

War games

Oct 13th 2005

From The Economist print edition

A big pay-off for two game theorists

THIS year's Nobel prize for economics might almost have doubled as the prize for peace. On October 10th, three days after the International Atomic Energy Agency and its director-general, Mohamed ElBaradei, won their laurels for monitoring the misuse of nuclear power, the economics prize was bestowed on two scholars whose best work was also done in the shadow of the mushroom cloud.

Robert Aumann, of Hebrew University, and Thomas Schelling, of the University of Maryland, are both game theorists. Game theory is now part of every economist's toolkit and has been recognised by the Nobel award before, when John Harsanyi, John Nash and Reinhard Selten shared the honour in 1994. It is the study of what happens when the calculating, self-interested protagonist of economic fable meets another member of his kind. In such encounters, neither party can decide what to do without taking into account the actions of the other.

During the cold war, two protagonists that captured game theorists' imaginations were the United States and the Soviet Union. How each of these nuclear adversaries might successfully deter the other was the most pressing question hanging over Mr Schelling's classic work, "The Strategy of Conflict", published in 1960. The book ranged freely and widely in search of an answer, finding inspiration in gun duels in the Old West, a child's game of brinkmanship with its parents, or the safety precautions of ancient despots, who made a habit of drinking from the same cup as any rival who might want to poison them.

Mr Schelling's back-of-the-envelope logic reached many striking conclusions that appeared obvious only after he had made them clear. He argued that a country's best safeguard against nuclear war was to protect its weapons, not its people. A country that thinks it can withstand a nuclear war is more likely to start one. Better to show your enemy you can hit back after a strike, than to show him you can survive one. Mr Schelling invested his hopes for peace not in arms reductions or fall-out shelters but in preserving the ability to retaliate, for example by putting missiles into submarines.

All-out thermonuclear warfare is the kind of game you get to play only once. Other games, however, are replayed again and again. It is these that fascinate Mr Aumann. In a repeated encounter, one player can always punish the other for something he did in the past. The prospect of vengeful retaliation, Mr Aumann showed, opens up many opportunities for amicable co-operation. One player will collaborate with another only because he knows that if he is cheated today, he can punish the cheat tomorrow.

Mutually assured co-operation

According to this view, co-operation need not rely on goodwill, good faith, or an outside referee. It can emerge out of nothing more than the cold calculation of self-interest. This is in many ways a hopeful result: opportunists can hold each other in check. Mr Aumann named this insight the "folk theorem" (like many folk songs, the theorem has no original author, though many have embellished it). In 1959, he generalised it to games between many players, some of whom might gang up on the rest.

Mr Aumann is loyal to a method—game theory—not to the subject matter of economics per se. His primary affiliation is to his university's delightfully named Centre for Rationality, not its economics department. Trained as a mathematician, he started out as a purist—pursuing maths for maths' sake—but soon found his work pressed into practical use. Between 1965 and 1968, for example, he co-wrote a series of reports for the United States Arms Control and Disarmament Agency. The Russians and Americans were pursuing gradual, step-by-step disarmament. But the military capabilities of each superpower were so shrouded in mystery that

neither side knew precisely what game they were playing: they did not know what their opponents were prepared to sacrifice, nor what they themselves stood to gain. Without knowing how many missiles the Russians had, for example, the Americans could not know whether an agreement to scrap 100 of them was meaningful or not.

In such games, Mr Aumann pointed out, how a player acts can reveal what he knows. If Russia were quick to agree to cut 100 missiles, it might suggest its missile stocks were larger than the Americans had guessed. Or perhaps the Russians just wanted the Americans to think that. Examples of such deception are not limited to the cold war. Some have speculated that Saddam Hussein pursued a similar strategy in the run-up to the invasion of Iraq in 2003. Despite apparently having no actual weapons of mass destruction left, he offered only the most grudging co-operation to weapons inspectors. The Iraqi dictator perhaps wanted to conceal the humiliating fact that he had nothing much to hide.

Messrs Aumann and Schelling have never worked together, perhaps because the division of labour between them is so clear. Mr Aumann is happiest proving theorems; Mr Schelling delights in applying them. Mr Aumann operates at the highest levels of abstraction, where the air is thin but the views are panoramic. Mr Schelling tills the lower-lying valleys, discovering the most fertile fields of application and plucking the juiciest examples.

In one of his more unusual papers, Mr Aumann uses game theory to shed light on an obscure passage in the Talmud, which explains how to divide an asset, such as a fine garment, between competing claimants. You should give three-quarters to the person who claims all of it, and the remaining quarter to the person who claims half of it, the text instructs, somewhat inscrutably. Fortunately, the Nobel committee had no need for such a complicated rule in dividing up its prize. Between its two equally deserving laureates, it split the SKr10m (\$1.3m) fifty-fifty.