19 Sept. 2006 Eric Rasmusen, Erasmuse@indiana.edu. Http://www.rasmusen.org. Overheads for Chapter 4 of *Games and Information*

Latex

Finance— risk aversion, conglomerates, multinationals

BEPP Seminar Friday at 3:30–Raphael Rob, U. of Penn. . CG 2069. Repeated Games.

TUESDAY:

1. Perfectness
2. Repeated Games
3. Reputation

THURSDAY

1. Rob's paper
2. Perfect bayesian equilibrium

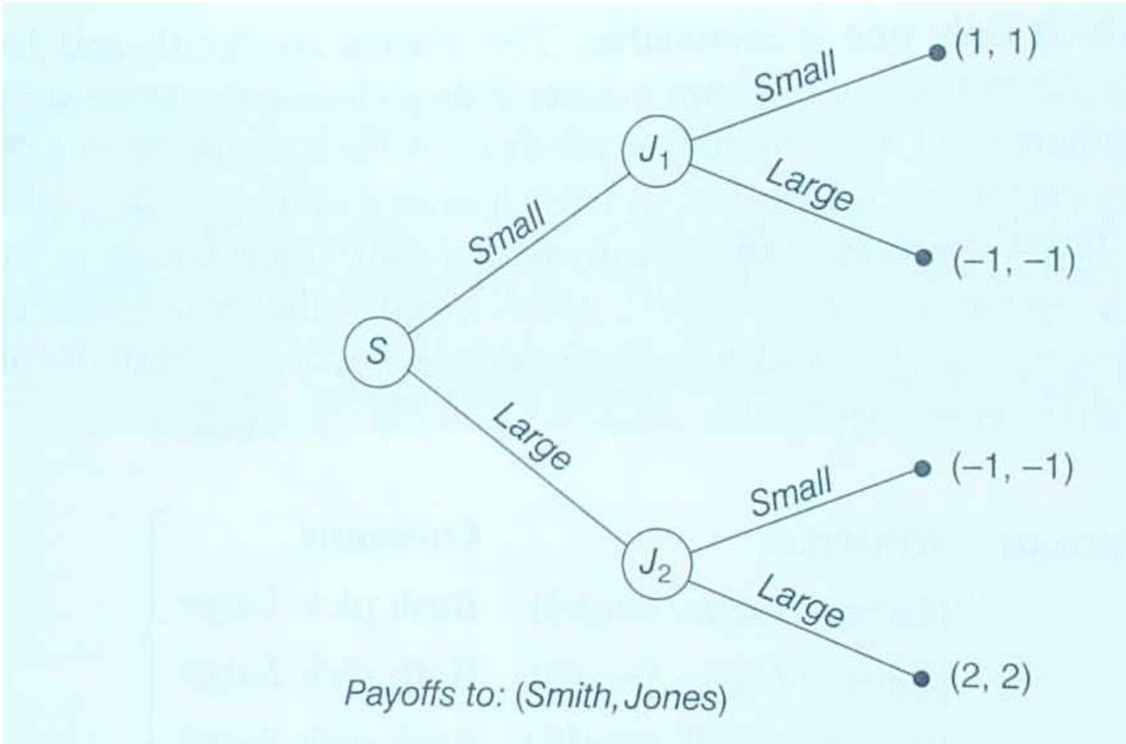

Figure 1: *Follow the Leader I*

We say that equilibria E_1 and E_3 are Nash equilibria but not "perfect" Nash equilibria. A strategy profile is a perfect equilibrium if it remains an equilibrium on all possible paths, including not only the equilibrium path but all the other paths, which branch off into different "subgames."

A strategy profile is a **subgame perfect Nash equilibrium** *if (a) it is a Nash equilibrium for the entire game; and (b) its relevant action rules are a Nash equilibrium for every subgame.*

TREMBLES

A second reason is that a weak Nash equilibrium is not robust to small changes in the game. So long as he is certain that Smith will not choose *Large*, Jones is indifferent between the never-to-be-used responses (*Small* if *Large*) and (*Large* if *Large*). Equilibria E_1, E_2, and E_3 are all weak Nash equilibria because of this. But if there is even a small probability that Smith will choose *Large*— perhaps by mistake— then Jones would prefer the response (*Large* if *Large*), and equilibria E_1 and E_3 are no longer valid. Perfectness is a way to eliminate some of these less robust weak equilibria. The small probability of a mistake is called a **tremble**, and Section 6.1 returns to this **trembling hand** approach as one way to extend the notion of perfectness to games of asymmetric information.

The tremble approach is distinct from sequential rationality.

Consider Figure 2's Tremble Game. This game has three Nash equilibria, all weak: *(Out, Down)*, *(Out, Up)*, and *(In, Up)*. Only *(Out, Up)* and *(In, Up)* are subgame perfect, because although *Down* is weakly Jones's best response to Smith's *Out*, it is inferior if Smith chooses *In*. In the subgame starting with Jones's move, the only subgame perfect equilibrium is for Jones to choose *Up*. The possibility of trembles, however, rules out *(In, Up)* as an equilibrium. If Jones has even an infinitesimal chance of trembling and choosing *Down*, Smith will choose *Out* instead of *In*. Also, Jones will choose *Up*, not *Down*, because if Smith trembles and chooses *In*, Jones prefers *Up* to *Down*. This leaves only *(Out, Up)* as an equilibrium, despite the fact that it is weakly pareto dominated by *(In, Up)*.

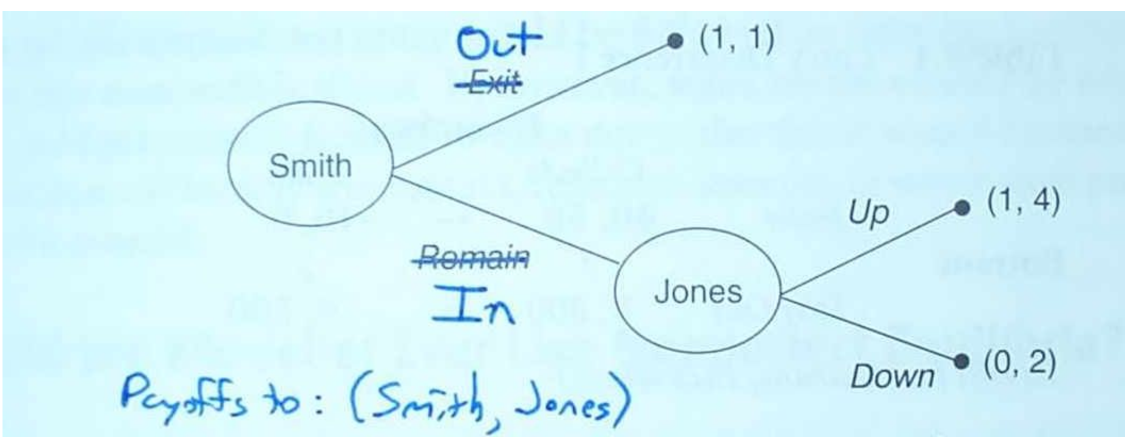

Figure 2: The Tremble Game: Trembling Hand Versus Subgame Perfectness

Entry Deterrence I

Players

Two firms, the entrant and the incumbent.

The Order of Play

1 The entrant decides whether to *Enter* or *Stay Out.*

2 If the entrant enters, the incumbent can *Collude* with him, or *Fight* by cutting the price drastically.

Payoffs

Market profits are 300 at the monopoly price and 0 at the fighting price. Entry costs are 10. Duopoly competition reduces market revenue to 100, which is split evenly.

Table 1: Entry Deterrence I

		Incumbent		
		Collude		*Fight*
	Enter	**40,50**	←	$-10, 0$
Entrant:		↑		↓
	Stay Out	$0, 300$	↔	**0,300**

Payoffs to: (Entrant, Incumbent). Arrows show how a player can increase his payoff.

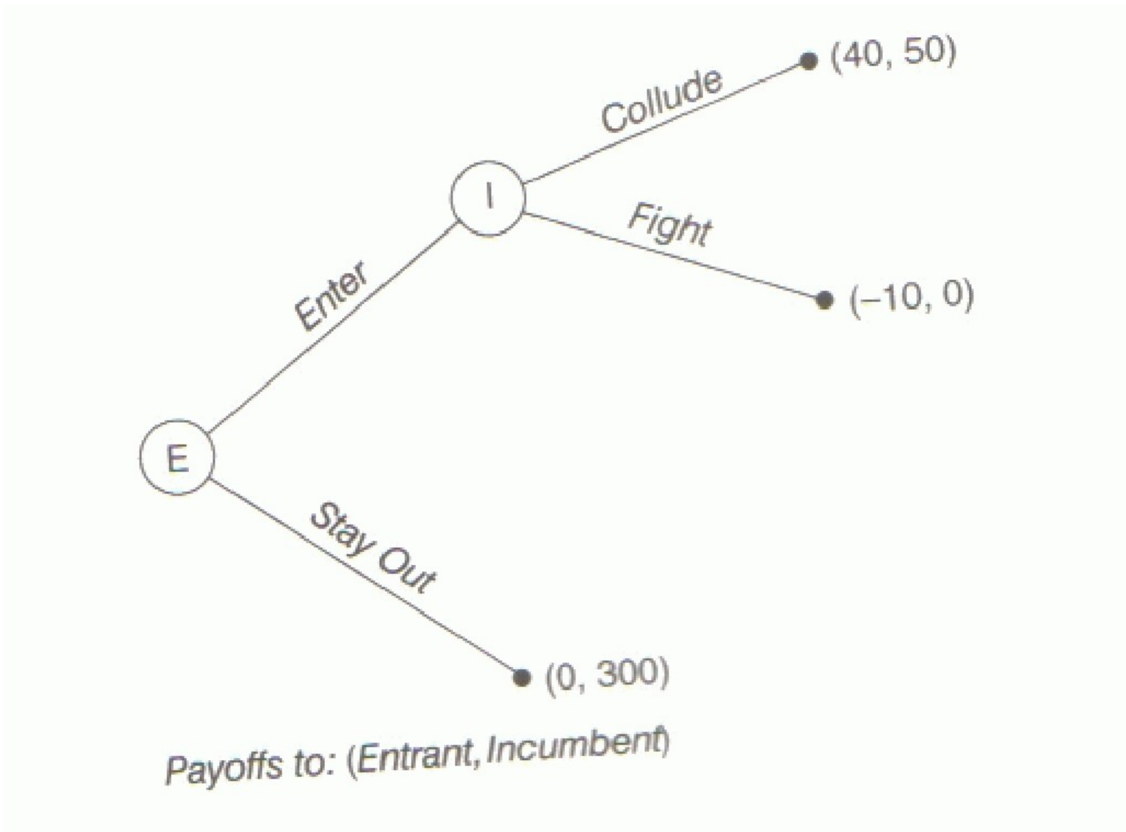

Figure 3: Entry Deterrence I