Creating the Largest Pie

Adam Brandenburger

Game Theory vs. The Invisible Hand

"Adam Smith said the best outcome for the group comes from everyone trying to do what's best for himself. Incorrect. The best outcome results from everyone trying to do what's best for himself ***and the group****."* *

http://en.wikipedia.org/wiki/File:The-Invisible-Man.jpg

* *A Beautiful Mind: The Shooting Script*, by Akiva Goldsman, Newmarket Press, 2002, p.24. Bold in quote added.

Game Theory and the Pie

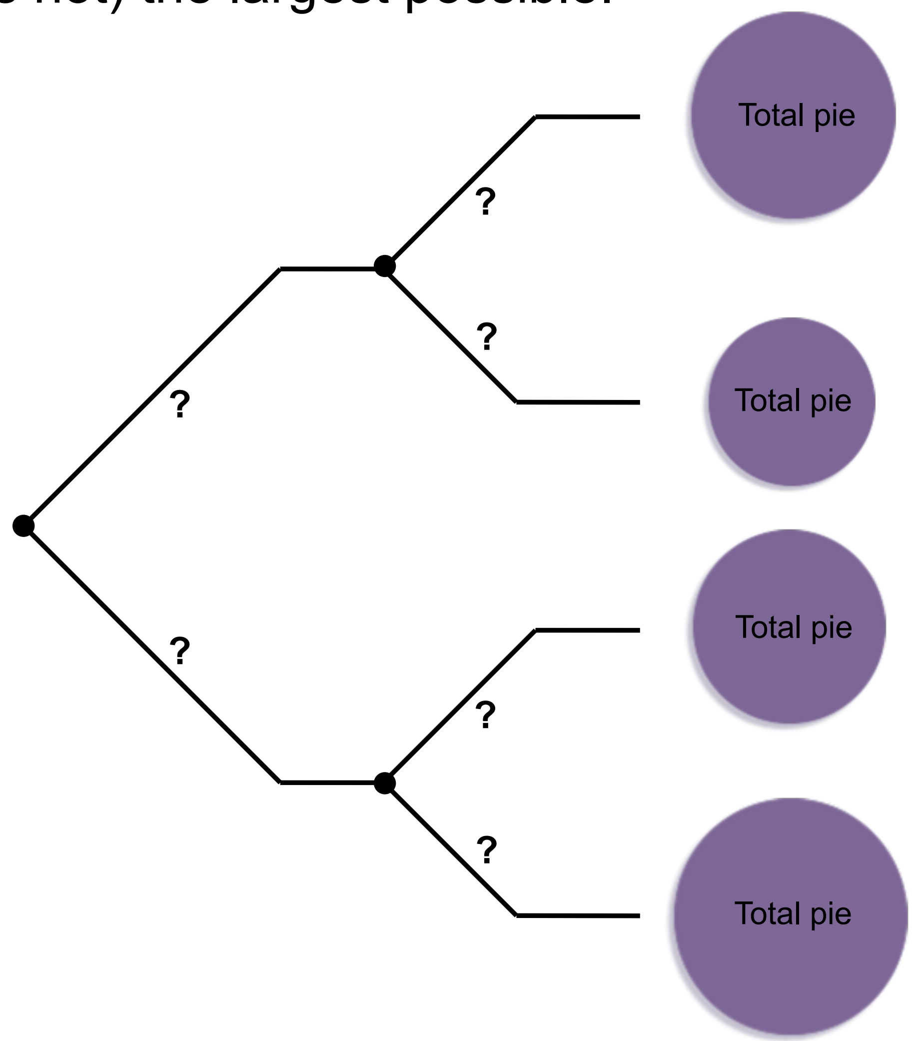
	Do not confess	Confess
Do not confess	1 Year / 1 Year	0 Years / 20 Years
Confess	20 Years / 0 Years	5 Years / 5 Years

Is Confess-Confess good or bad under an appropriate measure of the overall worth of the game?

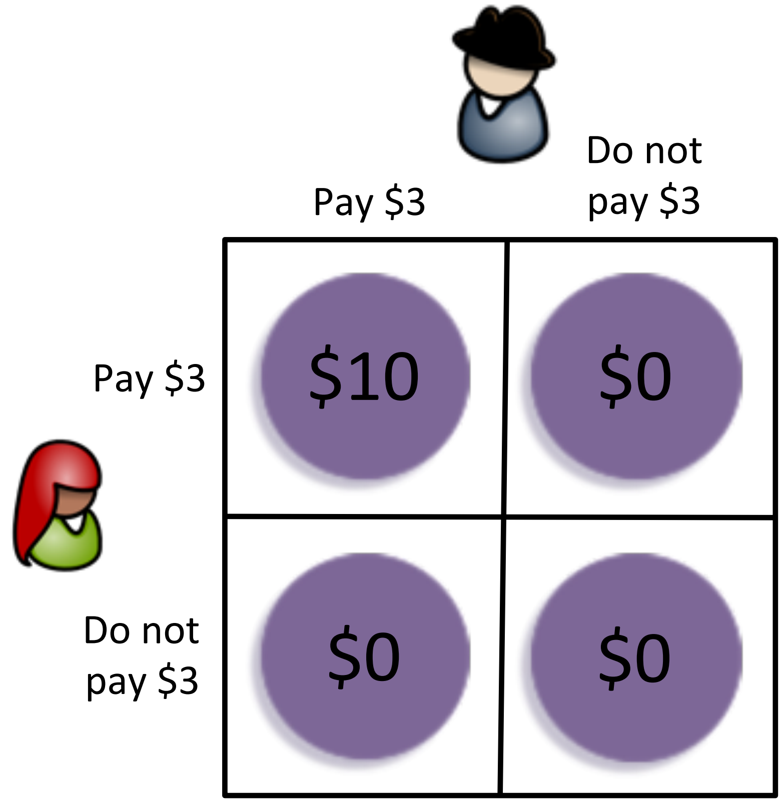
When players follow their individual interests, do the choices they make lead to the largest overall pie?

Efficiency and Inefficiency

Efficiency (resp. inefficiency) arises when the pie that results from the strategic moves that the players choose is (resp. is not) the largest possible.



Example #1



Alice and Bob each has to decide whether or not to pay $3 to a third party. If they both pay $3, they are in a position to transact with each other and together create $10 of value.

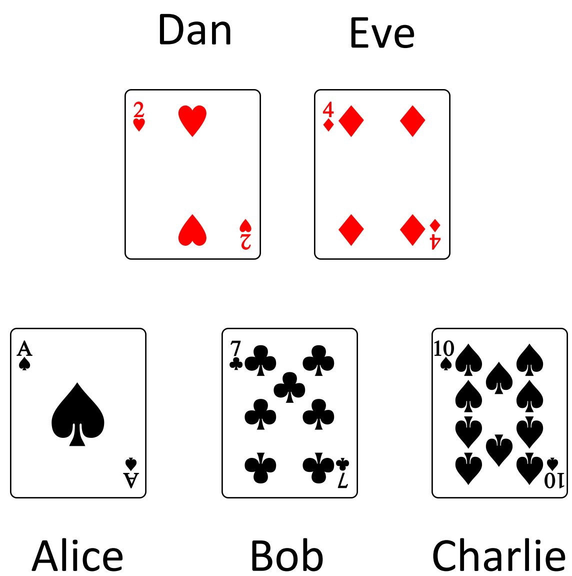
Will they pay?

No Bargaining Problems

A game exhibits **No Bargaining Problems** if the sum, over all the players, of each player's added value is equal to the total value of the game:

$$\sum_{\text{All players } i} \text{Added value of player } i = \text{The total value of the game.}$$

Example #2



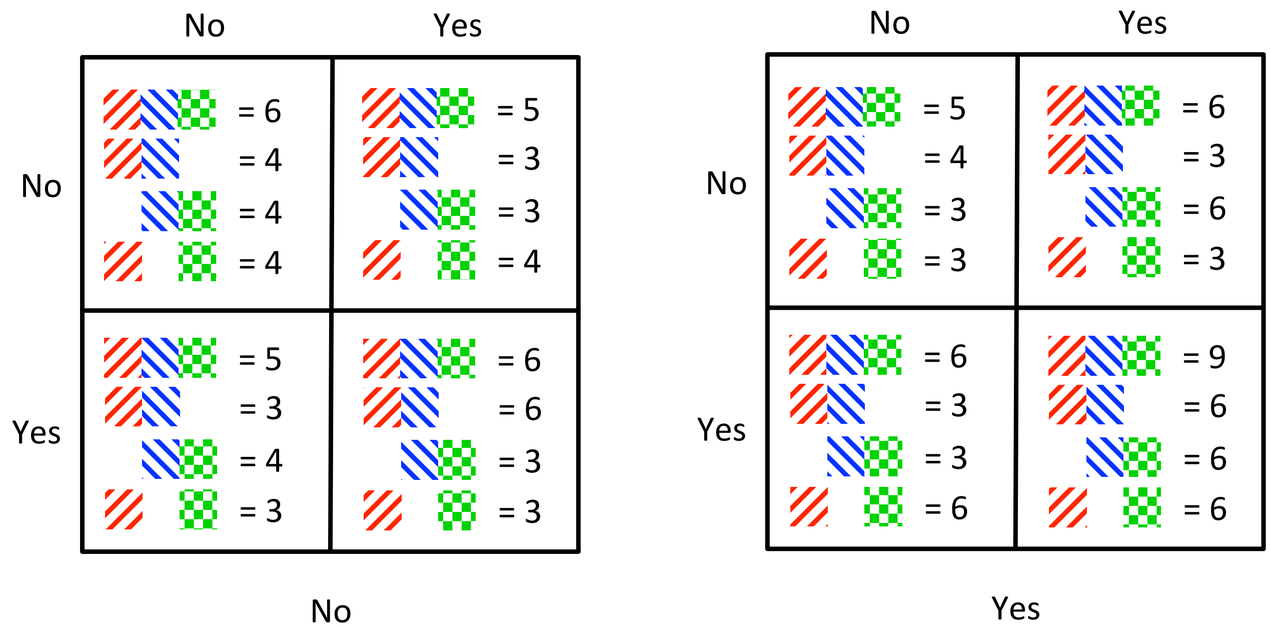
Before negotiations begin, Alice can dog-ear the black cards that Bob and Charlie get. A red card and a dog-eared black card are together worth $50 (rather than $100).

Will she do so?

No Externality Problems

A game exhibits **No Externality Problems** if, taking each player *i* at a time (and holding constant the pre-negotiation choices made by all the players other than *i*), the choices *i* makes do not affect the pie created by all the players other than *i*.

Example #3



	No	Yes
No	2, 2, 2	2, 1, 2
Yes	1, 2, 2	3, 3, 0

No

	No	Yes
No	2, 2, 1	0, 3, 3
Yes	3, 0, 3	3, 3, 3

Yes

Will Ann, Bob, Charlie choose Yes-Yes-Yes?

No Coordination Problems

A game exhibits **No Coordination Problems** if the maximum of the overall pie can be found by maximizing the overall pie player-by-player.

An Invisible Hand Theorem

If a game exhibits No Bargaining Problems, No Externality Problems, and No Coordination Problems, then each player has a dominant strategy and, when these strategies are played, the largest overall pie is created.

We see that for the Invisible Hand to work, various kinds of interdependencies among players have to be ruled out.

From: Brandenburger, A., and H. Stuart, “Biform Games,” *Management Science*, 53, 2007, 537-549.

Default Bias

Too easily accepting a default or status-quo option is a well-studied human cognitive error.*

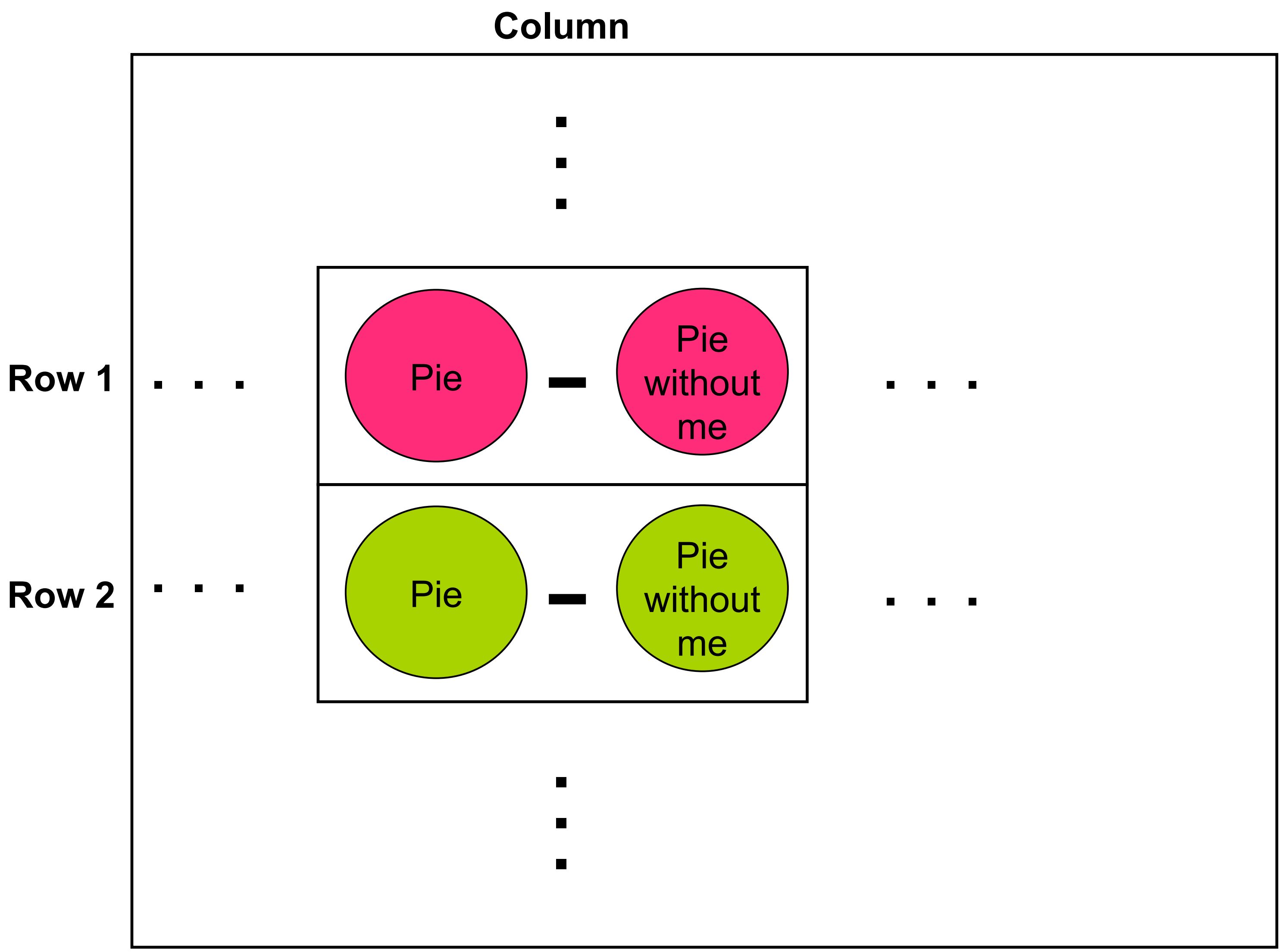
This means that it matters a great deal which default view of an economic system is accepted.

Under the first view --- the orthodox view --- the conclusion will be that, very often, the Invisible Hand works well.

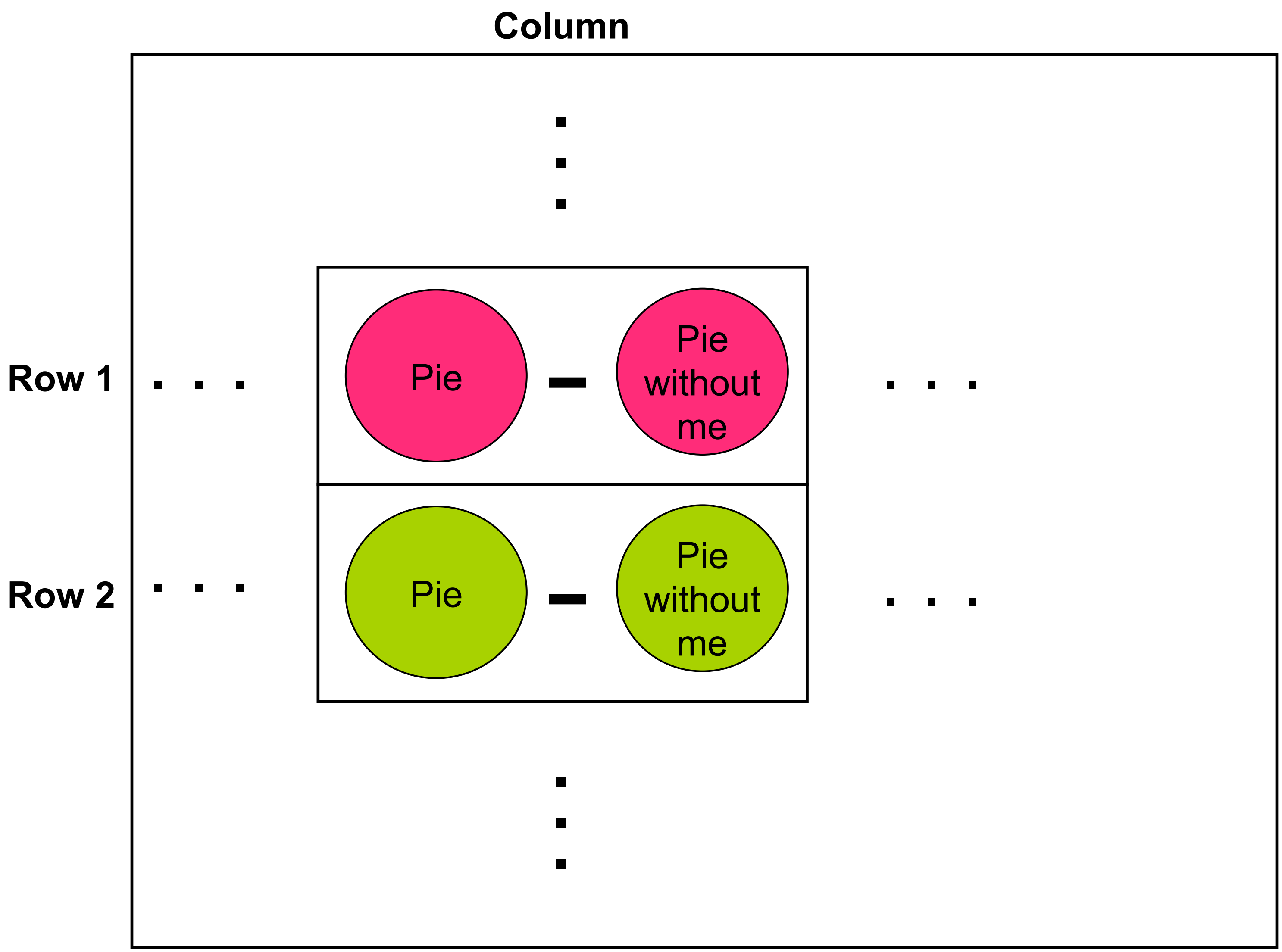
Under the second view --- the view that comes from our general game model --- this conclusion will be much less likely to be reached.

* See Samuelson, W., and R. Zeckhauser, "Status Quo Bias in Decision Making," *Journal of Risk and Uncertainty*, 1, 1988, 7-59; "Overcoming Status Quo Bias in the Human Brain," by Fleming, S., C. Thomas, and R. Dolan, *Proceedings of the National Academy of Sciences*, 107, 2010, 6005-6009.

Step 1 of Proof



Step 2 of Proof



Step 3 of Proof