

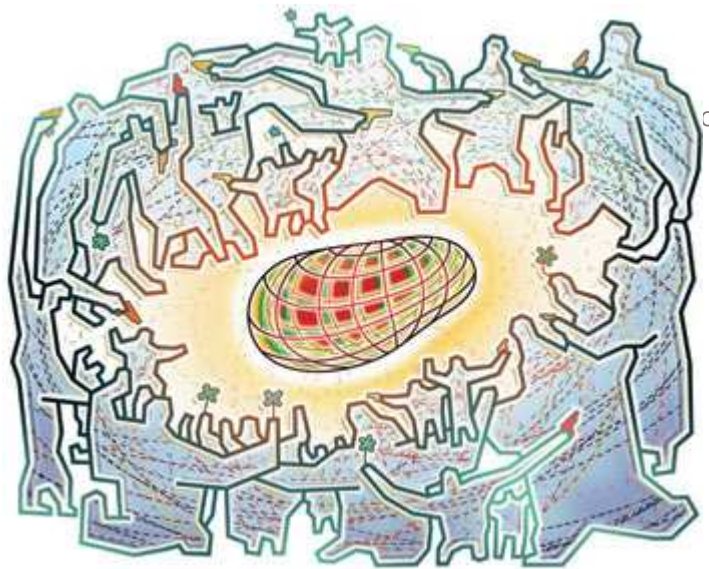
ECONOMICS FOCUS

Economics focus

## Playing games with the planet

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### A version of the “prisoner's dilemma” may suggest ways to break through the Kyoto impasse

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AT ANY given summit on climate change, it is never long before some politician declares how “urgent” or “vital” or “imperative” it is to stop the planet from overheating. And yet few governments are willing to tackle the problem by themselves. In practice, what these impassioned speakers usually mean is that it is urgent—no, vital!—no, imperative!—for all countries but their own to get to grips with climate change.

That is natural enough. After all, all countries will enjoy the benefits of a stable climate whether they have helped to bring it about or not. So a government that can persuade others to cut their greenhouse-gas emissions without doing so itself gets the best of both worlds: it avoids all the expense and self-denial involved, and yet still escapes catastrophe. The most obvious free-riders of this sort are America and Australia, the only rich countries that refuse to put a limit on their emissions. But they are far from being the only offenders: most poor countries, too, are keen to palm the responsibility for curbing global warming off on rich ones, and to continue to grow and pollute as much as they like.

The problem, of course, is that if everyone is counting on others to act, no one will, and the

consequences could be much worse than if everyone had simply done their bit to begin with. Game theorists call a simplified version of this scenario the "prisoner's dilemma". In it, two prisoners accused of the same crime find themselves in separate cells, unable to communicate. Their jailers try to persuade them to implicate one another. If neither goes along with the guards, they will both receive a sentence of just one year. If one accepts the deal and the other keeps quiet, then the turncoat goes free while the patsy gets ten years. And if they both denounce one another, they both get five years.

If the first prisoner is planning to keep quiet, then the second has an incentive to denounce him, and so get off scot-free rather than spend a year in prison. If the first prisoner were planning to betray the second, then the second would still be better off pointing the finger, and so receive a five-year sentence instead of a ten-year one. In other words, a rational, self-interested person would always betray his fellow prisoner. Yet that leaves them both mouldering in jail for five years, when they could have cut their sentences to a year if they had both kept quiet.

Pessimistic souls assume that the international response to climate change will go the way of the prisoner's dilemma. Rational leaders will always neglect the problem, on the grounds that others will either solve it, allowing their country to become a free-rider, or let it fester, making it a doomed cause anyway. So the world is condemned to a slow roasting, even though global warming could be averted if everyone co-operated.

Yet in a recent paper, Michael Liebreich, of New Energy Finance, a research firm, draws on game theory to reach the opposite conclusion. The dynamics of the prisoner's dilemma, he points out, change dramatically if participants know that they will be playing the game more than once. In that case, they have an incentive to co-operate, in order to avoid being punished for their misconduct by their opponent in subsequent rounds.

The paper cites a study on the subject by an American academic, Robert Axelrod, which argues that the most successful strategy when the game is repeated has three elements: first, players should start out by co-operating; second, they should deter betrayals by punishing the transgressor in the next round; and third, they should not bear grudges but instead should start co-operating with treacherous players again after meting out the appropriate punishment. The result of this strategy can be sustained co-operation rather than a cycle of recrimination.

Mr Liebreich believes that all this holds lessons for the world's climate negotiators. Treaties on climate change, after all, are not one-offs. Indeed, the United Nations is even now trying to get its members to negotiate a successor to its existing treaty, the Kyoto Protocol, which expires in 2012. Many fear that the effort will collapse unless the laggards can be persuaded to join in. But the paper argues that rational countries will not be deterred by free-riders. They will continue to curb their emissions, while devising sanctions for those who do not.

## **Under lock and Kyoto**

The Kyoto Protocol already embodies some of these elements. Countries that do not meet their commitments, for example, are supposed to be punished with a requirement to cut their emissions more sharply the next time around. But Mr Liebreich argues that there should also be sanctions for rich countries that refuse to participate, and stronger incentives for poor countries (which are exempted from any mandatory cuts) to join in. Rather than trying to craft an agreement that is agreeable to all, the more enthusiastic countries should simply press on with a system to which recalcitrant ones could later accede.

The global regime on climate change, Mr Liebreich believes, should also be revised more frequently, to allow the game to play itself out more quickly. So instead of stipulating big reductions in emissions, to be implemented over five years, as in Kyoto, negotiators might consider adopting annual targets. That way, co-operative governments know that they cannot be taken advantage of for long, whereas free-riders can be punished and penitents brought

back into the fold more quickly.

There are flaws in the analogy, of course. In the real world, governments can communicate and form alliances, which makes the dynamics of the game much more complicated. And governments may not act consistently or rationally. Most observers, for example, assume that America's policy on global warming will change in 2008, along with its president. And most countries' willingness to act is presumably linked to the severity of global warming's ill effects. If things get bad enough, then with any luck everyone will play the game.