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Multimarket contacts with trade costs and distance cost

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ABSTRACT: This paper presents a critical comparison of the four major papers on territorial allocation by Bernheim and Whinston, Lommerud and Sorgard, Schroder, and Bhattacharjea and Sinha. The paper adds a new dimension to the analysis as it also studies the impact of a change in distance on collusion and establishes the distance paradox which states that collusion is facilitated with a unit fall in the distance.

KEYWORDS: Trade liberalization, collusion, territorial allocation, cartels, trade paradox, distance paradox, payoffs, price competition, quantity competition, defection, Cournot competition

1. INTRODUCTION

This paper majorly analyses the impact of trade liberalization on the scope of collusion. Territorial allocation was observed in the cases of Atlantic which had involved American, German and Japanese firms which used to produce graphite. During the 1990s many firms were involved in territorial allocation in America and Europe (Bhattacharjea, A. & Sinha,U., 2015). Cartels like lysine, chlorine chloride and copper plumbing tools all demonstrate the home market principle (Pinto et al, 2015). Papers by Bernheim and Whinston, Lommerud and Sorgard, Schroder, and Bhattacharjea and Sinha are milestones in the literature on territorial allocation. This paper provides a critical comparison of these four papers and also suggests the scope for further study. The paper is novel in the sense that it also studies the impact of a change in distance on collusion and establishes the distance paradox which states that collusion is facilitated with a unit fall in the distance. The suggested distance paradox breaks down in case of more competition just like the trade paradox suggested by Bhattacharjea and Sinha (2015), with unit distance costs. The paper also finds that the distance paradox does not hold good in Cournot case when there are greater than /equal to two firms in a single country. Also, similar results hold when I assume transportation costs to be a quadratic function of distance just like in a quadratic Hotelling model.

2. LITERATURE REVIEW

Bernheim and Whinston (1990) present a model of spheres of influence and reciprocal exchange where there are two markets with two firms and homogeneous products with the costs greater for one firm. There are optimal punishments with zero payoffs in the punishment phase. They find that under the optimal collusive agreement the inefficient firm withdraws from each market. They obtain the same result with the side payments also.

Lommerud and Sorgard (2001) analyse the impact of trade liberalization on the scope of collusion both in case of price as well as quantity competition. In their model they follow the Nash reversion strategy in the punishment phase. In price competition trade liberalisation promotes collusion whereas in the case of quantity competition the results are reverse. They find that a fall in the level of t increases the profitability in the defection more under price competition as compared to quantity competition. But this is in opposition to the previous result, hence they next analyse the profits in the punishment phase. In case of price competition a fall in t reduces the profit earned by the home producer in the domestic market, but this does not increase the profitability of the foreign firm (Mittal, 2017). But in the case of Cournot competition trade occurs even in the punishment phase. Firms save trade costs and so profits increase when there is a fall in trade costs. But rivalry

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also increases when trade costs fall. So the total effect depends on the relative strength of these two effects. In Cournot competition the short run increase in profits in the defection phase dominates despite the point that profitability in the punishment phase is smaller and also less dependent on the level of trade costs than under Bertrand setting. They now turn to optimal punishments which yield zero payoffs in the deviation phase. The trade paradox reverses in this case. In earlier case profit under punishment was determined by the level of trade costs (Garg & Mittal, 2021). But now with optimal punishments, punishment is harder with zero profits. But this harsher punishment does not depend on the level of trade costs. The reduced trade costs only increase the attractiveness of attacking the foreign market. Now they assume the case of cost asymmetry where $t > c_2 > c_1 = 0$. c is the unit production cost and the high cost firm is capable of providing the product at a lower cost as compared to the foreign firm. Further, they find that trade liberalization promotes collusion. They next investigate the asymmetry in the market size. They assume the following demand function where $a_2 = 1$and $a_1 > 1$ i.e. market B is smaller.

$$q_i = a_i (1 - p_i)$$

The discount factor is greater in this case as compared to the symmetric case and also trade liberalization promotes collusion.

Schroder (2007) also does the same analysis but now along with the unit trade costs t he includes an ad valorem trade cost τ. The only change which he observes is that now $\frac{\partial \delta}{\partial \tau}$ is less than zero. A fall in unit trade costs means a price increase in the deviation phase. But an ad valorem trade costs fall adds to the gain in the deviation phase when the prices are high. On the other hand, it costs very less in the punishment phase because the prices are anyway depressed so a further fall hardly makes any difference. He repeats this exercise for Cournot competition and again finds $\frac{\partial \delta}{\partial \tau}$ less than zero.

Bhattacharjea and Sinha (2015) also analyse the impact of trade liberalization on the level of collusion. But they carry out their analysis with a general demand function. They establish their trade cost paradox result and also generalise the result for M+1 countries. They further establish that the trade cost paradox disappears when there are more than one firm in a single market because now the Nash reversion strategy yields payoff of zero unlike in the single firm case. They next establish the competition paradox which states "When the number of firms increases from one in each country to any number n= max(n_a , n_b), (where n_a , $n_b > 1$), there exists a level of trade costs $\tilde{t}$(n) < $\bar{t}$ such that for t∈($\tilde{t}$(n), $\bar{t}$) the increase in the number of firms to n reduces the critical discount factor and makes collusion with SOI more likely." (Bhattacharjea and Sinha, 2015, p. 48)

3. A CRITICAL COMPARISON OF THE ASSUMPTIONS AND CONCLUSIONS OF THE PAPERS

Bernheim and Whinston develop a model of spheres of influence and reciprocal exchange. They conclude that the inefficient firm withdraws from each market and the optimal collusive outcome leads to the development of spheres of influence. But the paper by Lommerud and Sorgard is a development over the previous paper because Bernheim and Whinston do not consider the impact of a change in trade costs along with the assumption that trade takes place in the collusive outcome. Lommerud and Sorgard analyse the impact of trade costs on collusion. Schroder's paper is novel because along with the unit trade costs he also analyses the impact of ad valorem and fixed trade costs on collusion. Bhattacharjea and Sinha's paper goes one step further because they formally state the trade costs paradox for the first time. Schroder carries out his analysis with a linear demand function and Lommerud also does the same but he also proves the robustness of his results by using a general demand curve in the Appendix. Bhattacharjea's paper carries out all the analysis with a general demand function. Bernheim and Whinston, and Bhattachrjea and Sinha carry out their study for price competition whereas Lommerud and Sorgard, and Shroder also study the impact of trade costs in Cournot competition. Bernheim and Whinston go for optimal punishment whereas all the other papers follow Nash reversion in the punishment phase. But Lommerud and Sorgard also generalise their results for optimal punishments. Only their paper also presents the case of asymmetric costs. Lommerud and Sorgard also generalise their results for fixed costs. Schroder finds that the trade cost paradox reverses in the case of ad valorem costs. The paper by Bhattacharjea and Sinha comes up with a totally new finding which is the competition paradox which states that an increase in competition facilitates collusion. No previous paper establishes this result. Also they generalise the trade paradox for M+1 countries and they also find the reversal of trade cost paradox when there are more than one firm in a single market. Except their paper, none of the previous papers establishes the case of the reversion to a domestic cartel.

There remains a scope for further development. The robustness of all the results of Bhattacharjea and Sinha's paper like the trade costs paradox and competition paradox could be checked for trade costs which would include ad valorem as well as fixed costs. Also their analysis could be extended to include differentiated products. Also the robustness of Schroder results which showed opposite impact of ad valorem taxes as compared to unit costs could be checked for optimal punishments instead of the Grim trigger strategy.

All of these studies have not extended their results to analyse the impact of distance costs on the scope of collusion. In the next section I extend the previous results by including the distance costs. I find that a fall in

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the distance facilitates collusion in price competition. Now this result is paradoxical because globalization in the form of reduction in distance is facilitating collusion, hence I name this as the distance paradox.

Extension I: The Distance Paradox

In all the previous papers analysed, the authors have considered only trade costs and not the impact of distance on the scope of collusion. The distance between two countries is denoted by the parameter d. Globalization and liberalization lead to a fall in the distance between two countries because if two countries become more integrated then they sign new trade agreements and so new trade routes are built which eventually lead to a fall in the distance between two countries. In this section I will be considering the effect of change in the distance costs on the scope of collusion. Let the cost per unit of distance and per unit of output be t. Hence, the cost per unit is td.

Let $q_i = 1 - p_i$

td <1/2

π^{BM}=1/4 be the monopoly profits.

π^{BD} = 1/4 +1/4 –1/2td : be the defection profits. When a firm defects it earns monopoly profits in its own market and defection profits in the foreign market.

In the punishment phase a firm would set the price so that the foreign firm makes zero profits in the foreign market and so a defector would earn Nash profits in home market.

Hence, π^{BP}= td(1-td).

Hence, the incentive compatibility condition for collusion is

$$\frac{\pi^m}{1-\delta} \geq \pi^D + \frac{\pi^{BP}\delta}{1-\delta}$$

Inserting the values for all expressions yields the following condition:

$$\delta \geq \frac{1}{2(1-td)}$$

$$\frac{\partial \delta}{\partial d} = \frac{t}{2(1-td)^2} \geq 0$$

Hence, with one firm in every country a reduction in distance facilitates collusion and I term this as the distance paradox. The intuition behind this could be that a fall in the distance leads to a fall in the distance costs and increases the incentives for defection. But on the other hand a fall in the distance leads to harsher punishments and so this effect dominates here. In case of Cournot competition

$$\delta \geq (9 - 18td)/(22td + 13)$$

And $\frac{\partial \delta}{\partial d} = -432t/(22td + 13)^2 < 0$ just like in the case of trade costs.

Now when there are greater than or equal to two firms in a country then the trade cost paradox proposed by Bhattacharjea and Sinha breaks down. Now let us see whether my distance paradox holds good in a more competitive environment or not.

$$\frac{\pi^m/n}{1-\delta} \geq \pi^D$$

In the collusive phase the firms stay out of each other's territory and equally divide the monopoly profits. The punishment profits are zero because of the Nash reversion strategy which yields zero profit.

Where n is the number of firms in market A.

$$\frac{1}{4n(1-\delta)} \geq \frac{1}{4} + \frac{1}{4} - \frac{1}{2}td$$

$$\delta \geq 1 - \frac{1}{2n(1-td)}$$

$$\frac{\partial \delta}{\partial d} = \frac{-t}{2n(1-td)^2} \leq 0$$

Now this expression is less than zero.

Hence, my distance costs paradox also breaks down when there are more than one firm in a country just like the trade cost paradox.

Now, we may take up the case of quantity competition.

$$\pi^{cp} = 1/(n+1)^2$$

$$\delta \geq \frac{(n+1)^2[4n + n(1-2td)^2 - 4]}{(n+1)^2 n(4 + (1-2td)^2) - 16n}$$

$$\frac{\partial \delta}{\partial d} < 0$$

Hence, the distance paradox does not hold good in the case of Cournot competition in the case of many firms just like the price competition case.

Now I turn to quadratic distance costs and see their impact on collusion. Hence, now the transportation costs are a quadratic function of distance td^2 and less than ½ so that distance costs are not prohibitive.

The incentive compatibility conditions lead to the following value of δ,

$$\delta \geq \frac{1}{2(1-td^2)}$$

$$\frac{\partial \delta}{\partial d} = \frac{td}{(1-td^2)^2} \geq 0$$

Hence, the distance paradox holds good even in case of quadratic distance costs. Now let us examine its validity in case where there are more than one firm in the home market.

$$\frac{\pi^m/n}{1-\delta} \geq \pi^D$$

$$\delta \geq 1 - \frac{1}{2n(1-td^2)}$$

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$$\frac{\partial \delta}{\partial d} = \frac{-td}{n(1-td^2)^2} \leq 0$$

Again, my distance paradox breaks down in case of more competition just like the trade cost paradox.

Extension II:

This section explores empirical evidence with respect to multimarket contacts and trade costs. Pinto et al (2015) explore the role of trade costs and home bias in trading. Home bias is defined as the disproportionately large share of domestic products in the home market. They conduct a laboratory experiment for finding the role of trading costs for home bias. They find evidence in support of the Brander and Krugman argument. They find larger home bias than what has been predicted by theoretical models. Surprisingly, home bias exists irrespective of the trade costs. So the other explanation of home bias could be collusion between the firms. In the treatment groups considered by them they find that both the firms don't serve the export market and sell monopoly quantities in their home markets. This indicates that 'gains from trade in oligopolistic markets can be hampered by collusive division of geographic markets.' (Pinto et al, 2015, p. 3)

4. CONCLUSION

The paper analysed the impact of trade costs reduction on the scope of collusion. It critically analysed the assumptions and conclusions in the four milestone papers in the literature of industrial organization. All the concerned papers focussed on trade costs and not on the distance costs. Hence, the present paper extended the existing analysis to incorporate distance costs also. I came up with a distance paradox which states that a fall in the distance between two nations facilitates collusion in price competition and not in the case of Cournot competition just like the trade costs paradox. Just like the trade costs paradox the distance paradox holds in the case where there are more than two firms in a country in price competition. Also when I assume that transportation costs are a quadratic function of distance then it holds good when there are two firms operating in a country but breaks down when more than two firms exist in a country, just like the trade cost paradox. Pieces of empirical evidence with regard to the home market principle are also considered in the last section.

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