

Seeking Win-Win  
and  
Avoiding Lose-Lose Solutions  
求兩利，避俱傷

---

Lawrence J. Lau (劉遵義), Ph. D.

President and Ralph and Claire Landau Professor of Economics  
The Chinese University of Hong Kong

and

Kwoh-Ting Li Professor in Economic Development, Emeritus, Stanford University

Sayling WEN (溫世仁) Memorial Lecture

Donghwa University

Hualien, November 9, 2007

Phone: (852) 2609-8600; Fax: (852) 2603-5230

Email: [LAWRENCELAU@CUHK.EDU.HK](mailto:LAWRENCELAU@CUHK.EDU.HK); WebPages: [HTTP://WWW.CUHK.EDU.HK/VC](http://www.cuhk.edu.hk/vc)

# A Preview

---

- ◆ Introduction
- ◆ Cooperative and Non-Cooperative Games
- ◆ Example of a Lose-Lose Solution: The Prisoner's Dilemma Game
- ◆ Examples of Win-Win Solutions
- ◆ Are There General Principles?
- ◆ Concluding Remarks

# Introduction

---

- ◆ The application of “Game Theory” 博弈论 to the solution of real-world problems.
- ◆ In a typical game, the outcomes for each player depends not only on his or her own action but also on the actions of all other players.
- ◆ It is possible in some games that some outcomes are better than others for both players. Thus, these are win-win solutions for the game.
- ◆ Everyone should welcome win-win solutions because there is a gain for everyone—every one should support and no one should oppose such solutions (sometimes the distribution of gains between the players may be an issue).
- ◆ However, in order to realize win-win solutions, coordination among the players is frequently required—that is, all their actions must be coordinated.
- ◆ Coordination can take many forms: Signalling by players, government planning, side agreements among players.
- ◆ And often some enforcement mechanism, explicit or implicit, is also required; self-enforcement is sometimes possible in some games.

# Cooperative and Non-Cooperative Games

## 合作博弈 与 非合作博弈

---

- ◆ Repeated games are games that are played over and over again. In such games, reputation, based on past actions, may be important as a signaling device.
- ◆ In repeated games, differences in time preference between the players may allow mutually beneficial inter-temporal trades, e.g., taking turns.
- ◆ Randomization as a means of resolution of games of conflict—casting lots is and is perceived to be fair.
- ◆ The repeated nature of the game means that the relationships among the players are long-term ones, rather than one-time. The focus is therefore not only on the immediate transaction (move) at hand, but on all future transactions (moves).
- ◆ Many games are positive-sum games rather than zero-sum games 正和博弈而非零和博弈。
- ◆ Cooperative games by definition require coordination among the players—the players select actions jointly so as to achieve the best outcomes for all.

# An Example of a Lose-Lose Solution: The Prisoner's Dilemma Game 囚徒困境

---

- ◆ There are two prisoners, A and B.
- ◆ Each of them has two possible actions: (1) warn the warden, or (2) not warn the warden.
- ◆ If A tries to escape, and B warns the warden, A will be heavily punished by the warden, and B will receive a reward.
- ◆ Similarly If B tries to escape, and A warns the warden, B will be heavily punished by the warden, and A will receive a reward.
- ◆ However, if they both decide not to warn the warden, then they will both be able to escape—a win-win solution.
- ◆ But because there is lack of coordination (and lack of trust), each player cannot be sure that the other player will not turn him or her in, so each will always warn the warden, and neither is able to escape—a lose-lose solution.

# Examples of Win-Win Solutions

---

- ◆ International Trade
- ◆ Long-Term Capital Management
- ◆ Acid Rain
- ◆ The Petrochemical Industry
- ◆ Advertising of Cigarettes
- ◆ Price Coordination
- ◆ Mutually Assured Destruction (MAD)

# An Example: International Trade

---

- ◆ The theory of comparative advantage basically says that when two countries trade voluntarily, both must gain.
- ◆ Then why is there so much opposition to free trade in many countries?
- ◆ International trade is a two-way street: increased exports will imply an expansion in the exporting industries but increased imports will imply a contraction in the import-competing industries.
- ◆ Thus, international trade typically benefits the workers in the industries producing the increased exports but hurts the workers in the industries facing competition from the increased imports.

# An Example: International Trade

---

- ◆ However, the net gain in each country is always positive—there is therefore enough gain to make everyone better off--so that it comes down to a question of redistribution: How to tax the winners and compensate the losers in each country so that everyone in the respective countries is better off?
- ◆ There are many ways to achieve this objective—the government in a country can compensate its displaced workers by providing subsistence and re-training grants; it can tax the increased exports and use the proceeds to compensate the workers displaced by the increased imports; it can award the import licenses to the industry facing contraction because of the increased imports, on condition that the industry will take care of the displaced workers (this is an example of internalization of a potential externality), etc.

# An Example:

## Long-Term Capital Management

---

- ◆ Long-Term Capital Management (LTCM) was a hedge fund that collapsed in 1998, in part as a result of the collapse of the Russian Ruble.
- ◆ At the time, it owed US\$100 billion worth of debt to a group of international banks and had a net worth of not more than US\$4 billion.
- ◆ It was in the interests of these creditor-banks to continue to provide the liquidity to LTCM so as to enable an orderly liquidation. Thus, they needed to stay together for their own collective benefit.
- ◆ However, each creditor bank had the incentive to demand repayment immediately and not to stay in the creditor group if it could get away with it. But if everyone pulled out of the creditor group, LTCM would have to be liquidated immediately, as in a fire sale, and the results would be horrendous not only for LTCM, but also for all the creditor banks—a lose-lose solution.
- ◆ Thus, someone has to enforce any agreement among the creditor banks to stay together.
- ◆ The Federal Reserve Bank of New York was invited to be a witness to the discussions (and to make sure that no one opts out).
- ◆ As it turned out, the losses to the international banks were minimized.

# An Example:

## Acid Rain

---

- ◆ Mainland China operates many coal-fired electricity generation plants with high-sulfur coal.
- ◆ Coal burning generates sulfur dioxide, which is blown by the wind to Korea and Japan and falls with rain as acid rain, creating a great deal of damage to health, environment and property in these countries.
- ◆ The costs to Japan in terms of increased health care costs and environmental and property damages are high.
- ◆ However, Mainland Chinese operators have little or no incentive to use clean coal because it increases the cost of electricity generation and in any case the acid rain falls outside of Mainland China.
- ◆ While Japan can subsidize Mainland Chinese power plants to use clean coal, it is difficult to enforce such an agreement.

# An Example:

## Acid Rain

---

- ◆ One solution is for the Japanese Government to subsidize Japanese utilities to operate electricity generation plants in Mainland China, with the condition that the Japanese utilities use clean coal.
- ◆ The costs of the subsidies will be much less than the costs of repairing the damages to health, environment and property from the acid rain. In addition, the Japanese Government can enforce the use of clean coal by the Japanese utilities effectively.
- ◆ The electricity costs to Mainland Chinese users do not need to go up (because of the subsidies) and Japan is spared from acid rain. So everyone is better off, a win-win solution.
- ◆ This illustrates the principle of internalization of externalities but also the necessity of an enforcement mechanism.

# An Example:

## The Petrochemical Industry

---

- ◆ There are two firms in the proposed petrochemical industry: upstream and downstream.
- ◆ There is the traditional hold-up problem: the upstream firm is concerned that it has only one customer, the downstream firm; and the downstream firm is concerned that it has only one supplier, the upstream firm. The upstream firm is worried that once the plant is built, it is at the mercy of the downstream firm as to how much it will pay for the upstream firm's output. Similarly, the downstream firm is worried that once the plant is built, the upstream firm will charge whatever the market will bear, being the only supplier.
- ◆ One solution is to have an integrated operation—one firm owning both the upstream and the downstream plants. This is the internalization solution.
- ◆ Another solution is for the government to enforce long-term supply contracts between the upstream and the downstream firms at pre-agreed price formulas.
- ◆ As a last resort the government can also allow free exports and imports to break the potential monopoly-monopsony powers of the firms.
- ◆ Without coordination of the type discussed, neither the upstream or the downstream plant will be built as the risks are too high.

# An Example: Advertising of Cigarettes on U.S. Television

---

- ◆ It is in the interests of all U.S. tobacco companies not to advertise on U.S. television because the U.S. aggregate demand for cigarettes is not growing and advertising becomes purely defensive against poaching of customers by other tobacco companies.
- ◆ Every tobacco company is better off if all of them can agree not to advertise on U.S. television. There will be no decline in revenues, but a decline in costs due to the savings from not advertising, and hence a rise in profits.
- ◆ However, every tobacco company has the incentive to cheat, that is, to advertise on U.S. television while the others do not. If that occurs, everyone will have to advertise, a lose-lose situation.
- ◆ It is therefore in everyone's interest to have someone enforce the agreement of no advertising.
- ◆ The U.S. Congress obliged by passing a law that prohibits the advertising of cigarettes on U.S. television. One may argue that the U.S. Congress is motivated by public considerations, but given the lobbying power of the U.S. tobacco companies, the law could not have been passed with their consent.

# Price Coordination

---

- ◆ Two firms in the same market both want to raise prices on the products they produce because the costs of inputs have risen.
- ◆ However, if one firm raises prices, and the other firm does not, the firm that raises prices will lose market share to the other firm (as well as lose goodwill amongst its customers). This it does not wish to do.
- ◆ Thus, it is advantageous for them to try to raise prices almost simultaneously.
- ◆ Usually, this takes the form of price leadership—one firm raises prices first as a signal, and the other firm follows very soon thereafter.
- ◆ If the other firm does not follow, the firm that raised prices in the first place may cancel the price increases, and may even launch a price war. (This is the enforcement mechanism).

# Mutually Assured Destruction

---

- ◆ The nuclear stand-off between the great powers can also be considered a cooperative game with a win-win solution.
- ◆ Both countries have a fully equipped nuclear arsenal that is ready to be used. However, the catastrophic nature of the response discourages any adventurous moves.
- ◆ Survival of a first-strike is essential—it is the potential retaliation afterwards that discourages a first strike.
- ◆ Thus, neither country will decide to use nuclear weapons against the other—a win-win situation.
- ◆ A nuclear deterrent capacity is therefore stabilizing in this context.
- ◆ If there is no certain and devastating retaliation, countries may be tempted to use nuclear weapons first.
- ◆ This illustrates the principle of exchange of positions—putting oneself in the other player's shoes—what would be optimal for the other player to do?

# Are There General Principles?

---

- ◆ Many of these games are “Repeated Games” and not “One-Off Games,” so that reputation (and history) can be important.
- ◆ But the repeated nature also allows for the possibility of short-term experimentation, tolerating possible short-term losses in exchange for long-term and possibly permanent gains.
- ◆ The differences in time preference may contribute to a solution. For example, in the Prisoner’s Dilemma Game, if one player has lower time preference, that is, is more willing to trade future gains against current gains, he or she may be willing to experiment with not warning the warden and thereby signal an invitation for cooperation. A new player may also have more room to experiment because he or she can start building a new reputation and history.
- ◆ Any win-win solution is completely consistent with the self-interest of each and all of the players. No altruism is required.
- ◆ Coordination is frequently required to achieve the win-win solution.
- ◆ Some enforcement mechanism, whether explicit or implicit, is also frequently required in order for the win-win solution to be sustainable.

# The Principles of Symmetry and Reciprocity

---

- ◆ Reciprocity is particularly relevant in repeated games.
- ◆ Reciprocity does not mean necessarily Tit-for-Tat, which is ex post.
- ◆ Ex ante reciprocity means exchanging places or positions with one's adversary and imagining what he or she would do or would not do, or would or would not be able to do, or would not like to see happen. Only by doing so can one discover potentially win-win solutions.

# Can Codes of Behavior Help?

---

- ◆ Common codes of behavior, grounded in culture and tradition, can sometimes be helpful.
- ◆ For example, Code of behavior I—”Don’t Do unto Others What You Do not Want Done to Yourself”—may lead the players in the Prisoner’s Dilemma Game to select the actions that allow both of them to escape.
- ◆ Code of behavior II—”Do unto Others What You Want Done to Yourself”
- ◆ Exchange of position: 换位
- ◆ Codes of behavior can therefore sometimes substitute for signaling and sometimes even serve as an implicit self-enforcement mechanism.

# Concluding Remarks

---

◆ 求兩利，避俱傷!