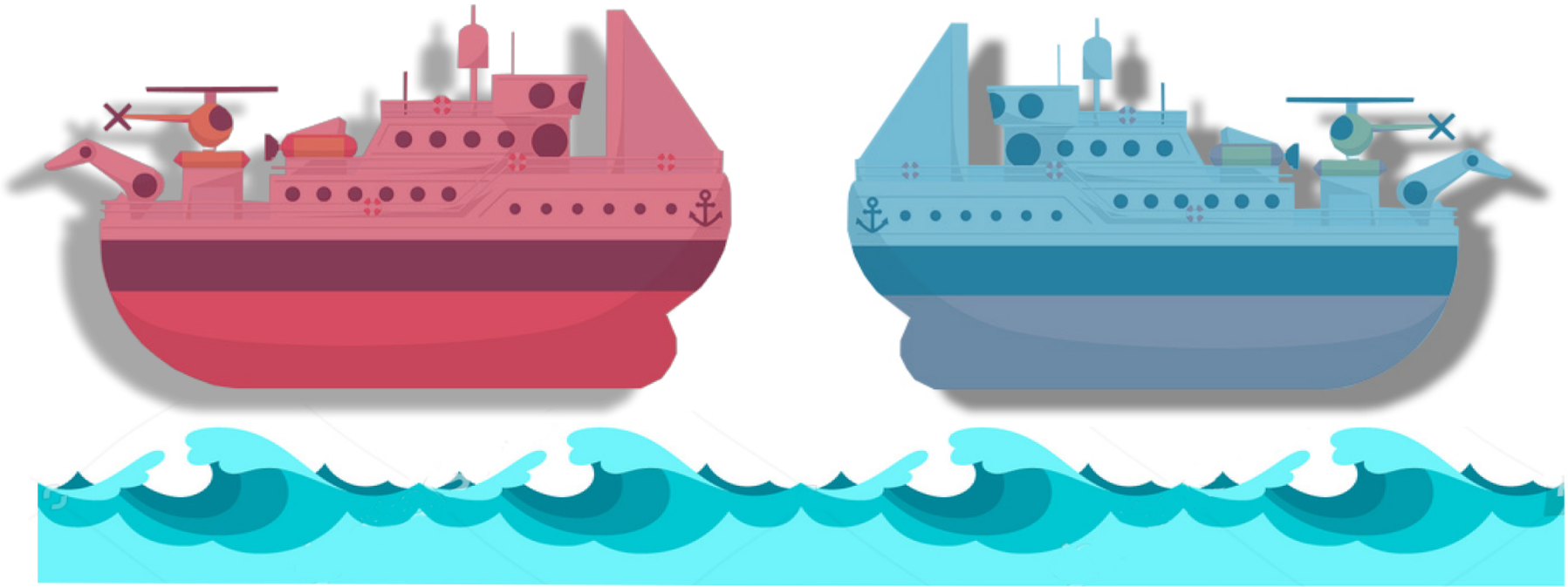
HOW TO WIN A TRADE WAR



Mentor: Prajual Maheshwari

Team Member

- Aditya Sharma
- Arzoo
- Gurashesh Singh
- Jay Gupta
- Muskan
- Naman Agrawal
- Maisam Ali
- Saurabh Sharma

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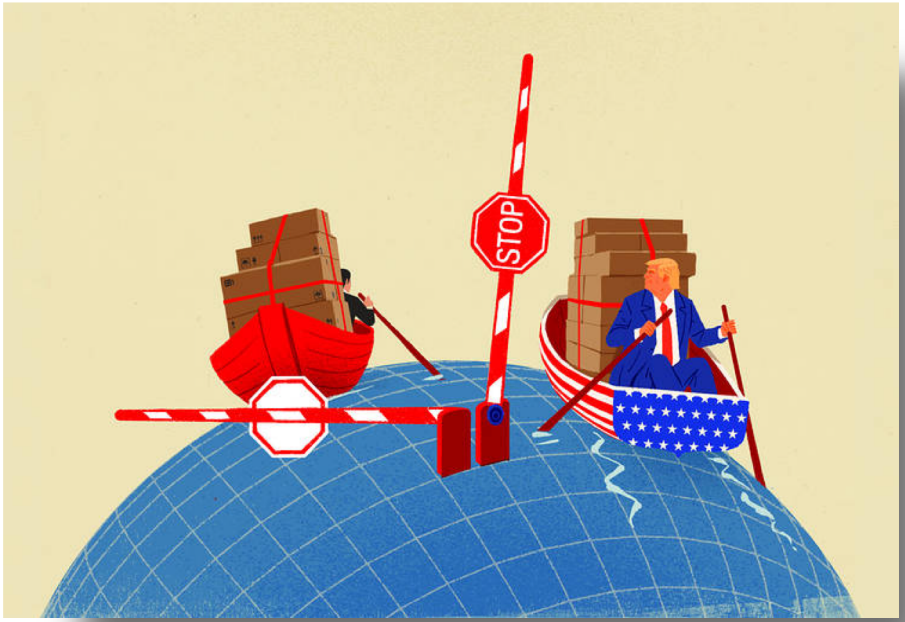
Introduction

A trade war is an economic conflict resulting from extreme protectionism in which states raise or create tariffs or other trade barriers against each other in response to trade barriers created by the other party.



Our Project

- A repeated prisoner’s dilemma can be precisely seen as the game which is a better analogue for the situation that two real-world countries face.
- Our aim is to analyse Trade war using Concepts of Game Theory
- We attempted to model Trade war as a repeated cooperative game using various factor
- Used few factor which impact our strategy
- Created a game for simulation

Factor affecting Trade

- Protectionism
- Retaliation
- Social Benefit
- Transfer of Technology
- Employment
- Dependence
- Trade Deficit
- Foreign Currency Exchange Rates
- Factor Endowments

How countries decide strategy

- **Friendliness :** As a baseline, how often will you cooperate, allowing free trade between your country and your opponent's?
- **Imitation:** How often will you abandon your baseline strategy to mimic their actions, responding to them in kind?
- **Vindictiveness :** If you're crossed by an unkind, defecting opponent who imposes tariffs on your goods, how long punish the other country by defecting yourself?

Cooperative game theory as Trade War

Consider two identical countries, denoted by $i = 1,2$.

COUNTRY 1

FIRM 1

MARKET

GOVERNMENT 1
(PLAYER 1)

COUNTRY 2

FIRM 2

MARKET

GOVERNMENT 2
(PLAYER 2)

FOR COUNTRY *i*

Country has a government that chooses the tariff rate (strategy of the player), a firm that produces output, both for home production and export, consumers who buy on home market from either home firm or the foreign firm.

Let the total quantity in the home market is Q_i, and the market clearing price is given by: $P_i(Q_i) = a - Q_i$

Firm produces h_i for home consumption and e_i for export.

The quantity in the market of a country i will be $(h_i + e_j)$

Total welfare to country i = consumer surplus + revenue generated by the government + profit earned by the home firm

- Firm i profit function, π = revenue - cost of production = $[a - (h_i + e_j)]*h_i - c*(h_i + e_i)$
- Revenue generated by the government = t_i*e_j
- Consumer surplus = $(1/2)*Q_i^2$

$$W_i(t_i, t_j, h_i, e_i, h_j, e_j) = (1/2)*Q_i^2 + \pi_i(t_i, t_j, h_i, e_i, h_j, e_j) + t_i*e_j$$

Solution to the problem

Suppose the governments have chosen the tariffs t_i and t_j and If $(h_i^*, e_i^*, h_j^*, e_j^*)$ is a Nash equilibrium in the remaining (two-market) game between firms 1 and 2 then, for each z\i, (h_i, e_i) must solve

$$\max_{h_i,\, e_i \geq 0} \ \pi_i(t_i, t_j, h_i, e_i, h_j^*, e_j^*)$$

So, firm i must solve the above optimization problem to decide the quantity to produce for home consumption and for the foreign consumption.

Solution:

$$h_i^* = (a - c + t_j) / 3 \qquad \& \qquad e_i^* = (a - c - 2*t_j) / 3$$

NOTE: **The governments' tariff choices can make marginal costs asymmetric**. On market *i*, for instance, firm *i* marginal cost is *c* but firm *j* is $(c+t_j)$. Since firm *j* cost is higher it wants to produce less. But if firm *j* is going to produce less, then the market-clearing price will be higher, so firm *i* wants to produce more, in which case firm *j* wants to produce even less. Thus, in equilibrium, h_i^* increases in t_i, and e_j^* decreases (at a faster rate) in t_i

Interaction between the two government

Government of each country simultaneously chooses the tariff rate.

Payoff to the government *i* are: $W_i(t_i, t_j, h_i^*, e_i^*, h_j^*, e_j^*)$ for i =1,2.

Game between the government: $\max_{t_i \geq 0} W_i(t_i, t_j^*)$

Solution to the Nash equilibrium to the above game is: $t_i = (a - c) / 3$

for each *i*, independent of t_j

Thus, in this model, choosing a tariff rate of $(a - c)/3$ is a dominant strategy for each government.

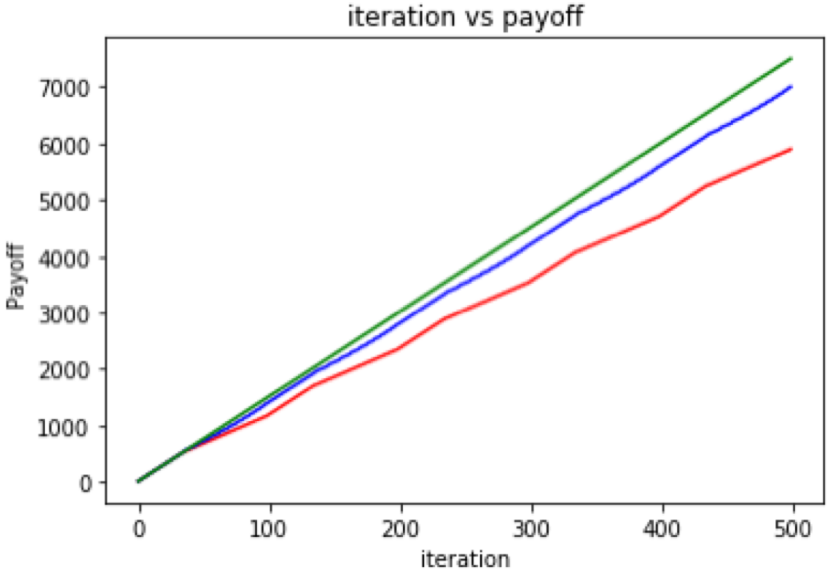
Substituting $t_i^* = t_j^* = (a - c) / 3$ into the solutions for h_i and e_i yields:

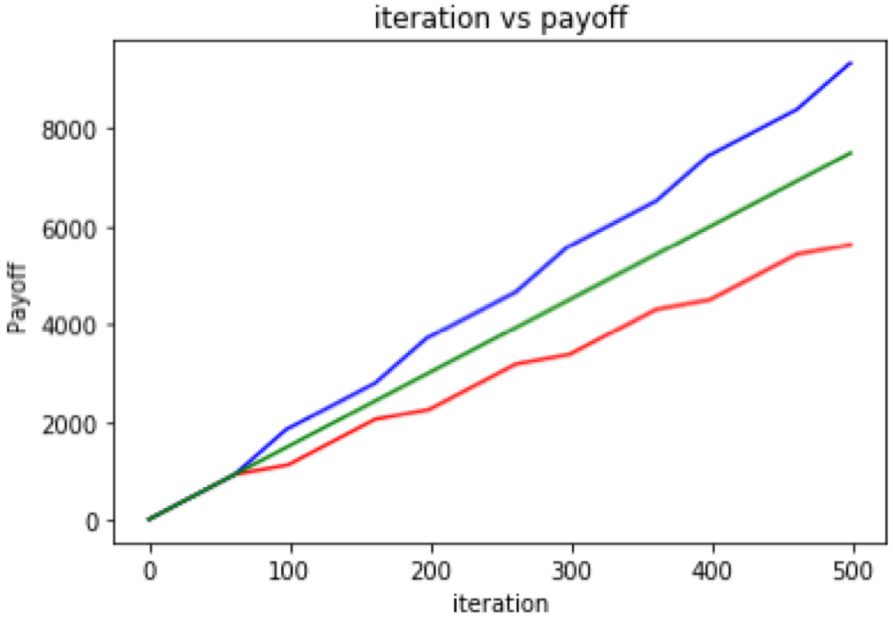
$$h_i^* = 4*(a - c) / 9 \quad \text{and} \quad e_i^* = (a - c) / 9$$

In the subgame-perfect outcome the aggregate quantity on each market is $5(a - c)/9$. If the governments had chosen tariff rates equal to zero, however, then the aggregate quantity on each market would have been $2(a - c)/3$, just as in the Cournot model. Thus, the consumers surplus on market *i is* lower when the governments choose their dominant- strategy tariffs than it would be if they chose zero tariffs.

So there is an incentive for the government to sign a treaty in which they commit to zero tariffs (i.e., free trade)

What our Game Shows





Conclusion

- From the theory discussed above on tariffs we can conclude the below points:
    - If both the countries imposes tariffs on each other then both incur some loss in **NET** surplus (welfare of the country)
    - If one country imposes tariff on an other country while the other country don’t then obviously they one will get benefit
    - If both don’t cooperate than both will get net loss

THANKYOU!!