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COMPETITION ON THE WEB STUDY THROUGH THE PRISM OF ECONOMICS OF NETWORK. CASE OF WEB COMPANIES FROM DIFFERENT GEOGRAPHIC AREAS

Iulian CARAGANCIU, Lecturer, PhD,
"Lucian Blaga" University of Sibiu, Romania
E-mail: j.caraganciuy@gmail.com

Abstract

This paper aims to develop a model that could help determine the rank of influence of a certain e-commerce company from a country against its competitors from other countries. In turn this gives us the possibility to understand better the area of competitive collusion between two e-commerce companies from different countries.

One of the main competition models on the economics of networks topics, is Corominas-Bosch model. However the model is based on suppliers and customers which has a moderated utility in the field of web based business, due to the difficulty in determining the quantity of suppliers that a client is exposed to because of the awareness levels for a certain web business.

Keywords: *economics of networks, network model, web market, web based business.*

JEL classification: A1, B5, D4

1. Introduction

In this paper we are going to study, with the help of a model, the area of competitive collusion, between two e-commerce companies that operate in different geographic areas [4].

In order to accustom the uninitiated reader with the concepts necessary for understanding the model itself we will have to present some of the basics for the economics of networks as well as theoretic models related to competition and how it is treated by economics of networks theory.

As an introduction to the economics of networks, which are necessary in order to better understand the web market as a whole. A network describes the relations between nodes, which could be countries, web pages etc., and the connections between these nodes, which could represent a connection between two or more pages, companies as well as access to a certain market.

The set of nodes in a network can be described as $N = \{1,2,3, \dots, n\}$ where n is a finite number. This network is denoted by $g_{ij} \in \{1,0\}$, where g_{ij} is 1 if there is a link between nodes I and j, otherwise g_{ij} takes the value of 0 [3].

These links represent the connections that arise between nodes, which we have defined as being companies or web pages or markets. They are very important in terms that if we have no link whatsoever between two nodes then there is no economic connectivity between those.

Now we are going to try to cover distance in network relations. We can mention distance between two distinct nodes, let them be I and j only if there is an existent link between the two. Therefore we have two possible cases when we can mention distance in a network. First case is when we have $g_{ij}=1$. While the second case is when we have a set of distinct intermediate nodes such as j_1; j_2; … j_n, such that we get a relation $g_{ij1}=g_{ij2}=\dots=g_{ijn}$.

A geodesic distance in a network is the shortest possible distance between two distinct nodes and can be denoted by d (i, j; g). If there is no path between two nodes in a network g then the distance $d(i,j;g) = \infty$.

2. Competition in the economics of networks

One of the most interesting models in the field of economics of networks in terms of competition material is the model by Corominas-Bosch [2]. She separates the nodes into two groups – buyers and sellers, presuming that each seller has a single good to sell, which is valued at price of 1. A price p between a pair of sellers means that the buyer would have to pay a price 1-p while the seller will get a price p.

The network's role in this model however is to determine which buyer can sell to what seller. Round one of the bargaining takes place in which the sellers declare a price for their goods, and buyers can either accept the offer or reject all offers. The sellers and buyers that participated in a transaction leave the market. Then the second bargaining round begins, this round takes place as any other even numbered bargaining round, in this round the buyers offer a price for the goods and the sellers either accept them or reject all prices. Suppose all traders discount the future at rate $\partial \in \{0,1\}$. Thus the discounted payoffs if a buyer trades at time t are $\partial^t(1-p)$ [2].

Therefore we are going to have three possible outcomes, one is favorable for the buyer when price (p is close to 0), the other one is favorable for the seller and therefore price is close to 1, and the last situation when the bargaining is bilaterally beneficial therefore the price will be close to ½.

In a more general network however where there is a multitude of sellers and buyers that are all interconnected, the price will be determined by the supply and demand curve. Let's say we have n sellers and m buyers, then if on the market $n > m$ then the price will tend to be 0. While if we have $n < m$ then the price will tend to 1, and in the case of $n = m$ the price is unpredictable and will be somewhere between 1 and 0.

If the graphs let's say G are complex then we can decompose them and get three possible types of sub graphs. The first type of resulted sub graph is $G_1^S, G_2^S, G_3^S, \dots, G_{n_s}^S$ for the seller surplus type, the second type is $G_1^b, G_2^b, G_3^b, \dots, G_{n_b}^b$ for the buyer surplus sub graph and the third type is $G_1^e, G_2^e, G_3^e, \dots, G_{n_e}^e$ for the equilibrium type.

The payoffs in these types of sub graphs can be described using the supply and demand curve. Therefore sellers in sub graphs G^S get 0 and buyers get 1, while Sellers in sub graphs G^B get 1 and buyers get 0 and sellers in G^e type sub graphs get $z = \frac{1}{1+\partial}$ and buyers get $1 - z$.

3. Market Model

The theoretical model which is about to be presented if it were to be classified by the previous criteria, presented by Giaglis and Peteli [4], it would most likely, at this stage of the research, fall under the category of "Understanding" business models.

In order to define the web market and its margins we have to keep in mind that a web business operates globally, therefore it has no boundaries and can be accessed from any country or region. Thus one of the ideas to define the web market geographic area of influence is to view it as a network, in which web companies are viewed as hubs. The other network nodes with which those hubs are linked could represent countries. As a result we would get something like the graph in the Figure 1 [1].

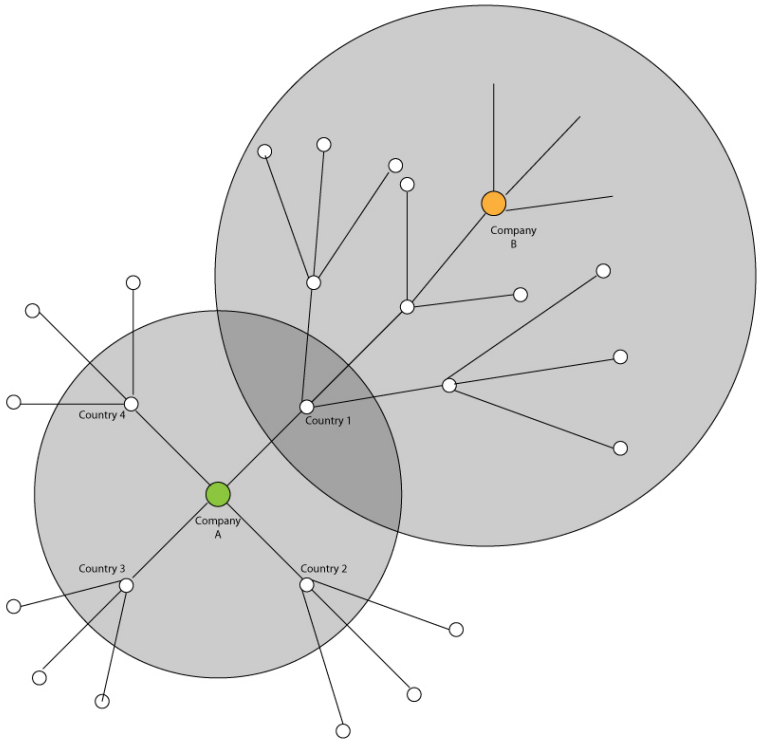

Figure 1: Competition on the web Market

Source: Developed by the author.

In the graph presented in Figure 1 we denote n as the number of countries and n_A as the number of countries on the company A's market and n_B on the company B's market accordingly. To define the size of the market A we could use the following method $Price\ for\ a\ good\ in\ a\ country \geq p_a + a \times c_d$, where a represents the number of connections between a hub and a country (distance), c_d cost of delivery to that country (in order for this to make sense we are to assume that all of the delivery costs for a link's length is the same value) and p_a represents price of a good in country a.

The size of the markets can be calculated as a sum of the countries' markets that are incorporated in this. But since the web market is a global market then we are going to have a primary sales market (which is located in a single country, in our case the Hub country itself), which generates let assume over a half of the company's revenue and secondary markets that compose the rest. Then the decrease in the demand curve would influence the price setting by company A only if the demand curve fluctuation would be in the primary market and not the secondary one, as the majority of the company's revenue comes from the primary market.

While to treat competitive collusion, between companies A and B, assuming that these companies are from completely different regions, we would have to look for the darker grey area in Figure 1, which basically represents the area where the company A sells its goods as well as company B.

However in order for this model to function define the collusion market properly we need to introduce the term of e-commerce rank of influence. This rank of influence is what we further are going to call the distance at which the price set by the e-commerce company can sell their goods and still be under the real market price of that market. Therefore the e-commerce rank for this model will be predefined for simplicity sake.

The distance between two e-commerce markets will be defined by the nodes which are between them, the nodes themselves will represent rank of countries. Rank of countries however will be determined by their proximity to the source country of the e-commerce, ascending. The effect of price discrimination, while present on the real market, will not be taken into account in this model. This is due to the fact that while being present on the web market it is unclear of why it is happening precisely. The causes could be multiple, one of which could be the fact, that companies include the transport cost for their goods already in the final price on the local market. I.E. amazon has more e-commerce website addresses, these vary by the country you are in. Some examples of such would be amazon.co.uk, amazon.de and at last but not least amazon.com. While the prices differ on amazon.co.uk from amazon.com this could be due to the fact that amazon.co.uk already incorporates the transport cost of the goods to the UK, therefore forcing the company to practice a higher price level which would be the composite of the main price and the aforementioned cost of transfer.

This being said, we cannot be sure whether the price differs in order to either undercut by a small margin the prices of other e-commerce websites of that region or to include delivery cost into the final price. The taxes and duties could also play a vital role in setting the price at a higher level for a certain country. This uncertainty determines us in our web market model to assume that the difference in price is due to the delivery costs alone and therefore be ignored, since we already incorporated delivery costs in calculating the e-commerce rank.

We are going to see multiple scenarios of e-commerce collusion and the way it could be illustrate by networks. The first case which we are to present is the case of a two company e-commerce competition collusion.

4. Two Company Market collusion

For this case we are to assume two e-commerce companies, let denote one of them A and the other B. We are to assume that on this web market these is no price discrimination, therefore the price of the company A is given only by its prices plus the delivery cost, the same method will be applied to company B.

Let the distance between these companies be n nodes, each node representing a country. And the delivery costs be denoted as $C = c_1, c_2, c_3 \dots c_n$, the prices of companies on markets denoted by nodes will be $P = p_1, p_2, p_3 \dots p_n$. The prices practiced by the companies themselves will be denoted by P_A and P_B respectively. K_{ij} will denote whether the company would still be profitable on that market or not and will take the form of:

$$K_{ij}^{A} = \begin{cases} 1, when\ P_A + C \leq P \\ 0, when\ P_A + C > P \end{cases}$$

For company B the company influence rank would be:

$$K_{ij}^{B} = \begin{cases} 1, when\ P_B + C \leq P \\ 0, when\ P_B + C > P \end{cases}.$$

Further we are going to check whether K_{ij}^{A} is met and for the number of C that cannot fulfill the profitability we will call it a rank of influence for company A. The same rules will be applied to company B.

We have to note that if the cost C is to be 1 for each node than we can just multiply it by the number of nodes to see the distance of e-commerce influence and this distance will depend solely on the prices P and the price set by the e-commerce itself.

For this we will have the following expression:

$$K_{ij}^{A} = \begin{cases} 1, when\ P_A + n \leq P \\ 0, when\ P_A + n > P \end{cases}.$$

And for the company B it will look the following

$$K_{ij}^{B} = \begin{cases} 1, when\ P_B + n \leq P \\ 0, when\ P_B + n > P \end{cases}.$$

In order to get to a more concrete case we are going to assume the influence of company A as being $\frac{n}{2} + 1$ and for the company B the same. Then we will have 2 ranks of countries (nodes) that will have competitive collusion between the two e-commerce companies.

The graph for this collusion can be seen in the following figure:

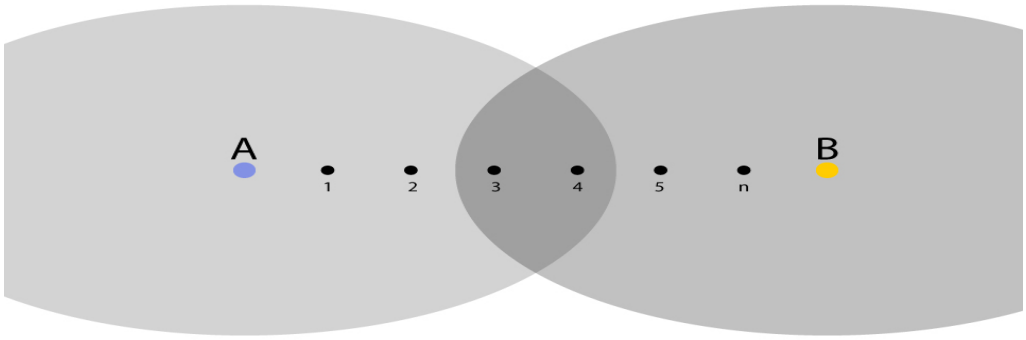

Figure 2: Competitive collusion for Companies A and B in case of $\frac{n}{2} + 1$ rank for each of the companies (Company A perspective)

Source: Developed by the author.

From this figure we can see that the competitive collusion will take place in rank 3 and 4 countries from A's perspective. However if the requirement K_{ij}^{A} equals zero from the beginning then we are talking about a small e-commerce that cannot be profitable outside of its country of origin and competitive collusion will take place only in case that their country will be in the influence of another e-commerce.

Presuming that each rank of countries has its own local e-commerce that has an influence rank of 1 and therefore is limited to only its local market, then the competition between the larger e-commerce and the local one will be brought down to the Awareness Trust Reputation and price model.

5. Three Company Market collusion

Denote companies A and B discussed before and add company Y. For these companies the e-commerce influence rank determination process will be the same as it was in the previous case. What will be different is that in this case we could have collusion between two companies and not have collusion with the third. I.E. we can have a collusion between A and Y and not have collusion with B. Or we could have a case when companies have a collusion of different strength. Assuming that we have a collusion between companies A and B, of two ranks of countries, and only have collusion of 1 rank of these companies with company Y.

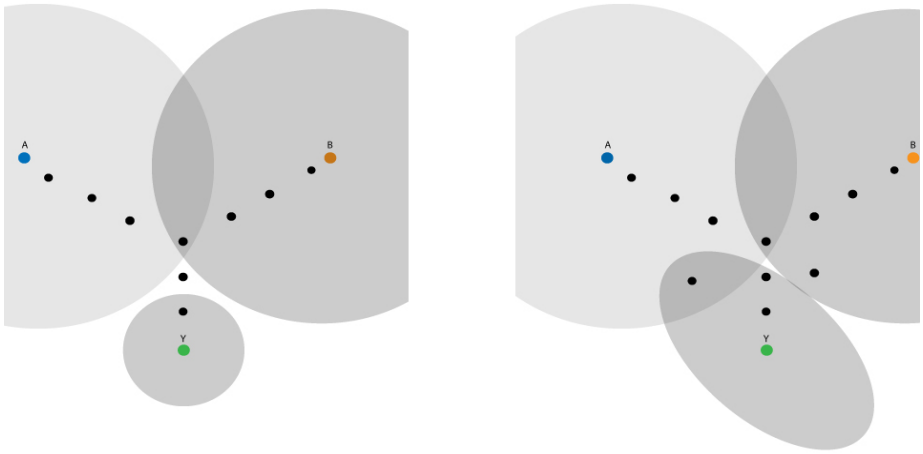

Figure 3: Three company collusion irregular cases

Source: Developed by the author.

We can see that in these two cases the collusions are different since we have more variables included in the model such as P_Y and K_{ij}^{Y}, which makes it hard to predict. However in a perfect case when the cost is c=1 (for each node) then we are more likely to see a collusion market for all of the three e-commerce at the same time.

However even though we have collusion and sometimes can determine it accurately we could not predict the behavior of companies in such a case, since the market where companies have competitive collusion might be an insignificant market for either of them (or both) and not influence the A, B and Y e-commerce prices whatsoever.

In conclusion to this model we can say that the web market is a distinct market that has to be treated separately, as at the moment it doesn't have a clear market definition method and therefore cannot be accurately analyzed by classic market analysis methods.

We can state that the web market is a complex sector which consists of many segments. This market isn't driven by price based competition, as we stated before, it is more of an awareness, trust, reputation driven competition, if we are to speak about the web market companies'

competitive collusion, while it is still price driven if we analyze the web market versus the real market competition.

Another conclusion that we reach is the one that reputation poses a competitive advantage and as we can speak of a web business as being international by definition we can see the effects of a country's reputation as well as that of the company on the country's market. This in turn can help us better understand why some foreign web companies are preferred over the other ones, by customers.

The economics of networks models and theory is the best to describe the competitive collusion on the web market as it is very important, whether a company has a link to a market in order to consider this market as being a potential market for the company.

Though this model provides a useful insight into the way competitive collusion takes place between two web companies from different poles, it is rather hard to be accurately applied due to the lack of awareness in this model. The awareness mentioned before is not the awareness of a web company but the awareness of the majority of consumers that it is a possibility to order online from an e-commerce other than that of your country.

6. Conclusions

The model presented in this paper shows that it is not necessary for two web companies to be located in the same country in order to have a competitive collision. This could be one reason why everyone knows and uses larger e-commerce retailers such as amazon.com and e-bay.com, often in the detriment of the smaller, yet local counterparts.

This model however could be improved in the field of actually calculating the distance of influence of an e-commerce, this can be done, by calculating the geodesic distance as well as more work could be involved in the improvement of a three company game.

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