider two products A and B . For the same price, if product A is a better substitute

¹For instance, studies have focused on the structure of transport costs and customer distribution (e.g., Shilony, 1981; Matsumura and Okamura, 2006b), the introduction of search costs (Braid, 2014), delivered pricing models (Hamilton et al., 1989; Colombo, 2014), or multi-product competition (Janssen et al., 2005). A recent overview is provided by Biscaia and Mota (2013).

²This is different from representative customer and discrete choice models. There, it is understood that equilibrium product variety could either be excessive, insufficient, or optimal depending on the model configuration (see, e.g., Dixit and Stiglitz, 1977; Sattinger, 1984). For an overview, see Anderson et al. (1992).

³Note that in the original setup and in many applications, it is assumed that each customer demands one unit of a differentiated product, independent of the price.

to a customer's ideal product than product B , not only does this customer choose A over B ; she may also buy more of product A compared to having to purchase the more distant product B .

To address this limitation, we revisit the question of free and optimal entry in a setting where customer demand is price-sensitive and where, in contrast to previous contributions, transport costs to customers are on a per-unit basis. This means that customers have to incur a transport cost (disutility costs) for each unit they purchase. As such, our setup can thus be interpreted in two ways. First, it may represent product differentiation along a taste dimension where a transport cost per unit representing the mismatch of product characteristic and a customer's preference is a suitable assumption. Second, it may reflect a situation where a customer incurs actual transportation costs per unit shipped (geographical interpretation), i.e., shipping a greater number of items results in an increase in the shipping costs.⁴

We use a model of product differentiation with price-sensitive demand and a per-unit transport cost. For tractability we focus on a linear demand function. In this setting, we characterize the price equilibrium and the level of entry in a free-entry equilibrium. We provide a comparison of equilibrium entry and the socially optimal level of entry. Our main finding is that for a high market entry cost, entry need not be excessive but can be insufficient. More precisely, we show that entry is insufficient if the transport cost per unit is high as in precisely those cases customers would strongly benefit from more entry. At the same time, however, firms' incentives to enter are low due to low profits.

It is instructive to compare the results of this paper with models where the transport costs come as a fixed cost (Gu and Wenzel, 2012).⁵ In both approaches, insufficient entry occurs for sufficiently high transport costs, but for different reasons. With fixed transport costs, the reason for insufficient product variety comes mainly from the customer side as with high transport

⁴This is different from another geographical view which is not covered here. For instance, regarding spatial competition among supermarkets or fast-food restaurants with an identical product range on offer, fixed transport costs covering the actual transportation (the cost of driving to a supermarket/restaurant) is a reasonable modeling assumption.

⁵Note, however, that the magnitude and parameter values across the two models are not directly comparable since the two approaches are not nested.

costs, prices are high and demand is low so that customers would benefit a lot from more entry and the associated lower prices. The incentives to enter, though, are still relatively strong as firm profits increase with the level of transport costs. The effects are different with per-unit transport costs. Here, changes in the transport-cost parameter or changes in the number of firms directly affect customer demand and hence welfare (whereas these parameters affect customer demand only indirectly through the price in Gu and Wenzel, 2012). As a consequence, high transport costs lead to low firm profits (due to low local demand) and low incentives to enter the market. At the same time, welfare strongly increases with entry as local demand rises. Taken together, we show that these two effects can lead to insufficient entry if the transport cost is high enough.

The novelty of the paper is to analyze equilibrium entry in a setting with price-sensitive demand and a per-unit transport cost. As such, it may contribute to the growing literature on price-sensitive demand in models of horizontal product differentiation⁶ and help to better understand how robust the results are when the impact of the transport costs on customer utility is changed.

2 Model

There are $n \geq 2$ price-setting firms which are equidistant from each other along the circular city of unit length, i.e., the distance between any two neighboring firms is equal to $1/n$ (Salop, 1979). Their marginal costs of production are normalized to zero.

Customers of mass one are uniformly distributed along the circle. All customers buy from one of the firms in the market (see *Assumption 1* below). Let q denote the quantity a customer demands at a given price and location. A customer who is located at x and who buys from firm i at location L_i

⁶Recent analyses which explore the impact of price-sensitive demand on market outcomes while employing either a per-unit or a fixed transport cost approach are Colombo (2011) (on the effects of spatial price discrimination), Rasch and Herre (2013) (on the stability of collusion), and Esteves and Reggiani (2014) (on the effects of behavior-based pricing). van der Weijde et al. (2014) analyze the scheduling decisions of competing transport providers when customers' demand depends on timing.

(with $i \in \{1, \dots, n\}$) derives the following utility

$$U(x, p_i) = q - \frac{q^2}{2} - q(p_i + \tau|L_i - x|), \quad (1)$$

where τ is the transport-cost parameter and p_i denotes the price charged by firm i . The utility specification implies that a customer incurs the transport costs for every unit purchased, i.e., transport costs increase linearly in the quantity purchased. One may interpret τ as the cost a customer incurs when shipping one unit of the product to his location. Alternatively, it may be viewed as the disutility the customer suffers when he buys a product that does not fully match his ideal product. Then, $q\tau|L_i - x|$ represents the total transport costs borne by a customer located at x when buying a product located at L_i .

As customers are assumed to be utility maximizers, the above utility specification implies that a customer who is located at x and buys from firm i has the following local demand

$$\begin{aligned} \max_q U(x, p_i) &\Rightarrow \frac{\partial U}{\partial q} = 1 - q - p_i - \tau|L_i - x| = 0 \\ &\Rightarrow q(x, p_i) = 1 - p_i - \tau|L_i - x|. \end{aligned} \quad (2)$$

Note that with a per-unit transport cost, individual demand decreases as the difference between the customer's location (preferences) and the actual product location (characteristics) grows. In contrast, the quantity a customer demands when transport costs are on a lump-sum basis depends only on the price.

We make the following assumption:

Assumption 1. Transport costs are such that the market is covered, i.e., $0 < \tau \leq 8/3 =: \bar{\tau}$.

The assumption that the market is covered means that in equilibrium for any number of firms, all customers along the circle buy from one firm, i.e., not buying at all is not optimal. However, as can be seen from expression

(2), this is only true if transport costs are not too high.⁷

In what follows, we will analyze the following two-stage free-entry game. In the first stage, firms decide whether to enter the market. In the second stage, firms compete in prices.

3 Results

In this section, we first derive the findings from the free-entry game to compare them to the first-best and the second-best outcomes.

Free entry

We start by analyzing customers' purchasing decisions. As we are interested in a symmetric equilibrium, suppose that all firms but firm i located at $L_i = 0$ charge the same price p . Then, plugging the local demand specified in expression (2) into the utility expression (1) implies that the indifferent customer between firm i and its neighboring firm at $1/n$ is located at a distance \tilde{x} :

$$U(\tilde{x}, p_i) = U(\tilde{x}, p) \Leftrightarrow \hat{x} = \frac{1}{2n} - \frac{p_i - p}{2\tau}.$$

Total demand at firm i by customers from the left and the right in the second stage is thus given by

$$Q_i = 2 \int_0^{\tilde{x}} (1 - p_i - \tau x) dx.$$

Firm i 's profits amount to $\pi_i = p_i Q_i$. Let $A := \sqrt{4n^2 - 4n\tau + 13\tau^2}$. Proceeding in the standard way to derive the optimal symmetric equilibrium prices (i.e., $p_i = p$), we have the following price in the second stage of the game⁸

$$p = \frac{2n + 3\tau - A}{4n}. \quad (3)$$

⁷Specifically, *Assumption 1* ensures that, for any number $n \geq 2$ of firms, even the customer with the largest travel distance to a firm will buy a non-negative amount at the equilibrium price (3). Note that this assumption is more restrictive than necessary but we use it for simplicity. As we will point out below (see the next footnote), the upper bound is increasing in the number of firms n , i.e., $\tau \leq 8/3$ represents the lowest value. As the number of firms is determined endogenously, the upper bound could be endogenized too.

⁸Note that in the symmetric equilibrium with n firms, the indifferent customer located

It is useful to analyze the comparative statics properties of the equilibrium price.

Observation 1. Define $\hat{\tau} := 2(1 + 3\sqrt{3})n/13 \approx 0.95325n$ and $\hat{n} := (3\sqrt{3} - 1)\tau/4 \approx 1.04904\tau$.

(i) Comparative statics with respect to transport costs τ give

$$\frac{\partial p}{\partial \tau} \begin{cases} > 0 & \text{if } 0 < \tau < \hat{\tau} \\ = 0 & \text{if } \tau = \hat{\tau} \\ < 0 & \text{if } \hat{\tau} < \tau \leq \bar{\tau}. \end{cases}$$

(ii) Comparative statics with respect to the number of firms n give

$$\frac{\partial p}{\partial n} \begin{cases} > 0 & \text{if } 2 \leq n < \hat{n} \\ = 0 & \text{if } n = \hat{n} \\ < 0 & \text{if } n > \hat{n}. \end{cases}$$

Proof: Ad (i): it holds that $\partial p/\partial \tau = (2n - 13n\tau + 3A)/4nA$. Solving $\partial p/\partial \tau = 0$ for τ gives $\hat{\tau}$ as the only solution that lies within the bounds specified by *Assumption 1*. Furthermore, it holds that $\partial p/\partial \tau \rightarrow 1/n > 0$ for $\tau \rightarrow 0$ and $\partial^2 p/\partial \tau^2 = -\sqrt{3}/6n^2 < 0$ for $\tau = \hat{\tau}$.

Ad (ii): it holds that $\partial p/\partial n = -(2n - 13\tau + 3A)/4n^2A$. Solving $\partial p/\partial n = 0$ for n gives \hat{n} as the only solution that satisfies the condition that $n \leq 2$. Moreover, for $n \rightarrow \infty$, it is true that $\partial p/\partial n \rightarrow 0$. Also, it holds that $\partial^2 p/\partial n^2 = -128\sqrt{3}/(3\sqrt{3} - 1)^4\tau^2 < 0$ for $n = \hat{n}$.

The properties of the equilibrium price differ from the standard model with inelastic demand (see, e.g., Tirole, 1988) as well as from the setup where elastic demand depends only on the price but not on transport costs (see, at an equal distance of $1/2n$ to two neighboring firms demands a quantity of

$$q\left(\frac{1}{2n}, p\right) = 1 - \frac{2n + 5\tau - A}{4n}.$$

Solving $q(1/2n, p) \geq 0$, which is required to ensure a covered market, for τ gives two solutions: 0 and $4n/3$. For $0 < \tau \leq 4n/3$, it holds that $q(1/2n, p) \geq 0$. Setting $n = 2$ yields the upper bound given in *Assumption 1*.

e.g., Gu and Wenzel, 2009). Whereas in those cases, the price unambiguously increases in the transport-cost parameter τ , here the price may increase or decrease in τ . This is because transport costs have two effects. On the one hand, larger values of τ relax competition leading firms to increase prices. On the other hand, larger values of τ also reduce individual demand which forces firms to reduce their prices. For low values of τ , the first effect dominates whereas for high values of τ , the second effect dominates.⁹

Similarly, the effect of additional competitors on prices is ambiguous. As in the standard model, more firms means tougher competition because firms are located closer to each other. On the other hand, additional competitors also allow firms to target only those customers with high local demand. For markets with few firms, the second effect dominates. However, as more firms enter the market, the first effect becomes stronger and this effect eventually dominates.

The fact that the equilibrium price can be increasing in the number of firms is an unexpected result in circular models. When disutility from mismatching is independent of the quantity consumed as in Gu and Wenzel (2012), the equilibrium price unequivocally decreases in the number of firms. The reason for this new result is that, in previous models, individual demand is independent of the distance traveled although they may be price dependent. In contrast, in the current model, both per-unit transport cost and the distance traveled have an impact on individual demand given by expression (2). As a consequence, the overall demand can be less elastic when customers travel less as the number of firms increases.¹⁰

Firm profits in the second stage amount to

$$\pi = \frac{(2n + 3\tau - A)(2n - 4\tau + A)}{16n^3}.$$

⁹See also Rothschild (1997) or Rasch and Herre (2013) for a related discussion.

¹⁰We note that an increase in the number of firms can also lead to a higher equilibrium price for a range of reservation prices in the spokes model (Chen and Riordan, 2007). In such cases in the spokes model, as the number of firms becomes higher, the monopoly segment—where demand is surprisingly more elastic—shrinks and the competitive segment expands and as a result, the overall demand elasticity reduces. In contrast, in the current paper, as the number of firms increases, marginal customers are located closer to the firms and demand a higher quantity at any given price. Hence, individual demand becomes less elastic, in particular, when there are just a few firms active in the market ($n < \hat{n}$).

Observation 2. Define $B := \sqrt[3]{7552 + 273\sqrt{993}}$ and $\check{\tau} := (-257 + B^2 + 4B)n/39B \approx 0.49008n$.

(i) Comparative statics with respect to transport costs τ give

$$\frac{\partial \pi}{\partial \tau} \begin{cases} > 0 & \text{if } 0 < \tau < \check{\tau} \\ = 0 & \text{if } \tau = \check{\tau} \\ < 0 & \text{if } \check{\tau} < \tau \leq \bar{\tau}. \end{cases}$$

(ii) Comparative statics with respect to the number of firms n give

$$\frac{\partial \pi}{\partial n} < 0.$$

Proof: Ad (i): it holds that $\partial\pi/\partial\tau = (14n^2 + nA - 21n\tau - 25\tau A + 91\tau^2)/8n^3A$. Solving $\partial\pi/\partial\tau = 0$ for τ gives $\check{\tau}$ as the only solution that lies within the bounds specified by *Assumption 1*. Next, it is true that $\partial\pi/\partial\tau \rightarrow 1/n^2 > 0$ for $\tau \rightarrow 0$ and $\partial^2\pi/\partial\tau^2 \approx -0.5641/n^3 < 0$ for $\tau = \check{\tau}$.

Ad (ii): it holds that $\partial\pi/\partial n = \tau(-56n^2 - 4nA + 70n\tau + 75\tau A - 273\tau^2)/16n^4A$. Solving $\partial\pi/\partial n = 0$ for n gives two (real) solutions: $\tau/4$ and $3\tau/4$. Note that not even the greater of the two solutions satisfies the condition that $n \geq 2$ as $3\tau/4 \geq 2 \Leftrightarrow \tau \geq 8/3$ which contradicts *Assumption 1*. Note last that for $n = 2$ and $\tau = 1$, $\partial\pi/\partial n = (67 - 17\sqrt{21})/256 \approx -0.0426$.

The parameter τ also has an ambiguous impact on firm profits. Note that profits are particularly low when τ is relatively large. This observation will later be helpful to explain why entry may be insufficient. Interestingly, an increase in the number of competitors may lead to higher prices for customers but firms' profits do not increase at the same time. This means that the negative effect on profits from a lower market share outweighs the positive price effect.

Turning to the firms' entry decision in the first stage, assume that market entry comes at a fixed cost f (with $f > 0$). We focus on those cases where at least two firms enter which can be guaranteed by assuming sufficiently low values of the entry cost f . As firm profits are strictly decreasing in the number of firms, the maximum relevant entry cost is given for $n = 2$.

Denote this cost by \bar{f} . Hence, at least two firms enter the market as long as

$$f \leq \frac{\tau \left(4 - 25\tau + 7\sqrt{16 - 8\tau + 13\tau^2} \right)}{128} =: \bar{f}.$$

Since profits are strictly decreasing in the number of firms, the unique equilibrium number of firms n^* is implicitly characterized as the solution to¹¹

$$\pi(n^*) - f = 0.$$

First-best entry

We define social welfare as the sum of customer surplus and firm profits. Unlike models with inelastic demand, prices matter due to their impact on the quantities purchased. In the first-best welfare benchmark, social welfare consists of total entry costs and customer welfare where the product price is set equal to the marginal cost of production, i.e., $p^F = 0$ (where superscript F stands for first-best). Social welfare can then be expressed as

$$W^F = 2n \int_0^{\frac{1}{2n}} \frac{(1 - \tau x)^2}{2} dx - nf = \frac{12n^2 - 6n\tau + \tau^2}{24n^2} - nf. \quad (4)$$

Maximizing expression (4) with respect to the number of firms and defining $C := \sqrt[3]{\tau f(-3\tau f + \sqrt{-3\tau f(1 - 3\tau f)})}$, the first-best level of entry n^F is given by

$$n^F = \frac{\sqrt[3]{3} (\sqrt[3]{3}\tau f + C^2)}{6fC}. \quad (5)$$

As the free-entry level is only given implicitly, we cannot directly compare the entry decision in the free-entry equilibrium and in the first-best scenario. Instead, we consider $\pi(n^F) - f$. As firm profits strictly decrease in the number of firms, it holds that whenever $\pi(n^F) - f < 0$, there is insufficient entry in the free-entry equilibrium and vice versa. Since the analytical expressions are cumbersome, we present the comparison graphically in *Figure 1* below. Note that, in the figure, f^F is defined as the fixed entry cost where

¹¹Note that we have shown in *Observation 2* that $\partial\pi(n, \tau, f)/\partial n < 0$. Hence, the implicit function theorem guarantees the existence of a unique $n^*(\tau, f)$ such that $\pi(n^*(\tau, f), \tau, f) - f = 0$.

the scope of entry in the first best is equal to the free-entry equilibrium. For any $f < f^F$, there is excessive entry; for any $f^F < f \leq \bar{f}$, an insufficient number of firms enter the market.

The figure shows that for relatively low levels of the fixed cost f , there is always excessive entry. For higher levels of the fixed cost, whether entry is excessive or insufficient depends on the transport costs. If the transport costs are sufficiently large (small), we observe insufficient (excessive) entry. The occurrence of insufficient entry can be explained by the observation that firm profits are decreasing in the transport-cost parameter for high values of τ (see *Observation 2*). With large values of τ customers would benefit to a large extent from additional market entry but the incentives to enter are low. As a consequence, the equilibrium level of entry falls short compared to the optimal outcome.

We summarize this finding:

Result 1. Market entry is excessive compared to the first-best outcome for low values of the entry cost f and/or low values of the transport costs τ . For high values of these parameters, market entry is insufficient.

Second-best entry

We now consider the optimal entry level under a second-best benchmark where prices are set according to expression (3). Second-best social welfare (superscript S) is given as

$$\begin{aligned}
 W^S &= 2n \int_0^{\frac{1}{2n}} \frac{(1-p-\tau x)^2}{2} dx + 2np \int_0^{\frac{1}{2n}} (1-p-\tau x) dx - nf \quad (6) \\
 &= \frac{12n^2 + 6nA - 24n\tau + 9\tau A - 31\tau^2}{48n^2} - nf. \quad (7)
 \end{aligned}$$

Since we cannot derive an explicit expression for n^S from the maximization of expression (6), we instead consider $\partial W^S / \partial n$ at $n = n^F$ to compare the socially optimal scope of entry in the first-best and second-best regimes. It holds that whenever $\partial W^S / \partial n$ at $n = n^F$ is larger than zero, more entry is

desirable in the second best and vice versa.¹²

We state the following result:

Result 2. The second-best level of entry is higher than the first-best level.

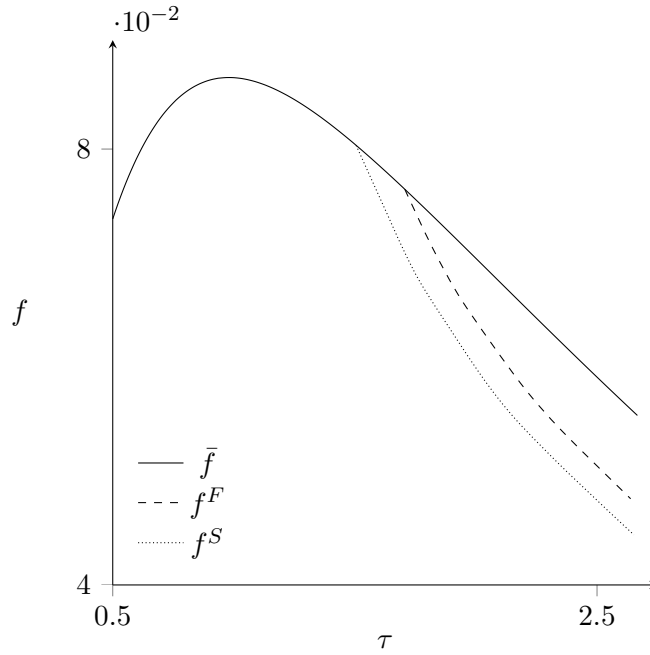


Figure 1: Entry comparison in the three scenarios: entry is insufficient (excessive) compared to the first-best benchmark if $f^F < f \leq \bar{f}$ ($f < f^F$) and insufficient (excessive) compared to the second-best benchmark if $f^S < f \leq \bar{f}$ ($f < f^S$).

It immediately follows that free entry can also be insufficient compared to a second-best benchmark and that the parameter range where entry is insufficient is larger than for the first-best comparison. *Figure 1* provides a graphical illustration. In the figure, f^S is defined as the fixed entry cost where the level of entry in the second best is equal to the free-entry equilibrium. For any $f < f^S$, too many firms enter the market from a social-welfare

¹²Analytical results are not obtainable, so we numerically verified that indeed $\partial W^S / \partial n > 0$ holds at $n = n^F$ for all permissible parameter values. The result is summarized in *Figure 1*. The figure shows that $f^S < f^F$ and that, in particular, both lines do not intersect. This implies that the second-best level of entry is higher than the first-best level.

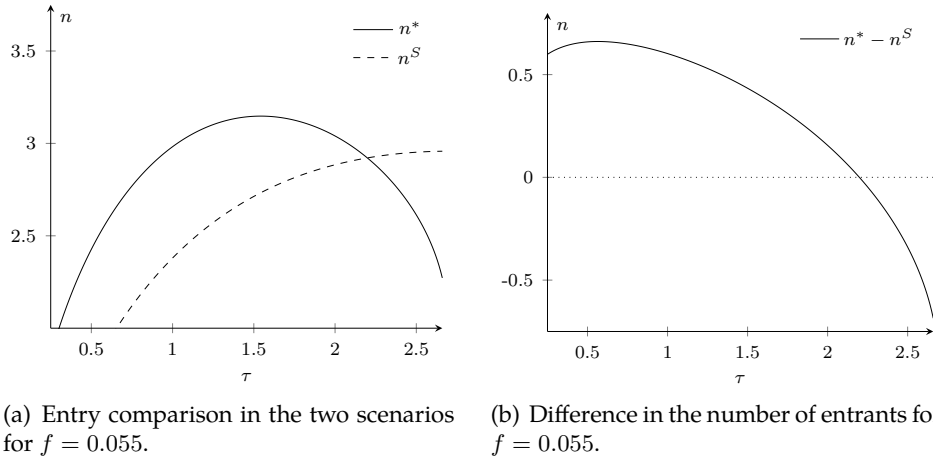


Figure 2: Entry comparison under free entry and in the second-best scenario for $f = 0.055$.

perspective; for any $f^S < f \leq \bar{f}$, there is insufficient entry. From the figure we can thus summarize:

Result 3. Market entry is excessive for low values of the entry cost f and/or low values of the transport costs τ and insufficient for high values of these parameters compared to the second-best outcome.

Note that this result extends previous findings. In settings with fixed transport costs, entry levels can also be insufficient if the entry cost or transport costs are high (Gu and Wenzel, 2012).¹³ Thus, a more general picture emerges in models with price-sensitive demand. Independent of who bears the transport costs and independent of whether the transport costs are on a fixed or a per-unit basis, insufficient entry may arise for high levels of transport costs. The reason for insufficient entry differ, however, between models with fixed transport costs and with per-unit transport costs. With fixed transport costs, insufficient entry arises as with high transport costs, prices are high and customer demand is low whereas firm profits are high. Contrary to that, with per-unit transport costs, insufficient entry arises as the incentives to enter the market (that is, firm profits) are very low with

¹³With delivered-price competition, insufficient entry also arises if fixed costs are large (Matsumura and Okamura, 2006a).

high transport costs because of the resulting downward shift of the local demand function (see *Observation 2*). Note, however, that in both types of models, the same main message (though for different reasons) emerges, i.e., insufficient entry arises under high transport costs.

Figure 2 provides an alternative illustration of the comparison of market vs. optimal entry. For a given fixed cost of entry of $f = 0.055$, the left panel shows equilibrium and second-best entry; the right panel plots the difference between these two entry levels. The figure shows that the degree of insufficient entry can become quite large for high values of the transport cost parameter τ .¹⁴

Extension: More general utility function

In this short extension, we provide some evidence that assuming a more general utility function does not result in qualitatively different results. A customer who is located at x and who buys from firm i at location L_i derives the following utility

$$U(x, p_i) = \frac{\alpha q}{\beta} - \frac{q^2}{2\beta} - q(p_i + \tau|L_i - x|),$$

where $\alpha, \beta > 0$.

Given that customers are utility maximizers, this customer has the following local demand when buying from firm i

$$q(x, p_i) = \alpha - \beta p_i - \beta \tau |L_i - x|.$$

Proceeding in the exact same way as in the previous part, we can compare the scope of entry in the different scenarios.¹⁵ *Figure 3* illustrates the scope of entry in the private optimum and the second best for two concrete examples ($\alpha = 1, \beta = 0.5$; $\alpha = 1.5, \beta = 1$). In the figure, the upper bound

¹⁴Again, we stress that *Assumption 1* is stronger than needed as even at the highest level of transport costs, the marginal customer would demand a strictly positive quantity. Indeed, we could extend the analysis to higher values of the transport costs without violating the assumption of a covered market. This would enlarge the area with insufficient entry.

¹⁵Note that the modified utility function requires a slightly adapted assumption regarding the transport-cost parameter. It must hold that $0 < \tau \leq 8\alpha/3\beta$.

on the entry cost \bar{f} as well as the critical f^S where the scope of entry is the same under free entry and in the second-best benchmark are given for the two cases. As can be seen from the figure, there is again insufficient market entry whenever both entry and transport costs are not too low. Moreover, the relative scope of insufficient entry remains the same in these two alternative scenarios.¹⁶ We thus conclude that introducing parameters α and β to allow for a more general utility specification does not qualitatively affect our results concerning insufficient entry.

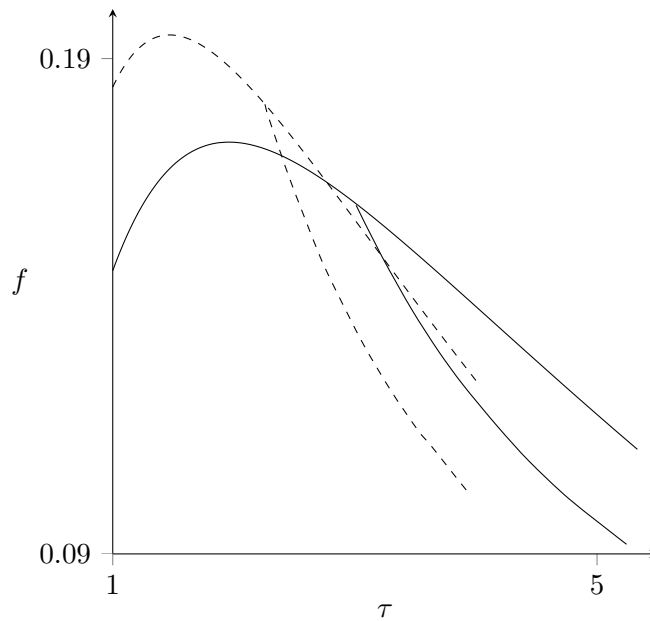


Figure 3: Comparison of entry decisions in the free-entry equilibrium and the second-best benchmark for two cases: (i) $\alpha = 1, \beta = 0.5$ (solid curves); (ii) $\alpha = 1.5, \beta = 1$ (dashed curves).

4 Conclusion

This paper revisits market and optimal entry in a circular-city model where customer demand is price-sensitive and also depends on the transport costs (per unit) a customer incurs. The main finding is that entry is not always

¹⁶Note that we have not found a meaningful parameter set where (qualitative) results changed.

excessive. So far, this has only been shown for the case where transport costs are on a lump-sum basis independent of the quantity. The current paper extends this result to the case where transport costs are incurred for each unit. Given that circular models of product differentiation are widely used, the results of this paper may be of practical use for researchers in the fields of industrial organization, regional science, and transport economics.

Our model fits markets where the quantities demanded by individual customers depend on a unit price as well as the degree of matching between product characteristics and individual preferences (such as food and drinks; visits to restaurants, pubs, and cinemas; travel demands). Our analysis suggests that the price in these markets is not necessarily monotonic in transport costs or the number of firms. As a policy implication, our paper suggests that entry in markets, where product differentiation is of high importance to consumers (high transport cost), may be insufficient, and subsidizing entry in such market may be welfare-enhancing.

References

- Anderson, S. P., de Palma, A., and Thisse, J.-F. (1992). *Discrete Choice Theory of Product Differentiation*. MIT Press.
- Biscaia, R. and Mota, I. (2013). Models of spatial competition: A critical review. *Papers in Regional Science*, 92(4):851–871.
- Braid, R. (2014). Search costs decrease prices in a model of spatial competition. *Papers in Regional Science*, 93(1):125–139.
- Chen, Y. and Riordan, M. H. (2007). Price and variety in the spokes model. *Economic Journal*, 117(522):897–921.
- Colombo, S. (2011). Spatial price discrimination in the unidirectional Hotelling model with elastic demand. *Journal of Economics*, 102(2):157–169.
- Colombo, S. (2014). Location choices with a non-linear demand function. Forthcoming *Papers in Regional Science*.
- Dixit, A. K. and Stiglitz, J. E. (1977). Monopolistic competition and optimum product diversity. *American Economic Review*, 67(3):297–308.

- Esteves, R.-B. and Reggiani, C. (2014). Elasticity of demand and behaviour-based price discrimination. *International Journal of Industrial Organization*, 32:46–56.
- Gu, Y. and Wenzel, T. (2009). A note on the excess entry theorem in spatial models with elastic demand. *International Journal of Industrial Organization*, 27(5):567–571.
- Gu, Y. and Wenzel, T. (2012). Price-dependent demand in spatial models. *B. E. Journal of Economic Analysis & Policy*, 12(1). Article 6.
- Hamilton, J. H., Thisse, J.-F., and Weskamp, A. (1989). Spatial discrimination: Bertrand vs Cournot in a model of location choice. *Regional Science and Urban Economics*, 19:87–102.
- Hotelling, H. (1929). Stability in competition. *Economic Journal*, 39:41–57.
- Janssen, M. C. W., Karamychev, V. A., and van Reeven, P. (2005). Multi-store competition: Market segmentation or interlacing? *Regional Science and Urban Economics*, 35(6):700–714.
- Matsumura, T. (2000). Entry regulation and social welfare with an integer problem. *Journal of Economics*, 71(1):47–58.
- Matsumura, T. and Okamura, M. (2006a). Equilibrium number of firms and economic welfare in a spatial price discrimination model. *Economics Letters*, 90(1):396–401.
- Matsumura, T. and Okamura, M. (2006b). A note on the excess entry theorem in spatial markets. *International Journal of Industrial Organization*, 24(5):1071–1076.
- Rasch, A. and Herre, J. (2013). Customer-side transparency, elastic demand, and tacit collusion under differentiation. *Information Economics and Policy*, 25(1):51–59.
- Rothschild, R. (1997). Product differentiation and cartel stability: Chamberlin versus Hotelling. *Annals of Regional Science*, 31(3):259–271.
- Salop, S. (1979). Monopolistic competition with outside goods. *Bell Journal of Economics*, 10(1):141–156.

- Sattinger, M. (1984). Value of an additional firm in monopolistic competition. *Review of Economic Studies*, 51(2):321–332.
- Shilony, Y. (1981). Hotelling's competition with general customer distributions. *Economics Letters*, 8:39–45.
- Tirole, J. (1988). *The Theory of Industrial Organization*. MIT Press.
- van der Weijde, A. H., Verhoef, E. T., and van den Berg, V. A. C. (2014). A Hotelling model with price-sensitive demand and asymmetric distance costs: The case of strategic transport scheduling. *Journal of Transport Economics and Policy*, 48(2):261–277.
- Vickrey, W. S. (1964). *Microstatics*. Harcourt, Brace and World, New York.

PREVIOUS DISCUSSION PAPERS

- 165 Gu, Yiquan, Rasch, Alexander and Wenzel, Tobias, Price-sensitive Demand and Market Entry, November 2014.
- 164 Caprice, Stéphane, von Schlippenbach, Vanessa and Wey, Christian, Supplier Fixed Costs and Retail Market Monopolization, October 2014.
- 163 Klein, Gordon J. and Wendel, Julia, The Impact of Local Loop and Retail Unbundling Revisited, October 2014.
- 162 Dertwinkel-Kalt, Markus, Haucap, Justus and Wey, Christian, Raising Rivals' Costs Through Buyer Power, October 2014.
- 161 Dertwinkel-Kalt, Markus and Köhler, Katrin, Exchange Asymmetries for Bads? Experimental Evidence, October 2014.
- 160 Behrens, Kristian, Mion, Giordano, Murata, Yasusada and Suedekum, Jens, Spatial Frictions, September 2014.
- 159 Fonseca, Miguel A. and Normann, Hans-Theo, Endogenous Cartel Formation: Experimental Evidence, August 2014.
Forthcoming in: Economics Letters.
- 158 Stiebale, Joel, Cross-Border M&As and Innovative Activity of Acquiring and Target Firms, August 2014.
- 157 Haucap, Justus and Heimeshoff, Ulrich, The Happiness of Economists: Estimating the Causal Effect of Studying Economics on Subjective Well-Being, August 2014.
Forthcoming in: International Review of Economics Education.
- 156 Haucap, Justus, Heimeshoff, Ulrich and Lange, Mirjam R. J., The Impact of Tariff Diversity on Broadband Diffusion – An Empirical Analysis, August 2014.
- 155 Baumann, Florian and Friehe, Tim, On Discovery, Restricting Lawyers, and the Settlement Rate, August 2014.
- 154 Hottenrott, Hanna and Lopes-Bento, Cindy, R&D Partnerships and Innovation Performance: Can There be too Much of a Good Thing?, July 2014.
- 153 Hottenrott, Hanna and Lawson, Cornelia, Flying the Nest: How the Home Department Shapes Researchers' Career Paths, July 2014.
- 152 Hottenrott, Hanna, Lopes-Bento, Cindy and Veugelers, Reinhilde, Direct and Cross-Scheme Effects in a Research and Development Subsidy Program, July 2014.
- 151 Dewenter, Ralf and Heimeshoff, Ulrich, Do Expert Reviews Really Drive Demand? Evidence from a German Car Magazine, July 2014.
- 150 Bataille, Marc, Steinmetz, Alexander and Thorwarth, Susanne, Screening Instruments for Monitoring Market Power in Wholesale Electricity Markets – Lessons from Applications in Germany, July 2014.
Published in: Economics Letters, 125 (2014), pp.223-225.
- 149 Kholodilin, Konstantin A., Thomas, Tobias and Ulbricht, Dirk, Do Media Data Help to Predict German Industrial Production?, July 2014.

- 148 Hogrefe, Jan and Wrona, Jens, Trade, Tasks, and Trading: The Effect of Offshoring on Individual Skill Upgrading, June 2014.
- 147 Gaudin, Germain and White, Alexander, On the Antitrust Economics of the Electronic Books Industry, September 2014 (Previous Version May 2014).
- 146 Alipranti, Maria, Milliou, Chrysovalantou and Petrakis, Emmanuel, Price vs. Quantity Competition in a Vertically Related Market, May 2014.
Published in: Economics Letters, 124 (2014), pp.122-126.
- 145 Blanco, Mariana, Engelmann, Dirk, Koch, Alexander K. and Normann, Hans-Theo, Preferences and Beliefs in a Sequential Social Dilemma: A Within-Subjects Analysis, May 2014.
Published in: Games and Economic Behavior, 87 (2014), pp.122-135.
- 144 Jeitschko, Thomas D., Jung, Yeonjei and Kim, Jaesoo, Bundling and Joint Marketing by Rival Firms, May 2014.
- 143 Benndorf, Volker and Normann, Hans-Theo, The Willingness to Sell Personal Data, April 2014.
- 142 Dauth, Wolfgang and Suedekum, Jens, Globalization and Local Profiles of Economic Growth and Industrial Change, April 2014.
- 141 Nowak, Verena, Schwarz, Christian and Suedekum, Jens, Asymmetric Spiders: Supplier Heterogeneity and the Organization of Firms, April 2014.
- 140 Hasnas, Irina, A Note on Consumer Flexibility, Data Quality and Collusion, April 2014.
- 139 Baye, Irina and Hasnas, Irina, Consumer Flexibility, Data Quality and Location Choice, April 2014.
- 138 Aghadadashli, Hamid and Wey, Christian, Multi-Union Bargaining: Tariff Plurality and Tariff Competition, April 2014.
- 137 Duso, Tomaso, Herr, Annika and Suppliet, Moritz, The Welfare Impact of Parallel Imports: A Structural Approach Applied to the German Market for Oral Anti-diabetics, April 2014.
Published in: Health Economics, 23 (2014), pp. 1036-1057.
- 136 Haucap, Justus and Müller, Andrea, Why are Economists so Different? Nature, Nurture and Gender Effects in a Simple Trust Game, March 2014.
- 135 Normann, Hans-Theo and Rau, Holger A., Simultaneous and Sequential Contributions to Step-Level Public Goods: One vs. Two Provision Levels, March 2014.
Forthcoming in: Journal of Conflict Resolution.
- 134 Bucher, Monika, Hauck, Achim and Neyer, Ulrike, Frictions in the Interbank Market and Uncertain Liquidity Needs: Implications for Monetary Policy Implementation, July 2014 (First Version March 2014).
- 133 Czarnitzki, Dirk, Hall, Bronwyn, H. and Hottenrott, Hanna, Patents as Quality Signals? The Implications for Financing Constraints on R&D?, February 2014.
- 132 Dewenter, Ralf and Heimeshoff, Ulrich, Media Bias and Advertising: Evidence from a German Car Magazine, February 2014.
Published in: Review of Economics, 65 (2014), pp. 77-94.

- 131 Baye, Irina and Sapi, Geza, Targeted Pricing, Consumer Myopia and Investment in Customer-Tracking Technology, February 2014.
- 130 Clemens, Georg and Rau, Holger A., Do Leniency Policies Facilitate Collusion? Experimental Evidence, January 2014.
- 129 Hottenrott, Hanna and Lawson, Cornelia, Fishing for Complementarities: Competitive Research Funding and Research Productivity, December 2013.
- 128 Hottenrott, Hanna and Rexhäuser, Sascha, Policy-Induced Environmental Technology and Inventive Efforts: Is There a Crowding Out?, December 2013.
- 127 Dauth, Wolfgang, Findeisen, Sebastian and Suedekum, Jens, The Rise of the East and the Far East: German Labor Markets and Trade Integration, December 2013. Forthcoming in: Journal of European Economic Association.
- 126 Wenzel, Tobias, Consumer Myopia, Competition and the Incentives to Unshroud Add-on Information, December 2013.
Published in: Journal of Economic Behavior and Organization, 98 (2014), pp. 89-96.
- 125 Schwarz, Christian and Suedekum, Jens, Global Sourcing of Complex Production Processes, December 2013.
Published in: Journal of International Economics, 93 (2014), pp. 123-139.
- 124 Defever, Fabrice and Suedekum, Jens, Financial Liberalization and the Relationship-Specificity of Exports, December 2013.
Published in: Economics Letters, 122 (2014), pp. 375-379.
- 123 Bauernschuster, Stefan, Falck, Oliver, Heblich, Stephan and Suedekum, Jens, Why Are Educated and Risk-Loving Persons More Mobile Across Regions?, December 2013.
Published in: Journal of Economic Behavior and Organization, 98 (2014), pp. 56-69.
- 122 Hottenrott, Hanna and Lopes-Bento, Cindy, Quantity or Quality? Knowledge Alliances and their Effects on Patenting, December 2013.
Forthcoming in: Industrial and Corporate Change.
- 121 Hottenrott, Hanna and Lopes-Bento, Cindy, (International) R&D Collaboration and SMEs: The Effectiveness of Targeted Public R&D Support Schemes, December 2013.
Published in: Research Policy, 43 (2014), pp.1055-1066.
- 120 Giesen, Kristian and Suedekum, Jens, City Age and City Size, November 2013.
Published in: European Economic Review, 71 (2014), pp. 193-208.
- 119 Trax, Michaela, Brunow, Stephan and Suedekum, Jens, Cultural Diversity and Plant-Level Productivity, November 2013.
- 118 Manasakis, Constantine and Vlassis, Minas, Downstream Mode of Competition With Upstream Market Power, November 2013.
Published in: Research in Economics, 68 (2014), pp. 84-93.
- 117 Sapi, Geza and Suleymanova, Irina, Consumer Flexibility, Data Quality and Targeted Pricing, November 2013.
- 116 Hinlopen, Jeroen, Müller, Wieland and Normann, Hans-Theo, Output Commitment Through Product Bundling: Experimental Evidence, November 2013.
Published in: European Economic Review, 65 (2014), pp. 164-180.

- 115 Baumann, Florian, Denter, Philipp and Friehe Tim, Hide or Show? Endogenous Observability of Private Precautions Against Crime When Property Value is Private Information, November 2013.
- 114 Fan, Ying, Kühn, Kai-Uwe and Lafontaine, Francine, Financial Constraints and Moral Hazard: The Case of Franchising, November 2013.
- 113 Aguzzoni, Luca, Argentesi, Elena, Buccirosi, Paolo, Ciari, Lorenzo, Duso, Tomaso, Tognoni, Massimo and Vitale, Cristiana, They Played the Merger Game: A Retrospective Analysis in the UK Videogames Market, October 2013. Forthcoming in: Journal of Competition Law and Economics under the title: "A Retrospective Merger Analysis in the UK Videogame Market".
- 112 Myrseth, Kristian Ove R., Riener, Gerhard and Wollbrant, Conny, Tangible Temptation in the Social Dilemma: Cash, Cooperation, and Self-Control, October 2013.
- 111 Hasnas, Irina, Lambertini, Luca and Palestini, Arsen, Open Innovation in a Dynamic Cournot Duopoly, October 2013. Published in: Economic Modelling, 36 (2014), pp. 79-87.
- 110 Baumann, Florian and Friehe, Tim, Competitive Pressure and Corporate Crime, September 2013.
- 109 Böckers, Veit, Haucap, Justus and Heimeshoff, Ulrich, Benefits of an Integrated European Electricity Market, September 2013.
- 108 Normann, Hans-Theo and Tan, Elaine S., Effects of Different Cartel Policies: Evidence from the German Power-Cable Industry, September 2013. Published in: Industrial and Corporate Change, 23 (2014), pp.1037-1057.
- 107 Haucap, Justus, Heimeshoff, Ulrich, Klein, Gordon J., Rickert, Dennis and Wey, Christian, Bargaining Power in Manufacturer-Retailer Relationships, September 2013.
- 106 Baumann, Florian and Friehe, Tim, Design Standards and Technology Adoption: Welfare Effects of Increasing Environmental Fines when the Number of Firms is Endogenous, September 2013.
- 105 Jeitschko, Thomas D., NYSE Changing Hands: Antitrust and Attempted Acquisitions of an Erstwhile Monopoly, August 2013. Published in: Journal of Stock and Forex Trading, 2 (2) (2013), pp. 1-6.
- 104 Böckers, Veit, Giessing, Leonie and Rösch, Jürgen, The Green Game Changer: An Empirical Assessment of the Effects of Wind and Solar Power on the Merit Order, August 2013.
- 103 Haucap, Justus and Muck, Johannes, What Drives the Relevance and Reputation of Economics Journals? An Update from a Survey among Economists, August 2013.
- 102 Jovanovic, Dragan and Wey, Christian, Passive Partial Ownership, Sneaky Takeovers, and Merger Control, August 2013. Published in: Economics Letters, 125 (2014), pp. 32-35.
- 101 Haucap, Justus, Heimeshoff, Ulrich, Klein, Gordon J., Rickert, Dennis and Wey, Christian, Inter-Format Competition Among Retailers – The Role of Private Label Products in Market Delineation, August 2013.

- 100 Normann, Hans-Theo, Requate, Till and Waichman, Israel, Do Short-Term Laboratory Experiments Provide Valid Descriptions of Long-Term Economic Interactions? A Study of Cournot Markets, July 2013.
Published in: *Experimental Economics*, 17 (2014), pp. 371-390.
- 99 Dertwinkel-Kalt, Markus, Haucap, Justus and Wey, Christian, Input Price Discrimination (Bans), Entry and Welfare, June 2013.
- 98 Aguzzoni, Luca, Argentesi, Elena, Ciari, Lorenzo, Duso, Tomaso and Tognoni, Massimo, Ex-post Merger Evaluation in the UK Retail Market for Books, June 2013.
Forthcoming in: *Journal of Industrial Economics*.
- 97 Caprice, Stéphane and von Schlippenbach, Vanessa, One-Stop Shopping as a Cause of Slotting Fees: A Rent-Shifting Mechanism, May 2012.
Published in: *Journal of Economics and Management Strategy*, 22 (2013), pp. 468-487.
- 96 Wenzel, Tobias, Independent Service Operators in ATM Markets, June 2013.
Published in: *Scottish Journal of Political Economy*, 61 (2014), pp. 26-47.
- 95 Coublucq, Daniel, Econometric Analysis of Productivity with Measurement Error: Empirical Application to the US Railroad Industry, June 2013.
- 94 Coublucq, Daniel, Demand Estimation with Selection Bias: A Dynamic Game Approach with an Application to the US Railroad Industry, June 2013.
- 93 Baumann, Florian and Friehe, Tim, Status Concerns as a Motive for Crime?, April 2013.
- 92 Jeitschko, Thomas D. and Zhang, Nanyun, Adverse Effects of Patent Pooling on Product Development and Commercialization, April 2013.
Published in: *The B. E. Journal of Theoretical Economics*, 14 (1) (2014), Art. No. 2013-0038.
- 91 Baumann, Florian and Friehe, Tim, Private Protection Against Crime when Property Value is Private Information, April 2013.
Published in: *International Review of Law and Economics*, 35 (2013), pp. 73-79.
- 90 Baumann, Florian and Friehe, Tim, Cheap Talk About the Detection Probability, April 2013.
Published in: *International Game Theory Review*, 15 (2013), Art. No. 1350003.
- 89 Pagel, Beatrice and Wey, Christian, How to Counter Union Power? Equilibrium Mergers in International Oligopoly, April 2013.
- 88 Jovanovic, Dragan, Mergers, Managerial Incentives, and Efficiencies, April 2014 (First Version April 2013).
- 87 Heimeshoff, Ulrich and Klein Gordon J., Bargaining Power and Local Heroes, March 2013.
- 86 Bertschek, Irene, Cerquera, Daniel and Klein, Gordon J., More Bits – More Bucks? Measuring the Impact of Broadband Internet on Firm Performance, February 2013.
Published in: *Information Economics and Policy*, 25 (2013), pp. 190-203.
- 85 Rasch, Alexander and Wenzel, Tobias, Piracy in a Two-Sided Software Market, February 2013.
Published in: *Journal of Economic Behavior & Organization*, 88 (2013), pp. 78-89.
- 84 Bataille, Marc and Steinmetz, Alexander, Intermodal Competition on Some Routes in Transportation Networks: The Case of Inter Urban Buses and Railways, January 2013.

- 83 Haucap, Justus and Heimeshoff, Ulrich, Google, Facebook, Amazon, eBay: Is the Internet Driving Competition or Market Monopolization?, January 2013.
Published in: *International Economics and Economic Policy*, 11 (2014), pp. 49-61.
- 82 Regner, Tobias and Riener, Gerhard, Voluntary Payments, Privacy and Social Pressure on the Internet: A Natural Field Experiment, December 2012.
- 81 Dertwinkel-Kalt, Markus and Wey, Christian, The Effects of Remedies on Merger Activity in Oligopoly, December 2012.
- 80 Baumann, Florian and Friehe, Tim, Optimal Damages Multipliers in Oligopolistic Markets, December 2012.
- 79 Duso, Tomaso, Röller, Lars-Hendrik and Seldeslachts, Jo, Collusion through Joint R&D: An Empirical Assessment, December 2012.
Published in: *The Review of Economics and Statistics*, 96 (2014), pp.349-370.
- 78 Baumann, Florian and Heine, Klaus, Innovation, Tort Law, and Competition, December 2012.
Published in: *Journal of Institutional and Theoretical Economics*, 169 (2013), pp. 703-719.
- 77 Coenen, Michael and Jovanovic, Dragan, Investment Behavior in a Constrained Dictator Game, November 2012.
- 76 Gu, Yiquan and Wenzel, Tobias, Strategic Obfuscation and Consumer Protection Policy in Financial Markets: Theory and Experimental Evidence, November 2012.
Forthcoming in: *Journal of Industrial Economics* under the title "Strategic Obfuscation and Consumer Protection Policy".
- 75 Haucap, Justus, Heimeshoff, Ulrich and Jovanovic, Dragan, Competition in Germany's Minute Reserve Power Market: An Econometric Analysis, November 2012.
Published in: *The Energy Journal*, 35 (2014), pp. 139-158.
- 74 Normann, Hans-Theo, Rösch, Jürgen and Schultz, Luis Manuel, Do Buyer Groups Facilitate Collusion?, November 2012.
- 73 Riener, Gerhard and Wiederhold, Simon, Heterogeneous Treatment Effects in Groups, November 2012.
Published in: *Economics Letters*, 120 (2013), pp 408-412.
- 72 Berlemann, Michael and Haucap, Justus, Which Factors Drive the Decision to Boycott and Opt Out of Research Rankings? A Note, November 2012.
- 71 Muck, Johannes and Heimeshoff, Ulrich, First Mover Advantages in Mobile Telecommunications: Evidence from OECD Countries, October 2012.
- 70 Karaçuka, Mehmet, Çatik, A. Nazif and Haucap, Justus, Consumer Choice and Local Network Effects in Mobile Telecommunications in Turkey, October 2012.
Published in: *Telecommunications Policy*, 37 (2013), pp. 334-344.
- 69 Clemens, Georg and Rau, Holger A., Rebels without a Clue? Experimental Evidence on Partial Cartels, April 2013 (First Version October 2012).
- 68 Regner, Tobias and Riener, Gerhard, Motivational Cherry Picking, September 2012.
- 67 Fonseca, Miguel A. and Normann, Hans-Theo, Excess Capacity and Pricing in Bertrand-Edgeworth Markets: Experimental Evidence, September 2012.
Published in: *Journal of Institutional and Theoretical Economics*, 169 (2013), pp. 199-228.

- 66 Riener, Gerhard and Wiederhold, Simon, Team Building and Hidden Costs of Control, September 2012.
- 65 Fonseca, Miguel A. and Normann, Hans-Theo, Explicit vs. Tacit Collusion – The Impact of Communication in Oligopoly Experiments, August 2012.
Published in: *European Economic Review*, 56 (2012), pp. 1759-1772.
- 64 Jovanovic, Dragan and Wey, Christian, An Equilibrium Analysis of Efficiency Gains from Mergers, July 2012.
- 63 Dewenter, Ralf, Jaschinski, Thomas and Kuchinke, Björn A., Hospital Market Concentration and Discrimination of Patients, July 2012 .
Published in: *Schmollers Jahrbuch*, 133 (2013), pp. 345-374.
- 62 Von Schlippenbach, Vanessa and Teichmann, Isabel, The Strategic Use of Private Quality Standards in Food Supply Chains, May 2012.
Published in: *American Journal of Agricultural Economics*, 94 (2012), pp. 1189-1201.
- 61 Sapi, Geza, Bargaining, Vertical Mergers and Entry, July 2012.
- 60 Jentzsch, Nicola, Sapi, Geza and Suleymanova, Irina, Targeted Pricing and Customer Data Sharing Among Rivals, July 2012.
Published in: *International Journal of Industrial Organization*, 31 (2013), pp. 131-144.
- 59 Lambarraa, Fatima and Riener, Gerhard, On the Norms of Charitable Giving in Islam: A Field Experiment, June 2012.
- 58 Duso, Tomaso, Gugler, Klaus and Szücs, Florian, An Empirical Assessment of the 2004 EU Merger Policy Reform, June 2012.
Published in: *Economic Journal*, 123 (2013), F596-F619.
- 57 Dewenter, Ralf and Heimeshoff, Ulrich, More Ads, More Revs? Is there a Media Bias in the Likelihood to be Reviewed?, June 2012.
Erscheint in: *Economic Modelling*.
- 56 Böckers, Veit, Heimeshoff, Ulrich and Müller Andrea, Pull-Forward Effects in the German Car Scrappage Scheme: A Time Series Approach, June 2012.
- 55 Kellner, Christian and Riener, Gerhard, The Effect of Ambiguity Aversion on Reward Scheme Choice, June 2012.
Published in: *Economics Letters*, 125 (2014), pp. 134-137.
- 54 De Silva, Dakshina G., Kosmopoulou, Georgia, Pagel, Beatrice and Peeters, Ronald, The Impact of Timing on Bidding Behavior in Procurement Auctions of Contracts with Private Costs, June 2012.
Published in: *Review of Industrial Organization*, 41 (2013), pp.321-343.
- 53 Benndorf, Volker and Rau, Holger A., Competition in the Workplace: An Experimental Investigation, May 2012.
- 52 Haucap, Justus and Klein, Gordon J., How Regulation Affects Network and Service Quality in Related Markets, May 2012.
Published in: *Economics Letters*, 117 (2012), pp. 521-524.
- 51 Dewenter, Ralf and Heimeshoff, Ulrich, Less Pain at the Pump? The Effects of Regulatory Interventions in Retail Gasoline Markets, May 2012.
- 50 Böckers, Veit and Heimeshoff, Ulrich, The Extent of European Power Markets, April 2012.

- 49 Barth, Anne-Kathrin and Heimeshoff, Ulrich, How Large is the Magnitude of Fixed-Mobile Call Substitution? - Empirical Evidence from 16 European Countries, April 2012.
Forthcoming in: Telecommunications Policy.
- 48 Herr, Annika and Suppliet, Moritz, Pharmaceutical Prices under Regulation: Tiered Co-payments and Reference Pricing in Germany, April 2012.
- 47 Haucap, Justus and Müller, Hans Christian, The Effects of Gasoline Price Regulations: Experimental Evidence, April 2012.
- 46 Stühmeier, Torben, Roaming and Investments in the Mobile Internet Market, March 2012.
Published in: Telecommunications Policy, 36 (2012), pp. 595-607.
- 45 Graf, Julia, The Effects of Rebate Contracts on the Health Care System, March 2012,
Published in: The European Journal of Health Economics, 15 (2014), pp.477-487.
- 44 Pagel, Beatrice and Wey, Christian, Unionization Structures in International Oligopoly, February 2012.
Published in: Labour: Review of Labour Economics and Industrial Relations, 27 (2013), pp. 1-17.
- 43 Gu, Yiquan and Wenzel, Tobias, Price-Dependent Demand in Spatial Models, January 2012.
Published in: B. E. Journal of Economic Analysis & Policy, 12 (2012), Article 6.
- 42 Barth, Anne-Kathrin and Heimeshoff, Ulrich, Does the Growth of Mobile Markets Cause the Demise of Fixed Networks? – Evidence from the European Union, January 2012.
Forthcoming in: Telecommunications Policy.
- 41 Stühmeier, Torben and Wenzel, Tobias, Regulating Advertising in the Presence of Public Service Broadcasting, January 2012.
Published in: Review of Network Economics, 11/2 (2012), Article 1.

Older discussion papers can be found online at:
<http://ideas.repec.org/s/zbw/dicedp.html>

Heinrich-Heine-University of Düsseldorf

**Düsseldorf Institute for
Competition Economics (DICE)**

Universitätsstraße 1_40225 Düsseldorf
www.dice.hhu.de

ISSN 2190-9938 (online)
ISBN 978-3-86304-164-9