Introduction to Game Theory:

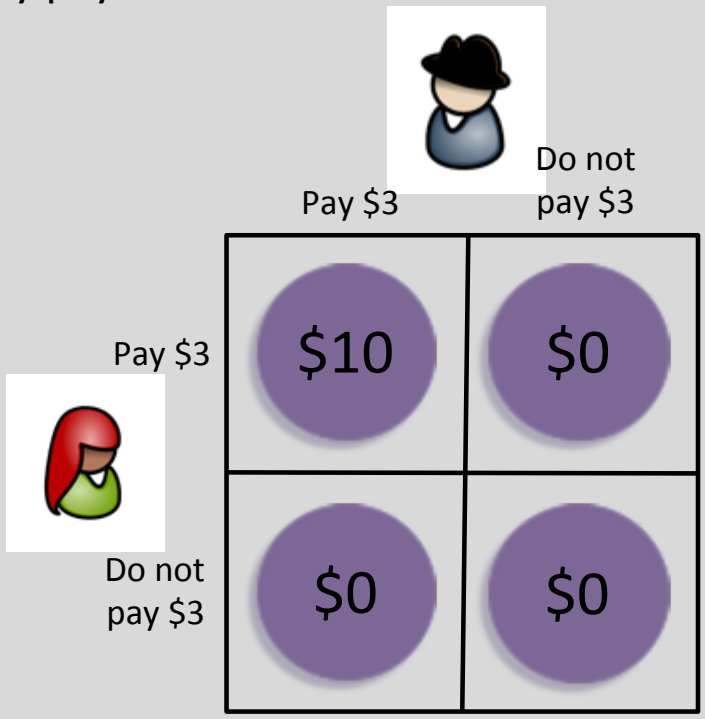
Game-Theoretic Analysis of Economic Efficiency

Version 10/29/17

Economic Efficiency from the Perspective of Game Theory

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: 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?



 Brandenburger, A., and H. Stuart, "Biform Games," *Management Science*, 53, 2007, 537-549

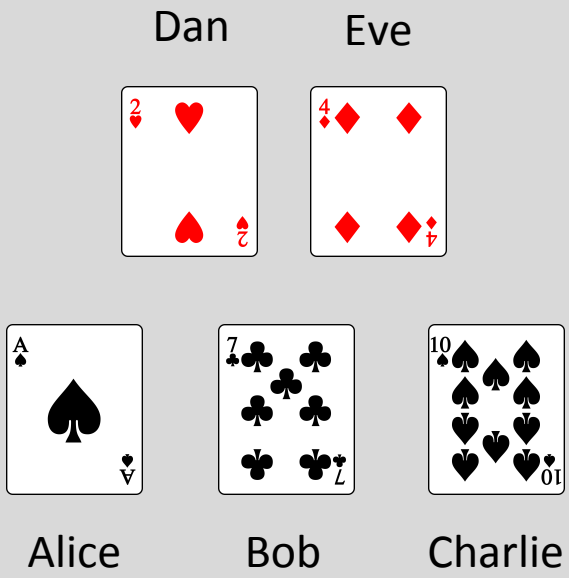
No Bargaining Problems

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

$$\sum_{i=1}^{n} \mathrm{MC}_i = v(N)$$

Economic Efficiency Cont'd

Example: Alice, Bob, and Charlie each hold a black playing card. Dan and Eve each hold a red playing card. Any black card and red card together are worth $100. Before negotiations among the players 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 only $50. Will she do so?

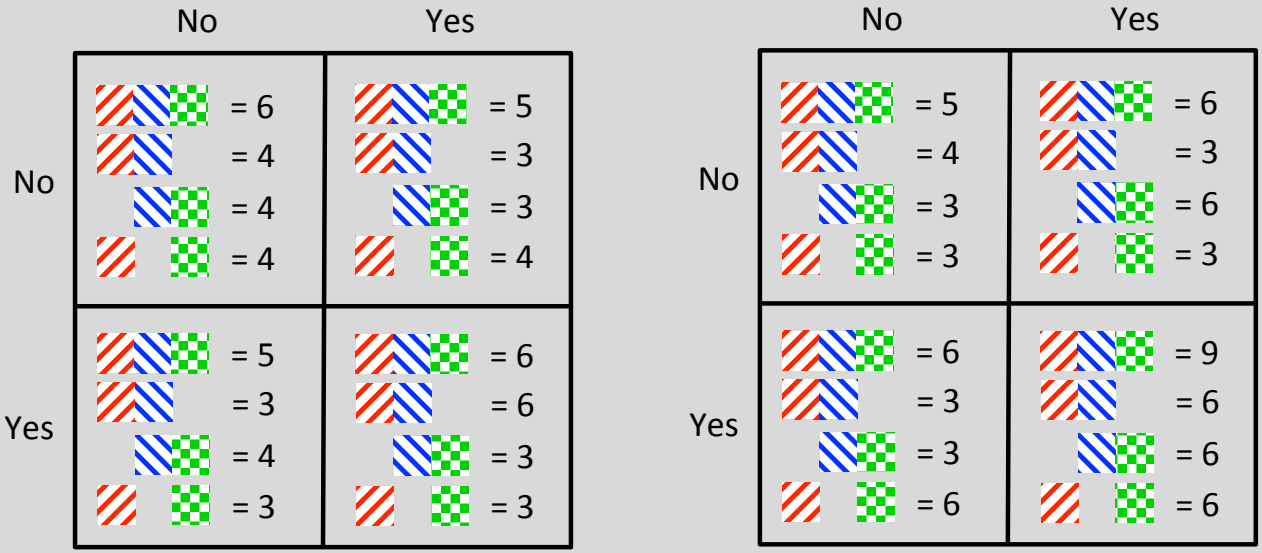


No Externality Problems

A game exhibits **No Externality Problems** if, taking each player i at a time (and holding constant the pre-bargaining 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

Economic Efficiency Cont'd

Example: Alice chooses the row, Bob chooses the column, and Charlie chooses the matrix. Will Ann, Bob, Charlie choose Yes-Yes-Yes?



No

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

Yes

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

No

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

A Theorem on Efficiency

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 efficiency to be assured, various kinds of interdependencies among players have to be ruled out.