

Discussion of Massol and Tchung-Ming

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Cooperative game Theory

- Is it important to have cooperative game theory concepts in our tool kit box ?
- What type of questions can be analysed ?
- Two main illustrations :
 - { Analytical Accounting
 - { Sharing the Benefits resulting from Cooperation
- Analytical Accounting : How to share the costs across branches (services, products, divisions,...) in a firm ?
- Surplus Sharing : How to share the benefits resulting from cooperation among the players participating to an organization (International Treaty, Cartel, Intermunicipality Agreements,...)

Analytical Accounting

- A group of three friends 1, 2 and 3 decide to buy collectively their wine.
- 1 (respectively 2 and 3) wants to buy 10 bottles (respectively, 20, 30)
- The unit price posted by the seller is as follows:

$$\text{price per bottle} = \begin{cases} 20e & \text{if the command is less than 10} \\ 17e & \text{from the 11th bottle to the 30 th bottle} \\ 15e & \text{from the 31th bottle to the 50 th bottle} \\ 12e & \text{for any bottle after the 50th} \end{cases}$$

Analytical Accounting (II)

- How the cost function (characteristic function) looks like ?

$$C(S) = \begin{cases} 200\$ \text{ if } S = \{1\} \\ 370\$ \text{ if } S = \{2\} \\ 540\$ \text{ if } S = \{3\} \\ 540\$ \text{ if } S = \{1, 2\} \\ 690\$ \text{ if } S = \{1, 3\} \\ 840\$ \text{ if } S = \{2, 3\} \\ 960\$ \text{ if } S = \{1, 2, 3\} \end{cases}$$

Analytical accounting (III)

- How to divide the bill of 960\$ among the three friends ?
- Can we please any possible coalition of friends ?
- What is a fair agreement (solution) ?
- Shapley, Nucleolus, ...

Surplus Sharing

- By acting together, members of an organization can often implement a cooperative outcome that is collectively superior to the outcome resulting from a non cooperative behavior
- How to implement such outcome ?
- This is the question tackled by Massol and Tchong-Ming when the organization is the Gas Exporting countries Forum (Cartel)
- They have 11 players
- In the first part of their paper, they show that there are gains from cooperation. In the second part they compare 9 possible solutions

Criticisms and Extensions

- The comparison of the solutions is too mechanical
- It is truly a problem where only the cost side matters. The revenue side is totally outside of the model as the authors suppose that the quantities and the prices are fixed and therefore exogeneous.
- In fact this value of this cartel results exclusively from a more effective optimization on the cost side due to a relaxation of the constraints on the flows of transportation.
- It would be nice to construct explicitly the cost function $C(S)$

Criticisms and Extensions

- I have hard time to believe that in the (long run) the cartel will not act in order to influence the prices and quantities.
- There is a literature in IO on cartel formation and stability. If the cartel consisted of all the firms (countries) it would act as a monopoly. Otherwise things get more complicated and it is necessary to combine cooperative and non-cooperative game theory. Any particular solution (to share the benefits among the members of the Cartel) gives rise to a coalition formation game (with externalities).

Criticisms and Extensions

- Could we predict which cartel (s) will form at equilibrium ?
An outcome is a coalition structure i.e. a partition of the players into cartels (Ray and Vohra, Chander and Tulkens, Hart and Kurz,...)
- Multilateral Bargaining after the construction of the characteristic function (See the outstanding work of Ikonnikova on the Eurasian gas network,...)