Game Theory in Transport & Logistic World

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OV & DP and BRT
Game Theory
A briefly attempt

Is it possible to modeling one of the reality of Transport&Logistic World, thanks to the famous Game Theory? The main idea to write this paper began with this question.

So, let start with description of the game. We have OV (Officine Vica) as client. In addition DP and BRT are Transport&Logistic supplier for OV. Means that when OV needs a service for transporting her products, asks one of these guys. However there are some conditions could effect on the decision of OV to call which of her suppliers:

<table>
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<th>BRT</th>
<th>BRT</th>
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<td>BRT is faster (express) and more organized</td>
<td>DP is not so fast and organize</td>
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<tr>
<td>BRT wants her fee max. 90 days</td>
<td>DP wants her fee max. 120 days</td>
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As we can imagine the essential elements in this Game are the following:

a. **Actors**: OV, DP and BRT are actors of this game.

b. **Decisions**: The players could choose different decisions. Means different Strategy (S) to play the Game. For example OV normally prefer to choose DP rather than BRT, because she could pay the fixed fee after 120 days. In another hands, sometime is better to choose BRT, because they are faster.

c. **The Information**: Actors in this game, have perfect information about their Payoff and the strategy of other players but they have almost perfect information (not 100% perfect information) about the payoff of other players.

d. **The Rules**: Actors are aware about the rules. They are not particular rules in world of transport. OV should Load the vehicle of BRT or DP in the standard and safe method, then she must give all DDT (Transport Document) to the agent. Ones the product has loaded, supplier’s agent should sign the DDT and transport the product to the destination and after unloading the product into Delivery Point, agent has to bring back the signed DDT.

e. **The Utility** function: Players will receive their Utility base on their desire. OV wants supplier transport her products safety, on-time with lower cost. Suppliers (DP and BRT) want less GWT (Global Waiting Time) and more efficiency to receive more pure financial utility.

So, which kind of game is it? Is it static game or it is dynamic? How many game they are? OV find herself in front of two players (DP or BRT). So she could play with both.

Then we have a game between suppliers [the competitors (DP and BRT)]. So, total number of games, might be 3 games.

I. One game between DP and BRT

II. Two games between OV and her suppliers
I. One game between DP and BRT

The game between two suppliers (DP and BRT), could be similar to the game of “Battle of Sex”? I guess, yes! So if I am not rung, this game is STATIC GAME OF PERFECT INFORMATION. So, let assume some payoff for each players in the game of competitors (The game between DP and BRT):

BRT do not enter in the game when it is fee after 120 days, so her Payoff is equal to 0. However DP prefer 90 days rather than 120, so her Payoff is 4 rather than 3.

II. Two games between OV and her suppliers

OV find herself in front of two players (DP and BRT). So she could play with both. As we describe above, she prefer normally DP but sometime, in some case she doesn't want to risk and prefer to use the BRT services. This game looks like more similar to the DYNAMIC GAME and information are almost COMPLETE&PERFECT INFORMATION.

Why it is dynamic and complete information? Might because in the first time period, singleton OV play her game and chooses to pay the fixed fee of supplier in the day of service or after 90 days (in the case of BRT) or after 120 days (in the case of DP).

Then in the second time player 2 (DP or BRT) observes the action of first player and with knowledge about the strategy OV has decided, will play her part. Payoffs are \( U_1( a_1, a_2) \) and \( U_2( a_1, a_2) \).
So, as we see in the above diagrams, OV wants to reach her maximum payoff (5). It means that paying the fixed fee of the Transport Service, not on the day of service, but after a long time. Might for this reason OV normally prefer DP rather than BRT.

When OV play 120 and DP also play 120, that is the Perfect Nash Equilibrium in the mind of OV. For OV playing 0 (pay today) is not perfect strategy but for her opponents (DP and BRT) its a perfect strategy. OV never go to play this strategy, except a grim case! So maybe we can say that the game has just 1 NE for each of players.

Before conclude the case, its important to tack account about the global atmosphere of the market. Transport & Logistics companies, they have created some natural and strategical Entry Barriers. Some of these barriers are depend to the needs of investing a huge amount of money to purchase tangible and intangible assets, such as lands, magazine, parking space, software and hardware logistic devices plus truck and vehicles.

However, there is even other impenetrable barriers, that invented by the regulator. In this case the regulator is Ministero delle Infrastrutture e dei Trasporti. The rules from the ministry and the standards, they ask, are adversity enough to avoid any new entrance!

These barriers gave to the market, the multi-poly structure. This presented infrastructure, forced some of the companies to compete with others positively, but in the another hand, some others, abuse from the monopoly situation. Furthermore, in the such atmosphere, the probability of Collusion is high.
Resources: To write this paper we use books and websites has addressed in below.


✓ Lecture notes of Prof. Luigi Buzzacchi

✓ A. Villa, De Toni, Palazzolo; Gestione della produzione, Isedi, 2013

✓ DHL web site

✓ Trasporto merci su strada, è una pubblicazione a cura di: ANFIA - Associazione Nazionale Filiera Industria Automobilistica – Area Studi e Statistiche Automobile Club d’Italia – Area Professionale Statistica

✓ Ministero delle Infrastrutture e dei Trasporti, DIPARTIMENTO PER I TRASPORTI, LA NAVIGAZIONE ED I SISTEMI INFORMATIVI E STATISTICI, DIREZIONE GENERALE PER I SISTEMI INFORMATIVI, STATISTICI E LA COMUNICAZIONE; UFFICIO DI STATISTICA, SISTEMA STATISTICO NAZIONALE; Conto Nazionale delle Infrastrutture e dei Trasporti

✓ Analisi e previsioni per il trasporto merci in Italia, © Confcommercio-Imprese per l’Italia

✓ Logistics and supply chain management: creating value-adding networks / Martin Christopher; -- 4th ed. PEARSON EDUCATION LIMITED

✓ O’Brien, Marakas; Introduction to information system; 16th edition

✓ Prof. Alessandro Perego; Politecnico di Milano

✓ Personal Transport and Logistic blog of Sajjad Khaksari: http://italiancoaddress.blogspot.it