Sheets 15 Upward-Facing Dragonfly

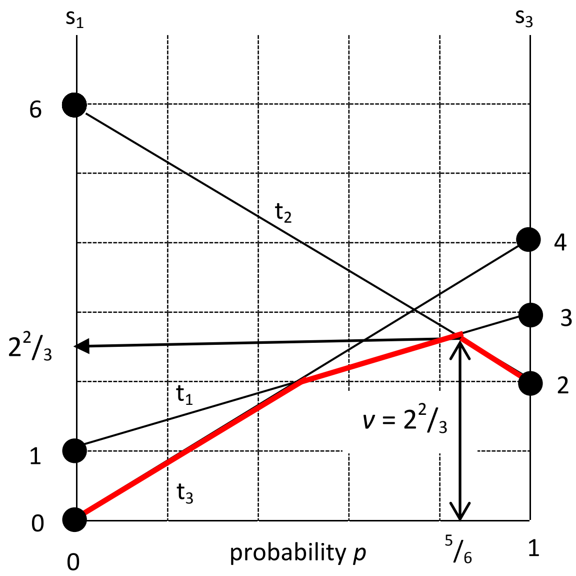
Figure 1 The two-person zero-sum game of Binmore

	t_1	t_1	t_1
s_1	1	6	0
s_2	2	0	3
s_3	3	2	4

Figure 2 The new two-person zero-sum game of Binmore

	t_1	t_1	t_1
s_1	1	6	0
s_3	3	2	4

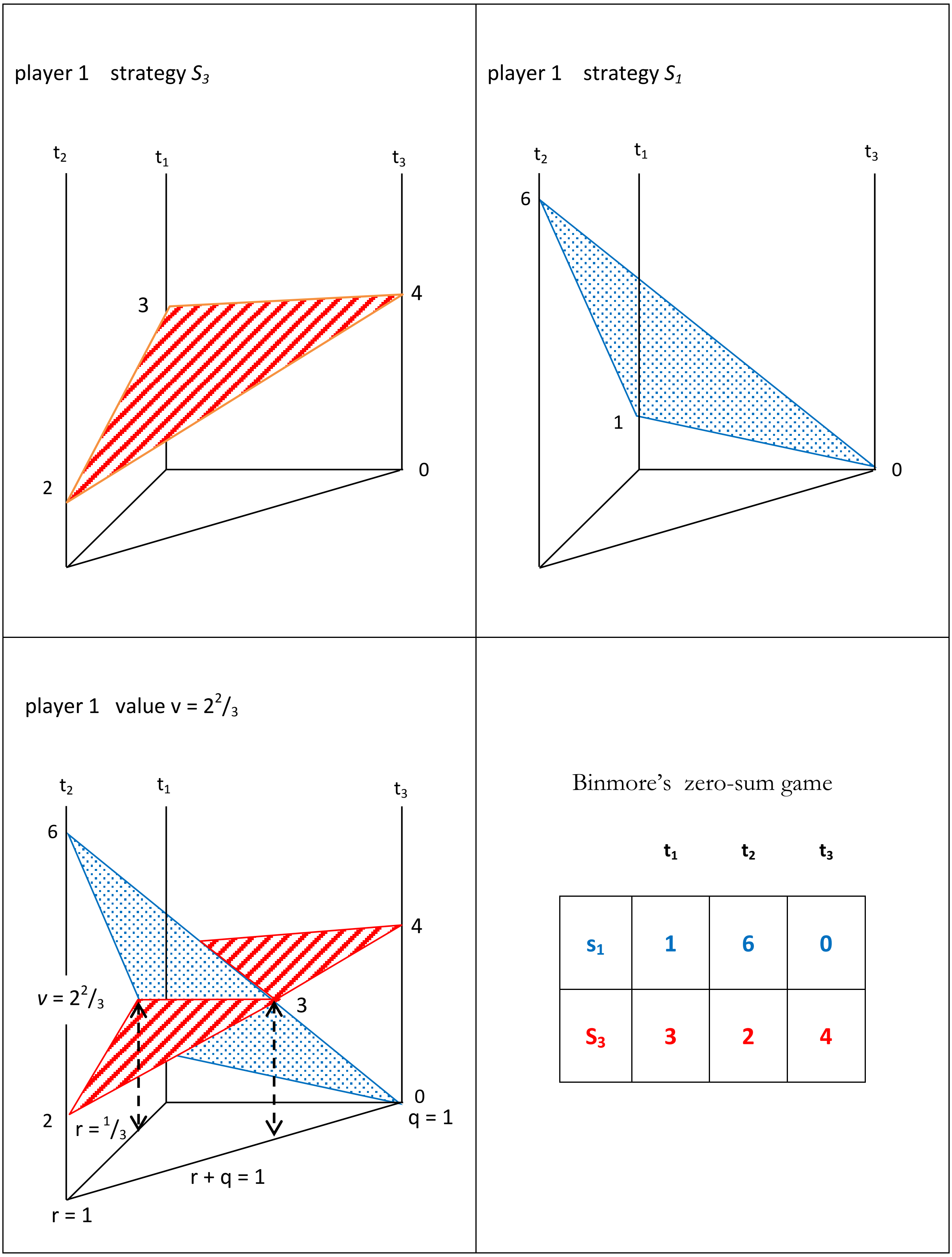
Figure 3 The utility space of the row player



Expected utility s_1: $1 * {}^2/_3 + 6 * {}^1/_3 = 2^2/_3$
Expected utility s_3: $3 * {}^2/_3 + 2 * {}^1/_3 = 2^2/_3$
Expected utility t_1: $1 * {}^1/_6 + 3 * {}^5/_6 = 2^2/_3$
Expected utility t_2: $6 * {}^1/_6 + 2 * {}^5/_6 = 2^2/_3$

But in the context of positive-sum games, the rationale for ensuring the security level by playing the maximin strategy is no longer valid. Each player in a positive-sum game is pursuing his own absolute gain without minimizing the maximum of the other player.

Figure 4 A three-dimensional utility space of the row player



	t_1	t_2	t_3
s_1	1	6	0
S_3	3	2	4

The evolutionary theory of conflict

The contest over the habitat has the value V, i.e. the gain in fitness due to a more favourable habitat. Fighting over the habitat can lead to injury and the cost of injury is C, which stands for the loss in fitness.

Realists assume that the aggressive nature of a state is based on the assumption of Morgenthau that humans possess an *animus dominandi*, i.e. humans have a lust for power and the desire to dominate (Thayer 2000: 129).

Figure 5 Hawk versus Dove game

		player 2	
		Dove (C)	Hawk (D)
player 1	Dove (C)	V/2, V/2	0, V
	Hawk (D)	V, 0	½ (V-C), ½ (V-C)

Figure 6 Game with V = 6 and C = 2: Prisoner's Dilemma

		player 2	
		Dove (C)	Hawk (D)
player 1	Dove (C)	3, 3	0, 6
	Hawk (D)	6, 0	2, 2

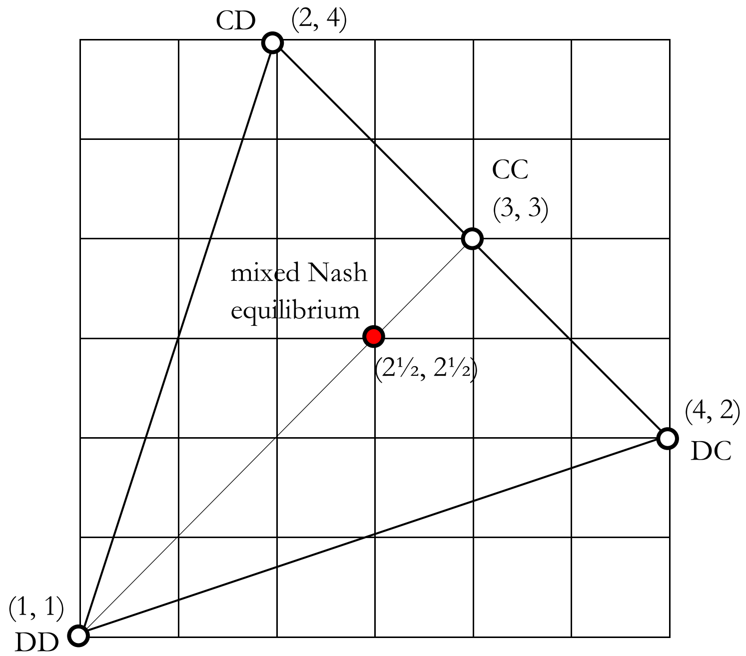
Figure 7 **Game with V = 2 and C = 4: Chicken Game**

		player 2	
		Dove (C)	Hawk (D)
player 1	Dove (C)	1, 1	0, 2
	Hawk (D)	2, 0	-1, -1

Figure 8 **Chicken Game**

		player 2	
		swerve (C)	drive straight (D)
player 1	swerve (C)	3, 3	2, 4
	drive straight (D)	4, 2	1, 1

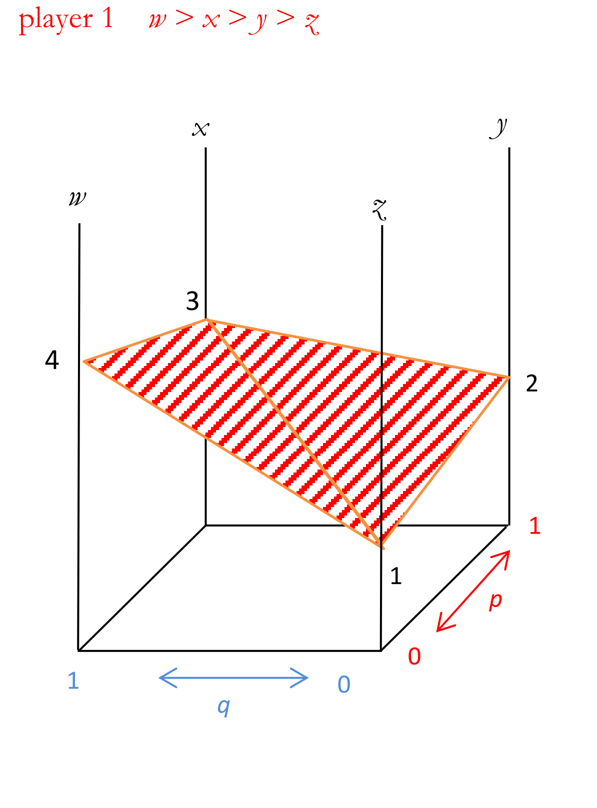
Figure 9 **Payoff polygon of the Chicken Game**

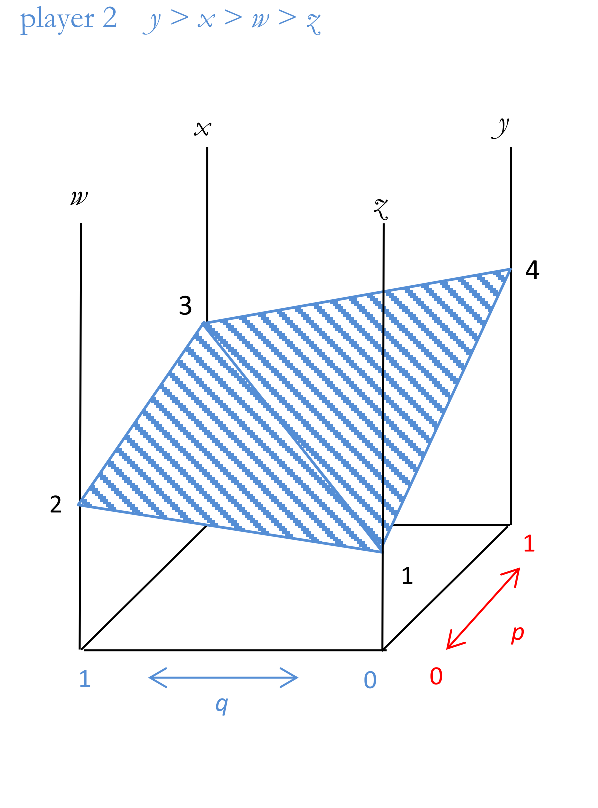


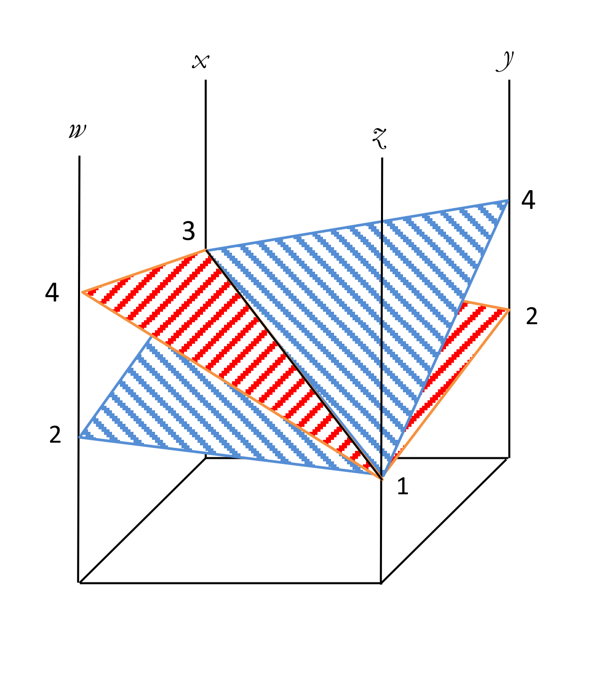
Mixed strategies are calculated to neutralize the other player's choice of strategy, not to maximize the mixing player's payoff' (Morrow 1994: 87).

We start with the spatial illustration of the Chicken Game to emphasize the difference with the two-dimensional typology of the game in Figure 9. The three-dimensional model of the Chicken Game resembles an upward-facing dragonfly.

Figure 10 Game # 66 The three-dimensional Chicken Game







Chicken Game

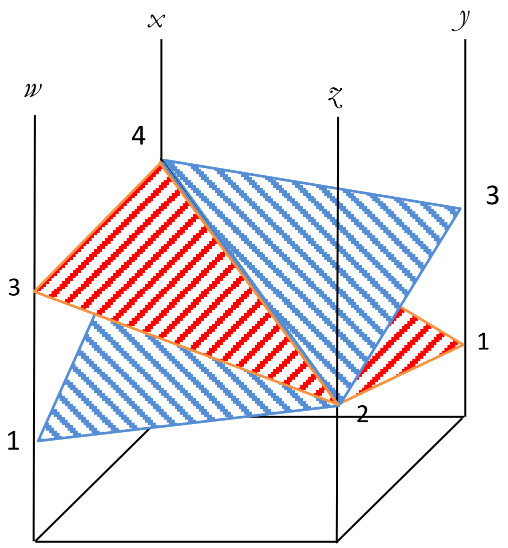
		player 2	
		$q * \beta_1$	$(1-q) * \beta_2$
player 1	$p * \alpha_1$	(x) 3, 3	(y) 2, 4
	$(1-p) * \alpha_2$	(w) 4, 2	(z) 1, 1

($\mathbf{A_4}$). If neither player has a dominating strategy, and if the game has either no Pareto equilibrium or more than one, each player will choose the strategy which contains his maximin outcome (i.e. in our context, the strategy which avoids the smallest of the four payoffs) (Rapoport and Guyer 1966: 205).

This result is interesting and it raises the question whether the random strategy of maximizing the absolute gain of a player also corresponds to rule A_3:

($\mathbf{A_3}$). If a game has single Pareto equilibrium, the players will choose the strategy which contains it.

Figure 11 Game #61, the Assurance Game or Stag Hunt



Stag Hunt

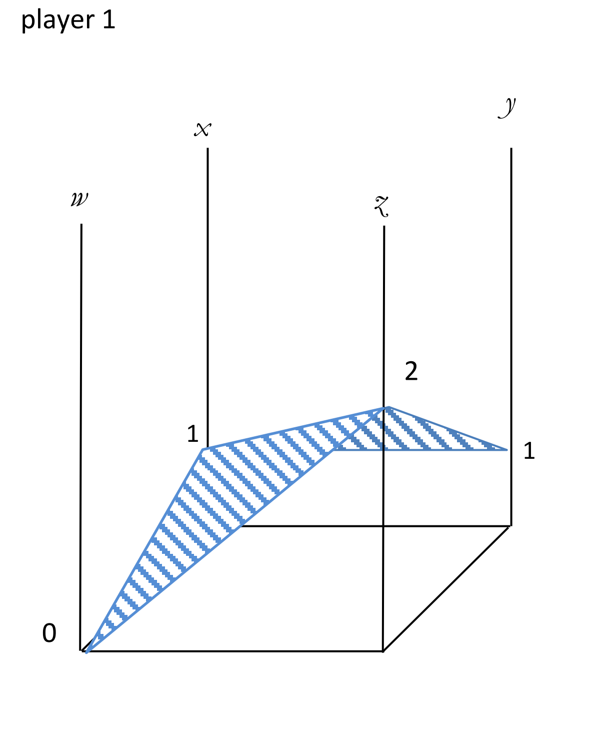
player 2

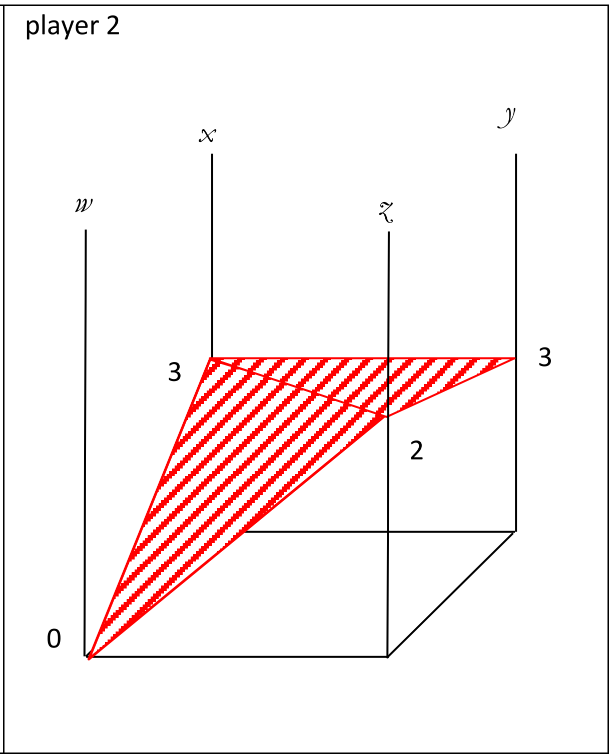
player 1		$q * \beta_1$	$(1\text{-}q) * \beta_2$
	$p * \alpha_1$	(*x*) 4, 4	(*y*) 1, 3
	$(1\text{-}p) * \alpha_2$	(*w*) 3, 1	(*z*) 2, 2

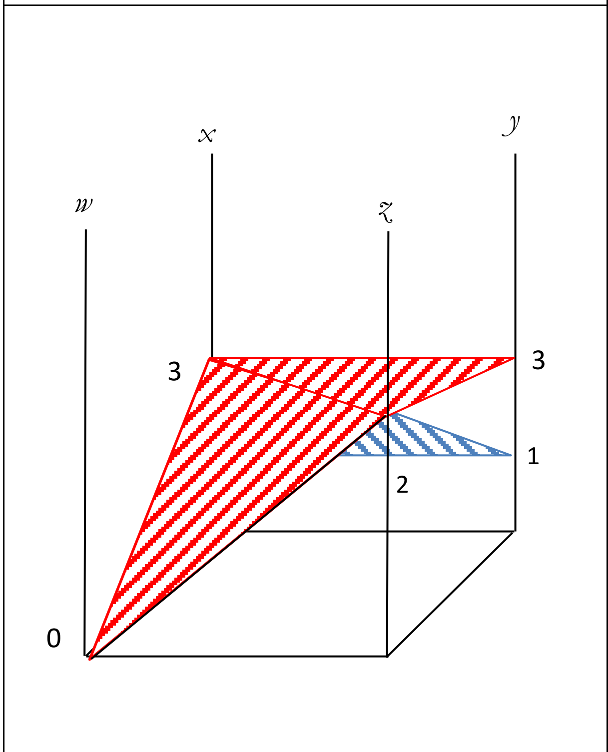
($\mathbf{A}_1$). If both players have a dominating strategy, both will choose it.

($\mathbf{A}_2$). If only one player has a dominating strategy, he will choose it, and the other will choose the strategy that maximizes his payoff under the assumption that the first player has chosen his dominating strategy.

Figure 12 The Harsanyi Game







Harsanyi Game

		player 2	
		q * B_1	(1-q) * B_2
player 1	p * A_1	(x) 1, 3	(y) 1, 3
	(1-p) * A_2	(w) 0, 0	(z) 2, 2

The calculation of mixed strategies makes sense in a zero-sum game, but neutralizing the utilities of the other player makes no sense in a positive-sum game. 'The notion of mixed strategy which has some appeal in the context of zero-sum games is not realistic in the context of non-zero-sum games' (Rubinstein 1995:10).

By rejecting the mixed strategy in positive-sum games, there is no foundation for the Nash equilibrium. Without an equilibrium point the theory of games faces a fundamental problem to define the best strategy for each player.

Therefore, the notions of maximizing one's own utility by selecting the best strategy for strictly determined games and applying a random strategy for games that are not strictly determined are sufficient for defining the best strategy for each player. An equilibrium point is not necessary for specifying the rational choice of players in a two-person positive-sum game.