



光华管理学院
Guanghua School of Management

Chapter 10 (subtopic) Game Theory

1. A Motivating Case: TV Sector in China

- Market Size: 111 billion RMB in 1999; 200 billion RMB in 2009 (the world's largest TV market)
 - In November 2003, TCL (67%) merged its TV manufacturing facilities with Thomson (France, 33%).
 - In 2004, the combined company export 18 million TVs, the world's number one, with 10 percent of the market.
- Profit Margin: 2.5 billion RMB in 1999, or a profit rate of 2.25%
- Market Structure: Monopolistic competition, with the 9 largest producer representing 70% of the market share

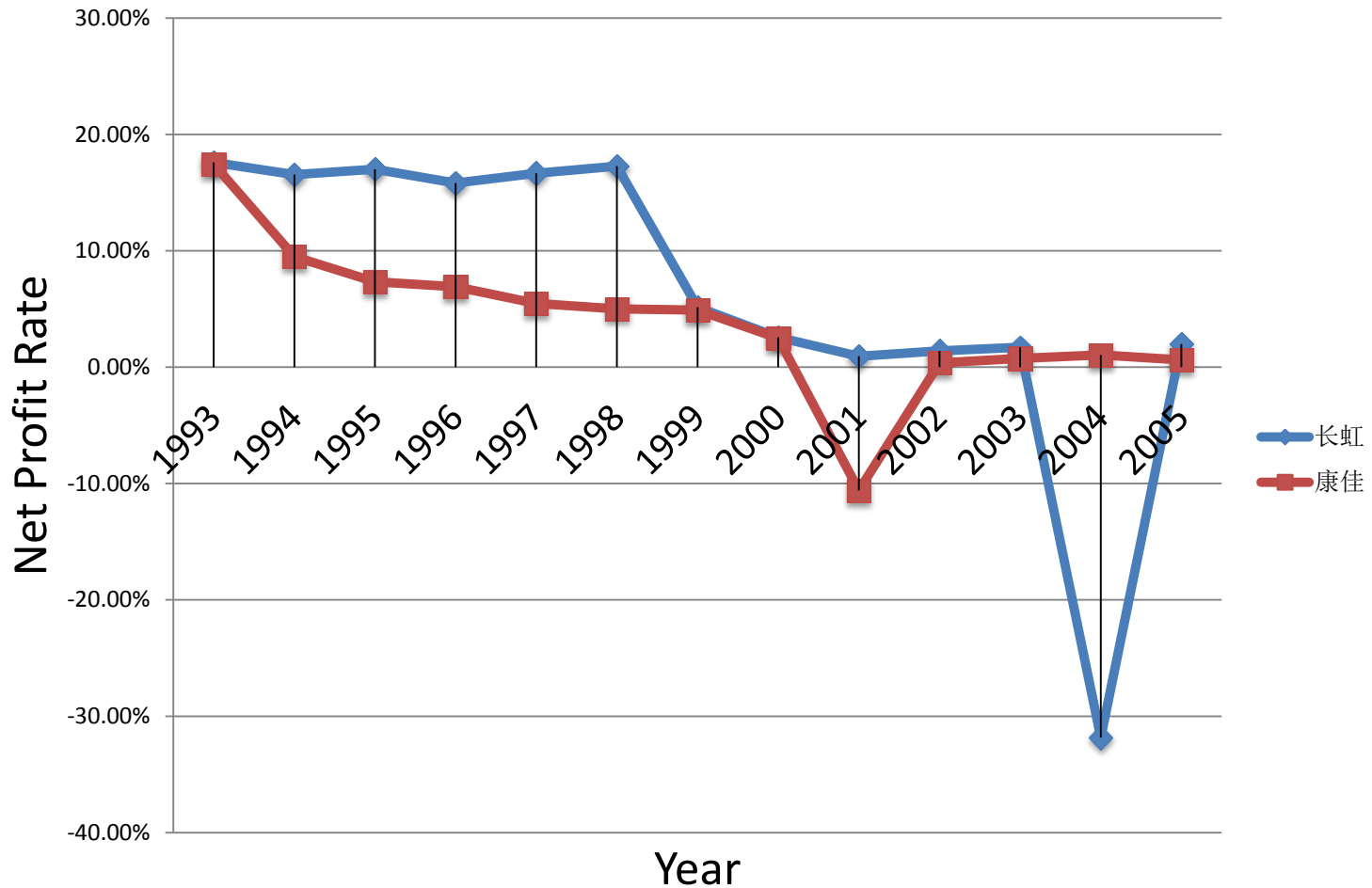


Price War among TV Manufactures in China

- In April, 1999, ChangHong announced a discount (up to 1000 RMB price reduction) among all its products.
- Other major producers, including KONKA and TCL, reacted by forming a “TV Alliance”. Members of the alliance should commit to sell their products at normal prices.
- However, later in that month, KONKA quit the alliance all of a sudden and engaged ChangHong with a price war.
- Other members had to follow as well. The TV Alliance was then dissolved.
- Since then, several rounds of price war spread in China’s TV industry.



“Try cabbage next time”





Economic Analysis of Price War

1. How do firms know that a price reduction will lead to increase in their revenue?
2. Even if demand is price elastic for all firms, a price war will result in profit reduction for all firm. WHY?
3. Knowing the above facts, why TV producers still engage in vicious price wars
4. For the TV producers in China, how to escape from the price war traps?

We need Game Theory to help answer Q3 and Q4 above



Price Elasticity of TV Brands

- Empirical Analysis (Jan. 2000 – July 2004)

Brand	TCL	SONY	Panasonic	KONKA	Hisense
Price Elasticity	-1.51	-0.39	-1.3	-2.18	-1.46
Brand	Haier	Philip	Skyworth 创维	ChangHong	LG
Price Elasticity	-0.54	-0.77	-0.47	-1.49	-0.6



2. Concepts and Theory

What is a Game?



- Business: pricing, advertising, location of stores
- Diplomacy: cold war
- Politics: voting campaign
- Daily life: who wash the dishes and who clean the floor; what would you do in case of a blackout.



What is Game Theory?

- A game is any situation in which players make strategic decisions
 - i.e., decisions that take into account each other's actions and responses.
 - Once you begin to consider how others will react to your actions, you have entered the realm of game theory
- ***Game theory*** analyzes the ways in which two or more players choose strategies that jointly affect each other



诺贝尔经济学奖对 “博弈论” 研究的重视



年份	得主	国籍	贡献
1994	约翰·海萨尼	美国	这三位数学家在非合作博弈的均衡分析理论方面做出了开创性的贡献，对博弈论和经济学产生了重大影响
	约翰·福布斯·纳什	美国	
	莱因哈德·泽尔腾	德国	
1996	詹姆斯·莫理斯	英国	在信息经济学理论领域做出了重大贡献，尤其是不对称信息条件下的经济激励理论
	威廉·维克里	美国、加拿大	在信息经济学、激励理论、博弈论等方面都做出了重大贡献
2001	乔治·阿克洛夫	美国	为不对称信息市场的一般理论奠定了基石，他们的理论迅速得到了应用，从传统的农业市场到现代的金融市场，他们的贡献来自于现代信息经济学的核心部分
	迈克尔·斯彭斯	美国	
	约瑟夫·斯蒂格利茨	美国	
2005	罗伯特·约翰·奥曼	美国	通过博弈论分析促进了对冲突与合作的理解
	托马斯·克罗姆比·谢林	美国	
2007	里奥尼德·赫维克兹	美国	奠定了机制设计理论的基础
	埃里克·马斯金	美国	
	罗杰·梅尔森	美国	

Representation: Two-way Payoff Table



Example: Prisoner's Dilemma

		Player	
		Prisoner B	
Prisoner A	Silent	Silent	Defect
	Defect	Defect	Defect
Prisoner A	Silent	$((-1, -1))$	$(-20, 0)$
	Defect	$(0, -20)$	$(-5, -5)$

Payoff (mind the ordering)

Principle 1 : Choose Your Dominant Strategy

		Prisoner B	
(A, B)		Silent	Defect
Prisoner A	Silent	(-1, -1)	(-20, 0)
	Defect	(0, -20)	(-5, -5)

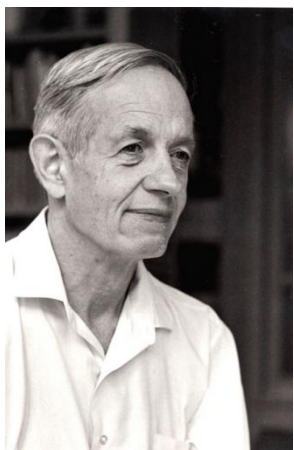
- **Dominant Strategy**: a strategy that gives a player the highest payoff no matter what strategy the other player follows
- In this game, (____, ____) is the possible outcome, since choosing ____ is the dominant strategy for both player.

Important Concept: Nash Equilibrium

Prisoner B

Prisoner A

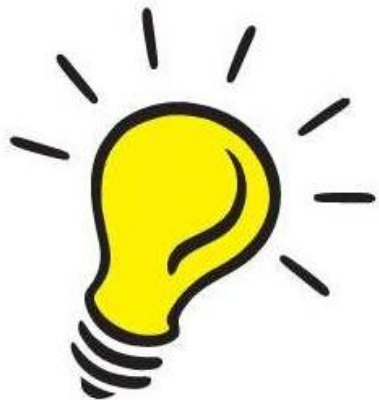
(A, B)	Silent	Defect
Silent	(-1, -1)	(-20, 0)
Defect	(0, -20)	(-5, -5)



Nash Equilibrium: no player can gain anything by changing his own strategy, given the other player's strategy

Important Concept: Nash Equilibrium

		Prisoner B	
(A, B)		Silent	Defect
Prisoner A	Silent	$(-1, -1)$	$(-20, 0)$
	Defect	$(0, -20)$	☺ $(-5, -5)$ ☺



Remarks on “Equilibrium”:

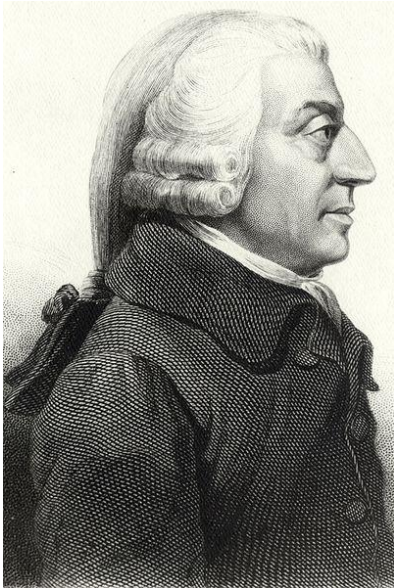
1. In Economics, Equilibrium is a stable outcome
2. It is a theoretical outcome predicted by game theory (based on the rationality assumption)
3. Optimal decisions for each player may NOT lead to optimal outcomes for the group

Cooperative Solution



- In prisoner's dilemma, the Nash Equilibrium (NE) is not the "optimal" solution
- Compared to the NE, (Silent, Silent) is a better outcome for both individuals and the group as a whole
- To achieve such an outcome requires cooperation from both players
--- **"cooperative solution"**
- However, being cooperative is hard
 - Each player have strong incentives to defect, given the other player's strategy being "cooperative" (silent)
 - In theory, "cooperative solution" is not a NE, therefore is not stable

“In competition, individual ambition serves the common good”



Every individual endeavors to employ his capital so that its produce may be of greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is in this led by an invisible hand to promote an end which of no part of his intention. By pursuing his own interest he frequently promotes that of society more effectively than when he really intends to promote it.

“每个人都在力图应用他的资本，来使其生产品能得到最大的价值。一般来说，他并不企图增进公共福利，也不知道他所增进的公共福利是多少。他所追求的仅仅是他个人的安乐，仅仅是他个人的利益。在这样做时，有一支**看不见的手**引导他去促进一种目标，而这种目标决不是他所追求的东西。由于追逐他自己的利益，他经常促进了社会利益，其效果要比他真正想促进社会利益时所得到的效果更大。”

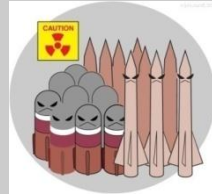



Key Insights of Nash

- Adam Smith: Best results come from everyone in the group doing what's best for himself
- Nash: Best results will come when everyone in the group doing what's best for himself and the group
- Prisoner's dilemma: "Smart" individuals may "lose together"
 - Conflicts between individual rationality and the group's common interest
- Applications in business and daily life



Application 1: Cold War



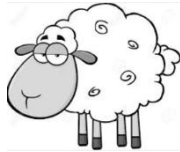
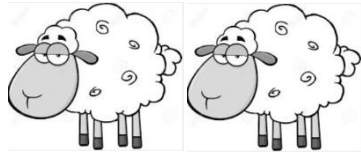
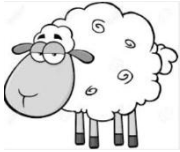
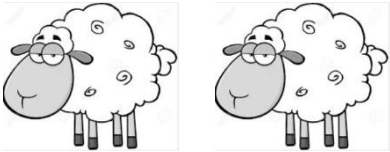
		
	Safe, Safe	Advantage, Danger
	Danger, Advantage	Safe, Safe

NE: (____,____)

Application 2: Tragedy of Commons

Sheepherder B

Sheep-
herder
A

- As the number of sheep increases, the total value from pasture decreases
- Nash Equilibrium: (____, ____)
- Total Value = _____

3. Analysis of the Price War

Price War as a Prisoner's Dilemma

KONKA 康佳



	Normal Price	Price Cut
Normal Price	$(0, 0)$	$(-100, 80)$
Price Cut	$(80, -100)$	$(-50, -50)$

- Payoff: Change in profits
- Nash Equilibrium: (____, ____)



Possibility of Collusion?



- Obviously, firms can gain larger profits than Nash outcome if they are able to collude and sustain a high price level
- However, such a collusion is not stable, because both firms have incentive to deviate from the collusion contract
- In June 2000, nine of the biggest TV manufacturers, including TCL, Hi-sense, and Skyworth, declared a truce and agreed on mutually acceptable prices
 - The government quickly stepped in, declaring their action illegal
 - Hostilities resumed, with big companies (KONKA) declaring price cuts of 20-30%.





How to Avoid the Price Wars?

- A shake-up in the industry (weak firm exit, or acquired by the winner)?
 - Consolidation did not happen
 - Nobody is winning during the price war
 - Local governments are not willing to let weaker companies fold
- Access to international market?
 - More feasible after entering WTO in 2001
 - Warning: anti-dumping cases



Escaping the Price War

- A vital point: Lack of Core Technologies
 - Large-scale integrated circuits, tubes, displays, and others
- Early technologies were imported from other industry leader, e.g., SONY, Philip
- Similar core technology and minor innovations leads to homogenous products, which in turns lead to severe competition, driving firms' economic profits down to zero
- A possible solution: Increase R&D, increase product differentiation, increase consumer loyalty

The Case with Product Differentiation

KONKA 康佳



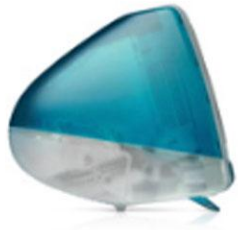
	Normal Price	Price Cut
Normal Price	$(0, 0)$	$(0, -30)$
Price Cut	$(-30, 0)$	$(-50, -50)$

- With sufficient product differentiation, substitutability among products become lower
- A firm's demand will not be easily affected by the price cut of its opponent
- The new Nash Equilibrium (____ , ____)

Dell v.s. Apple



The evolution of iMac.



1998



2000



2002



2004



2005



2007



2009



Today

2012



iMore

2013

