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The Effects of Trade Liberalization with Spatial Markets

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Abstract: It is established that with the reduction of trade barriers the number of competitors on the spatial markets involved increases. This increase has short run consequences for price competition. If the trade liberalisation is anticipated by the domestic producers they will respond by changing the locational pattern as well. A unique locational equilibrium is established from the "no further entry" condition of the process of sequential location of exporters' outlets in the import markets. The entry process stops if no further entrant can locate between the last entrant and any of the suppliers having entered the market before without being undercut in the price game.

Introduction

In this paper trade between two separate but interdependent spatial markets is investigated. The spatial character of the markets derives from the fact that transportation from the producer to the consumer within an individual market is costly. The two markets are separated in that the trade between spatial markets is associated with transaction costs which are absent within the individual markets. These peculiar costs of intermarket transactions may be due to different legal regulations of trade or product design, to different currencies etc. In contrast to the transportation costs within the markets they are independent of the distance over which the traded goods are shipped. It is assumed that both markets are circular. That is, the "space" of both markets is considered to be represented by a circle with unit circumference (cf. the characterisation of spatial markets in the companion paper Kopp 1993). Different from traditional models of international trade, and also of the "new international economics", trade between spatial market requires a decision on the part of the exporter where to locate an outlet in the export market. We shall investigate the situation of identical spatial markets and of firms using identical technologies to produce a homogeneous good.

Intermarket shipping costs are emphasised in the models of international "reciprocal dumping", showing that the "segmented market perception" leads to a price differentiation between the home and the export market and trade in homogeneous products even between identical countries. (Brander 1981, Brander/Krugman 1992, Helpman 1982 and Ben-Zvi/Helpman 1992). In these models the intermarket transaction costs are called "transportation costs" although all markets are assumed to be point markets and geographic distances are irrelevant for trade.

Trade between spatial markets is studied in a paper by Schmitt (1993). Schmitt studies location and entry within spatial markets and trade between them basing his analysis on the Salop (1979) model of monopolistic competition and the model of foresighted entry in a market with symmetrically located producers of Eaton and Wooders (1985). The characterisations of the equilibria in the Salop-model have been shown to be weak (Economides 1989, Schulz/Stahl 1985): Salop avoided the existence problem of pure strategy equilibria by disregarding a full-fledged stage of choice of locations and considering symmetric locations only. Schmitt (1993) adopts the Salop model to a multi-spatial market context assuming a symmetric and interleaved pattern of firm location and zero profit equilibria at the outset. This is justified by taking the costless relocation of firms as a benchmark of the analysis. Although an equilibrium of the price subgame exists taking symmetric locations for granted, there is no existence of *any* price subgame. Accounting for this weakness by adopting a quadratic transportation cost function, as is done by Eaton/Wooders (1985) and by Schmitt (1993) doesn't help much to ensure the robustness of this class of models: The transportation cost function has to be strictly exponential. Already a linear exponential form would again imply non-existence of the equilibrium (Gabszewicz/Thisse 1986, pp. 26-30). What is more, the existence of the price equilibria depends critically on the firms having identical cost functions.[1] The purpose of

[1] In the spatial context such an assumption appears to be particularly restrictive. If for example some inputs are not ubiquitous and transportation is costly the assumption of identical cost functions is invalidated even if the firms use the same technologies (Cf. Schulz/Stahl 1985).

this paper is to characterise location in and trade equilibria between separate but interdependent spatial markets when location decisions are taken sequentially. Sequential location prevents that the subspace of choices involving the firms' choice of locations is degenerate. In the non-sequential specification of location models, firms' payoffs normally depend on their distance to the other firms in geographic space and not on their locations proper. This entails that any two neighbouring firms are not individually free to choose the distance between each other, and for an equilibrium to exist they have to conform to a payoff maximising one.

It will be shown that a unique subgame perfect location-price equilibrium exists if the first stage location game and the second stage price subgame have a Stackelberg move structure. We will illustrate how trade liberalisation leads to the establishment of outlets in the export market and that "reciprocal dumping" occurs like in the trade theoretic literature in spatial markets as well.

The analysis is restricted to the case of two domestic and one exporting firm. Extensions to more general cases appear to be conceptually easy but computationally extremely involved.

In the next subsection the model is outlined. Following the logic of the Hotelling-type models of spatial competition we first determine the price equilibrium independence of locational parameters. On the basis of this price equilibrium the location equilibrium is derived starting out from the conditions which foreclose further entry.

The model

As set out in the introduction two spatial markets are touched upon, each being circular with unit length and offering a continuum of possible locations. We thus avoid well-known peculiarities associated with market boundaries. Each firm produces a single good at one location but each good can be sold in both markets. If a firm i produces and sells in the home market, a mill price p_i is charged, assuming that there is no price discrimination. The mill price of the output of firm i on the export market is q_i+t, t denoting a specific unit intermarket shipping cost and q_i the net foreign price. The firms do not produce but act only as sellers in the foreign market. As is known from the recent trade theoretic literature, p_i and q_i may differ if firms perceive different spatial markets as separate entities[2].

In each market the consumers' density is uniform and normalised to one. Each consumer has a perfectly inelastic demand for one unit of the good and incurs transportation costs which are a linear function of the distance between the consumer's and the firm's or seller's location. Consequently, the full price paid by the consumer is $p_i + c|s^c + s_i|$ or $q_i + t + c|s^c + s_i|$, where s^C denotes the consumer's location and s_i the location of firm i. The firms have identical cost functions of the form

2 On the empirical support for the "segmented market perception hypothesis" cf. Giovannini (1988) and Knetter (1989 and 1993).

$C(y) = f + ky$.

To facilitate the computation of equilibrium values (without changing the qualitative results of the analysis) it is assumed that marginal costs k are equal to zero. f denotes location specific sunk costs.

Domestic firms and foreign exporters compete in location and prices. Location decisions are taken once for all as relocation is prohibitively costly in the short-run. As prices can be revised at any time it is natural to assume that the location-price equilibrium is determined in a two-stage noncooperative game where location decisions are taken at the first stage. As has been discussed extensively in the literature following the seminal article of d'Aspremont et al. (1979) a pure strategy Nash equilibrium doesn't exist if the transportation cost function is linear and the competing firms move simultaneously in the price subgame. What the location decisions is concerned it is supposed that the firms appear on the markets one after the other in historical time while firms are foresighted in that they anticipate entry and location of future competitors. That is, the first firm acts as a Stackelberg leader in the location game with respect to firms two which in turn is a follower with respect to firm one and a leader with respect to firm three etc. As in Anderson (1987) for a linear and bounded market and in Kopp (1993) for a circular market we assume that the assignment of roles is reversed for the price subgame: The firm that enters last is the leader of the price subgame with respect to the second firm and the second firm is leader with respect to the first one etc.

To keep the model tractable the analysis is restricted to two domestic firms on each market which anticipate a reduction of intermarket shipping costs, exports of a foreign competitor and hence the location of an exporter's outlet in their home market. In the initial situation, where intermarket transaction costs are prohibitively high, only two producers are able to coexist in each market. After the reduction of the intermarket shipping costs there is only one seller who can recover his location-specific sunk costs. In the sequel the domestic firms will be called firm one and two and the foreign seller firm three.

Autarky equilibrium with prohibitive intermarket transaction costs

As prices can be changed instantaneously, the firms' anticipation of the market entry of a foreign competitor doesn't change the equilibrium of the price subgame as long as the intermarket shipping costs are sufficiently high to preclude exports. As will be shown below the expectation that the intermarket transaction costs will be reduced changes the location equilibrium in that the non-uniqueness of the location equilibrium that has been ascertained for a single circular market disappears (Kopp 1993, esp. Prop. 3). Given that the location equilibrium with three firms in a circular market implies a distance between firm one and firm two that lies within the equilibrium set of locations of the two firm game, the equilibrium of the price subgame with two firms protected by prohibitively high intermarket transaction costs but expecting its reduction foreign exports is identical to the price equilibrium with two firms competing in a single spatial market.

The location of firm one is fixed at point 0(1) and the location of firm two s_2 is restricted without loss of generality to the locations $0 \le s_2 \le 1/2$. In the no trade situation the demands of the two domestic firms are (cf. the detailed explanation in Kopp 1993):

$$D_1 = 1 + \bar{x} - \underline{x} = \frac{1}{2c}\{2p_2 - 2p_1 + c\}, \text{ and}$$

$$D_2 = \underline{x} - \bar{x} = \frac{1}{2c}\{2p_1 - 2p_2 + c\}.$$

Firm two being the leader of the price subgame we obtain the following equilibrium prices (cf. Prop. 2 in Kopp 1993):

$$p_2^L = \bar{p}_2 = \frac{3}{2}c - c(2 - 4s_2)^{\frac{1}{2}} \text{ for } s_2 < 23/64,$$

$$p_2^L = 3/4\ c \text{ for } 23/64 \le s_2 \le 1/2. \tag{1}$$

The optimal supply price of the follower is given by

$$p_1^F = c - \frac{1}{2}c(2 - 4s_2)^{\frac{1}{2}} \text{ for } s_2 < 23/64, \text{ as } \bar{p}_2 = \frac{3}{2}c - c(2 - 4s_2)^{\frac{1}{2}}, \text{ and}$$

for $23/64 \le s_2 \le 1/2$

$$p_1^F = \frac{5}{8}c. \tag{2}$$

Due to the firms' expectations the location equilibrium is the same as if firm three had virtually entered the market and will be discussed below.

<u>Price equilibrium with intermarket goods trade</u>

As we have assumed identical technologies and zero marginal production costs the decision to sell to the foreign market does not affect price, output and location decisions with respect to the domestic market. Hence the analysis of the consequences of less than prohibitive intermarket transaction costs can be confined to looking at one market.

If just one foreign seller is able to earn non-negative profits and maintaining the assumptions that firm one locates at 0 and firm two locates in the first half of the market from the analysis of the no-trade-situation, we obtain a location configuration like in Fig. 1. The s_i (i=1,2,3) in Fig. 1 denote the locations of the individual firms. x', x" and x"' denote the boundaries of the market areas of the individual firms. The values of these market boundaries are derived from the condition that the full prices of the direct competitors have to be equal where their market areas touch. p_i (i=1,2) denote the prices of the domestic firms. and q the price of the foreign exporter.

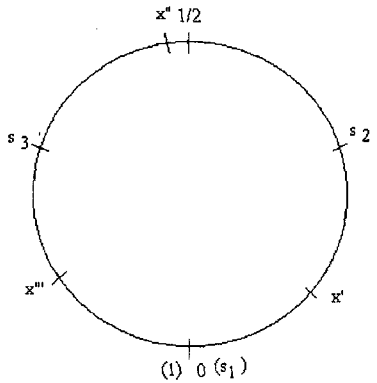
$p_1 + cx' = p_2 + c(s_2 - x')$, from which follows

$x' = \frac{1}{2c}\{p_2 - p_1 + cs_2\}$. Similarly

$x'' = \frac{1}{2c}\{q + t - p_2 + c(s_3 + s_2)\}$, and

$x''' = \frac{1}{2c}\{p_1 - q - t + c(1 + s_3)\}$.

Figure 1: Location and market boundaries of three firms in a circular market



These market boundaries imply the following firm specific market areas, indicating the at the same time the demand functions of the individual firms:

$$D_1 = 1 + x' - x''' = \frac{1}{2c}\{p_2 + q + t - 2p_1 + c(1 + s_2 - s_3)\}, \tag{3}$$

$$D_2 = x'' - x''' = \frac{1}{2c}\{p_1 + q + t - 2p_2 + cs_3\}, \text{ and} \tag{4}$$

$$D_3 = x''' - x'' = \frac{1}{2c}\{p_1 + p_2 - 2(q + t) + c(1 - s_2)\}. \tag{5}$$

D_3 describes the export demand of one of the two foreign firms which had been established on the foreign market in the autarky situation. One of the two domestic firms faces identical import demand from the foreign country.

With respect to the first stage location subgame we assume as in the autarky case the firms enter one after the other in historical time. The first firm locates at point 0 (1). Firm two chooses its distance from firm one anticipating that trade barriers will be reduced such that one foreign exporter contemplates to set up an outlet in the foreign market.

What the price subgame is concerned it is assumed that the foreign exporter acts as a Stackelberg price leader after having entered the market. The domestic firms set their prices as Stackelberg followers[3] but compete among themselves in a Bertrand fashion. Both domestic firms determine the reaction functions $p_1(p_2,q)$ and $p_2(p_1,q)$ from the first order conditions of profit maximisation:

$$p_1 = \frac{1}{4}\left(p_2 + q + t + c\left(1 + s_2 - s_3\right)\right), \text{ and} \tag{6}$$

$$p_2 = \frac{1}{4}\left(p_1 + q + t + cs_3\right). \tag{7}$$

From the Bertrand-Nash equilibrium follow the reaction functions of the domestic producers as functions of the price of the foreign competitor:[4]

$$p_1^* = \frac{1}{3}(q + t) + \frac{4}{15}c(1 + s_2) - \frac{1}{5}cs_3, \text{ and} \tag{8}$$

$$p_2^* = \frac{1}{3}(q + t) + \frac{1}{15}c(1 + s_2) + \frac{1}{5}cs_3. \tag{9}$$

That is, if the intermarket shipping costs are reduced to a level that would make imports profitable the domestic prices are influenced by the size of the intermarket shipping costs and the anticipated location of the foreign competitor. Acting as a price leader firm three maximises profits employing the reaction functions of the competitors. That is, it maximises the following profit function:

$$\begin{aligned} \pi_3 &= q\frac{1}{2c}\left\{p_1 + p_2 - 2(q + t) + c(1 - s_2)\right\} \\ &= q\frac{1}{2c}\left\{-\frac{4}{3}(q + t) + \frac{4}{3}c - \frac{2}{3}cs_2\right\} \end{aligned} \tag{10}$$

Consequently, the profits of the exporter depend on the distance between the neighbouring domestic firms but not on the location proper of the outlet. First order conditions of the profit maximum imply that the equilibrium price of the foreign entrant

3 As has been shown in the companion paper (cf. Prop. 4 in Kopp 1993) the domestic firms prefer the followership position to the leadership position in the price subgame.

4 As has been shown for the autarky equilibrium (Kopp 1993), the existence of the price equilibrium is ensured by the sequential character of location choice in the first stage location game.

q* depends on both the intramarket transportation costs, the intermarket shipping costs and the location of firm two:

$$q^* = \frac{1}{2}c - \frac{1}{4}cs_2 - \frac{1}{2}t. \tag{11}$$

The equilibrium price equation indicates that imports will only occur if $s_2 \leq 2 - 2\frac{t}{c}$. Reflecting the degeneracy of the location problem of firm three its profits are independent of its own location but are a function of the (shorter) distance between the two domestic firms which is indicated by s_2. Without any further restriction on the firms' decision the first stage location equilibrium would be indeterminate. Moreover, we have to check, if the foreign exporter decides to move close to one of the domestic firms, whether they can increase their profits by adopting the "mill price undercutting strategy". In other words, we have to ask whether the domestic firms can profitably charge mill prices such that their gross prices at the location of the outlet of the exporter are lower than the net price of the foreign competitor. This "mill price undercutting" appears to be particularly likely in view of the intermarket shipping costs.

We first consider the case that the exporter's outlet is located closer to firm one than to firm two. That is, firm one contemplates adopting the "mill price undercutting strategy". This is a viable strategy if profits are higher then compared to those that result from the accommodation of the foreign exporter. To undercut firm one has to choose a maximal price that is just below firm three's mill price minus the unit transportation costs between the two firms:

$$p_1|_U = q + t - c(1 - s_3) - \varepsilon, \text{ with } \varepsilon > 0, \text{ and } \varepsilon \to 0. \tag{12}$$

With only the two domestic firms remaining on the market, firm one's general demand expression is

$$D_1 = \frac{1}{2c}\{2p_2 - 2p_1 + c\}. \tag{13}$$

Both firms decide simultaneously on prices. Firm two's reaction function is

$p_2 = \frac{1}{2}p_1 + \frac{1}{4}c$, which implies the equilibrium price

$$p_2^{*\prime} = \frac{1}{2}(q + t) - \frac{1}{4}c + \frac{1}{2}cs_3, \tag{14}$$

(q+t) denoting the mill price of firm three and s_3 its location. If firm one decides to undercut, its profits are

$$\begin{aligned}\pi_1|_U &= \frac{1}{2c}(q+t-c(1-s_3))\left(-(q+t)+\frac{5}{2}c-cs_3\right)\\ &= \frac{1}{2c}\left(-(q+t)^2+c(1-s_3)(q+t)+\frac{5}{2}c(q+t)-\frac{5}{2}c^2(1-s_3)+c^2(1-s_3)s_3\right)\end{aligned} \tag{15}$$

If the domestic firms accommodate entry of the foreign exporter, firm one will choose its price according to the above reaction function (8). The demand of firm one as a function of the exporter's mill price and the location of firms two and three is then:

$$D_1|_M = \frac{1}{2c}\left\{\frac{2}{3}(q+t)+\frac{8}{15}c(1+s_2)-\frac{2}{5}cs_3\right\} \tag{16}$$

The expression for the profits of firms one in the case of accommodation are

$$\pi_1|_M = \frac{1}{c}\left\{\frac{1}{3}(q+t)+\frac{4}{15}c(1+s_2)-\frac{1}{5}cs_3\right\}^2. \tag{17}$$

Comparing $\pi_1|_U$ and $\pi_1|_M$ the range of the exporter's net price can be determined for which it is profitable for firm one to undercut.

$$\begin{aligned}\overline{q}_{(1)} &> -t+2,5727c-0,1455cs_2-0,7091cs_3\\ &\pm c\left(-0,5071-0,6069s_2+0,3808s_2s_3+1,2139s_3+0,0952s_2^2-0,3808s_3^2\right)^{\frac{1}{2}}\end{aligned} \tag{18}$$

That is, the undercutting strategy is viable if the exporter charges a net mill price q which is larger than the right hand side of the above expression. As we are looking for a threshold value from which on firm one will switch to the deterring strategy, it is clear that the smaller of the two net prices is the relevant one.

In the same way we determine the value of q which would induce firm *two* to switch from an accommodation strategy to a undercutting strategy. Were firm two to compete the foreign exporter out of the market, it would have the mill price

$p_2|_U = q+t-c(s_3-s_2)-\varepsilon$, with $\varepsilon > 0$, and $\varepsilon \to 0$.

The profits of the second firm are then:

$$\begin{aligned}\pi_2|_U &= \frac{1}{2c}(q+t-c(s_3-s_2))\left(-(q+t)+\frac{3}{2}c+c(s_3-s_2)\right)\\ &= \frac{1}{2c}\left\{-(q+t)^2+\left(\frac{3}{2}c+2c(s_3-s_2)\right)(q+t)-\frac{3}{2}c^2(s_3-s_2)+2c^2s_2s_3-c^2s_2^2+c^2s_3^2\right\}\end{aligned} \tag{19}$$

In case of the accommodation of the foreign exporter we obtain, in the same way as above for firm one, the following profit function:

$$\pi_2\big|_M = \frac{1}{c}\left\{\frac{1}{3}(q+t) + \frac{1}{15}c(1+s_2) + \frac{1}{5}cs_3\right\}^2 \qquad (20)$$

The range of q's which correspond to the profitability of the undercutting strategy follows from the inequality $\pi_2\big|_U > \pi_2\big|_M$:

$$\begin{aligned}\overline{q}_{(2)} > {} & -t + 0{,}5773c - 0{,}8545cs_2 + 0{,}7091cs_3 \\ & \pm c\left(0{,}3260 + 0{,}2261s_2 - 1{,}6795s_3 + 0{,}3808s_2s_3 - 0{,}0952s_2^2 + 1{,}2555s_3^2\right)^{\frac{1}{2}}\end{aligned} \qquad (21)$$

By the same reason as above the smaller value is the threshold value leading to the deterrence of the foreign exporter by the domestic firm two.

Comparing the expressions for the maximal q's, $\overline{q}_{(1)}$ and $\overline{q}_{(2)}$, with the equilibrium price equation of firm three we obtain locational parameters which imply the entry deterrence if firm three behaves according to the Stackelberg leader pricing rule that has been identified for the equilibrium of the (second stage) price subgame in equation (11). Setting the equilibrium price of firm three equal to the maximal price that is compatible with market entry we obtain expression for the minimal distance between the domestic firms and firm three as functions of the intra- and the intermarket shipping costs that are just compatible with exports from the foreign market.

The historical process of entry of firms will continue as long as the entrant can expect non-negative profits and no undercutting by at least one of the neighbouring firms occurs. The postulate that firm three should be the last one to enter is equivalent to the presupposition that no fourth firm can locate between firm three and firm one or between firm three and firm two without being undercut by either of the domestic firms. This in turn implies that the distance between the domestic firms and the foreign exporter must be equal to the minimum distances calculated above. Algebraically this means that the s_3 in the expressions for the minimal distances of domestic to the foreign firm must be equal.

Setting q* from equation (11) equal to $\overline{q}_{(1)}$ we obtain the following expression for s_3:

$$\begin{aligned}\overline{s}_3^{(1)} = {} & 2{,}3504 + 0{,}2994s_2 - 0{,}0402\frac{t}{c} \\ & \pm\left(0{,}0885 + 0{,}0944\frac{t}{c}s_2 + 2{,}5845s_2 + 0{,}1850s_2^2 - 0{,}2813\left(\frac{t}{c}\right)^2 + 2{,}1569\frac{t}{c}\right)^{\frac{1}{2}}\end{aligned} \qquad (22)$$

If firm three is undercut using the equilibrium price strategy and locating at a slightly higher than the smaller of the values of s_3 this holds a forteriori for the larger one. Hence the smaller of the values for s_3 is the one we were looking for.

In a completely analogous way we calculate the s_3 that belongs to the minimal distance between firm two and firm three:

$$\bar{s}_3^{(2)} = 1{,}0429 - 0{,}8225 s_2 - 0{,}4711\frac{t}{c}$$
$$\pm\left(0{,}6625 - 2{,}1401 s_2 + 1{,}2884 s_2^2 + 1{,}5779\frac{t}{c} s_2 - 0{,}9846\frac{t}{c} + 0{,}5540\left(\frac{t}{c}\right)^2\right)^{\frac{1}{2}} \quad (23)$$

By a similar argument as for the relevant s_3 derived from the analysis of the minimum distance between firm one and firm three we have the greater value here as the relevant one: If undercutting by firm two occurs for values of s_3 smaller than the greater of the two expressions this holds a forteriori for the smaller one.

As pointed out above $\bar{s}_3^{(1)}$ and $\bar{s}_3^{(2)}$ have to be equal to exclude further entry. Setting both expressions equal we are able to express the equilibrium location of the second domestic firm, which is follower to firm one in the first stage of the price location game to firm one and leader to firm three, as a function of the parameters c and t, i. e. the intra- and the intermarket shipping costs.

Conclusions

As to the effects of trade liberalisation we have established that with the reduction of trade barriers the number of competitors on the spatial markets involved increases. The increase of competitors has short run consequences for price competition. The intensified price competition leads to lower prices as from trade liberalisation with point markets.

If trade liberalisation is anticipated by the domestic producers they will respond in changing the locational pattern as well. Without further analysis of the process of entry of foreign exporters on a national market the locational equilibrium is not unique. The unique locational equilibrium is established from the peculiar "no further entry" condition of the process of sequential location of exporters' outlets. The entry process stops if no further entrant can locate between the last entrant and any of the suppliers having entered the market before without being undercut in the price game.

References

BEN-ZVI, Shmuel and Elhanan HELPMAN,
Oligopoly in segmented markets. In: Gene M. Grossman (Ed.), Imperfect Competition and International Trade, op. cit., pp 31-53.
BRANDER; James A. and Paul KRUGMAN
A "reciprocal dumping" model of international trade. In: Gene M. Grossman (Ed.), Imperfect Competition and International Trade. Cambridge, op. cit., pp. 23-30..
BRANDER, James A.
Intra-industry trade in identical commodities. In: Journal of International Economics, Vol. 11, 1981, pp. 1-14.
EATON, B. Curtis and Myrna H. WOODERS
Sophisticated entry in a model of spatial competition. In: Rand Journal of Economics, Vol. 16, 1985,.pp. 282-297.
ECONOMIDES, Nicholas
Symmetric equilibrium existence and optimality in differentiated product markets. In: Journal of Economic Theory, Vol. 47, 1989, pp. 178-184.
GROSSMAN, Gene M (Ed.)
Imperfect Competition and International Trade. Cambridge, Mass. 1992.
GIOVANNINI, Alberto
Exchange rates and traded goods prices. In: Journal of International Economics, Vol. 24, 1988, pp. 45-68.
HELPMAN, Elhanan
Increasing returns, imperfect markets, and trade theory. Working Paper. Tel Aviv University 1982.
KNETTER, Michael M.
International comparisons of pricing to market behaviour. In: American Economic Review, Vol. 83, 1993, pp. 473-486.
KNETTER, Michael M.
Price discrimination by U.S. and German exporters. In: American Economic Review, Vol. 79, 1989, pp. 198-210.
KOPP, Andreas
Spatial Competition and Equilibrium in a Circular Market. Kiel Working Paper No. 609. Kiel 1993.
SALOP, Steven C.
Monopolistic competition with outside goods. In: Bell Journal of Economics, Vol. 10,1979, pp. 141-156.
SCHMITT, Nicolas
Equilibria and entry in two interdependent spatial markets. In: regional Science and Urban Economics, Vol. ,1993, pp.
SCHULZ, Norbert and Konrad STAHL
On the non-existence of oligopolistic equilibria in differentiated product spaces. In: Regional Science and Urban Economics, Vol. 15, 1985, pp. 229-243.