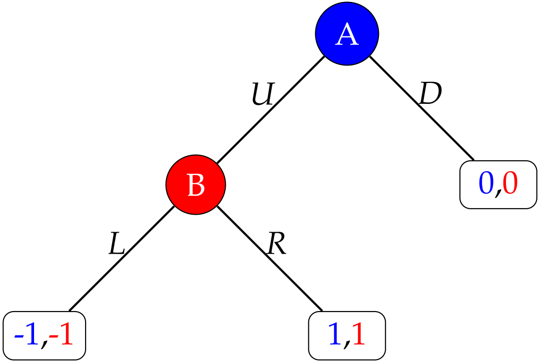
PHIL309P
Methods in Philosophy, Politics and Economics

Eric Pacuit
University of Maryland

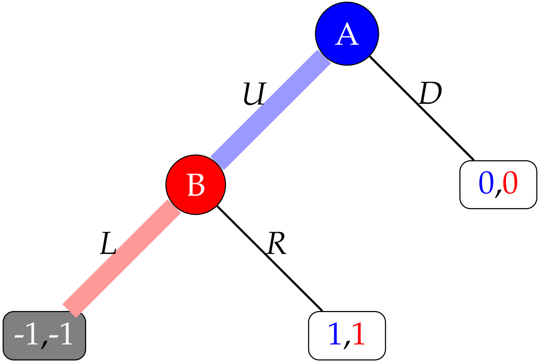
	L	R
U	-1, -1	1, 1
D	0, 0	0, 0

	L	R
U	-1, -1	1, 1
D	0, 0	0, 0

Extensive Form



Extensive Form



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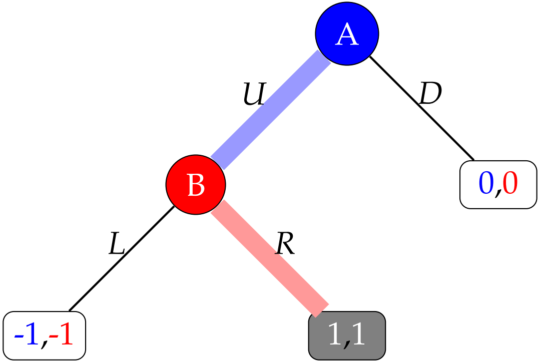

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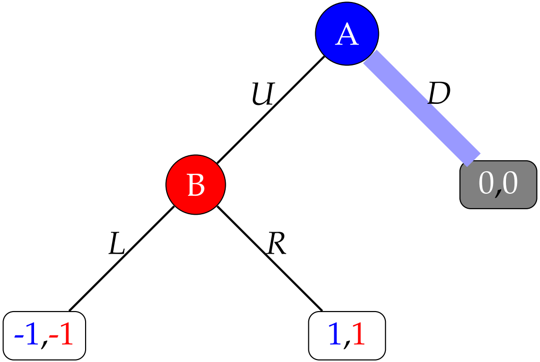

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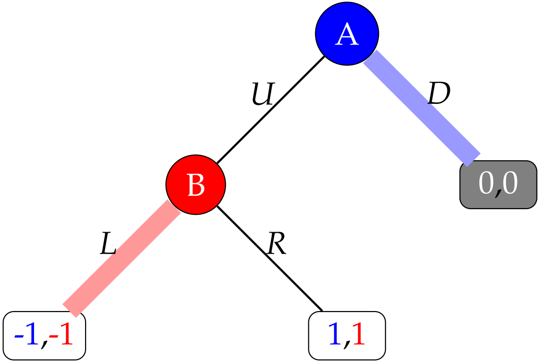

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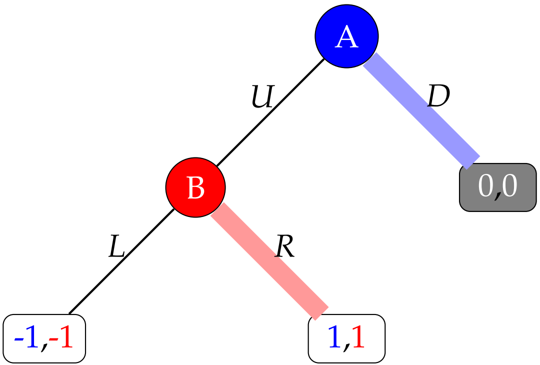
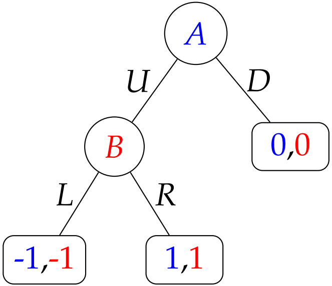


Normal form vs. Extensive form



	L if *U*	*R* if *U*
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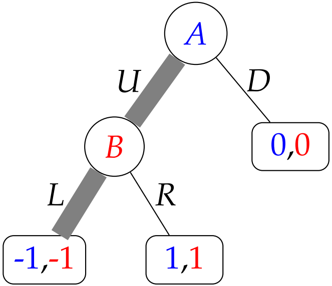

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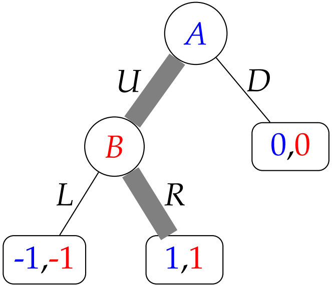

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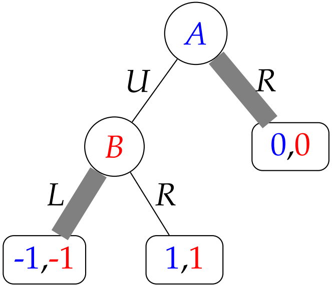

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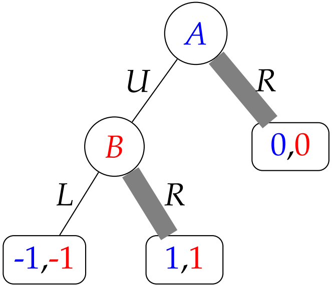

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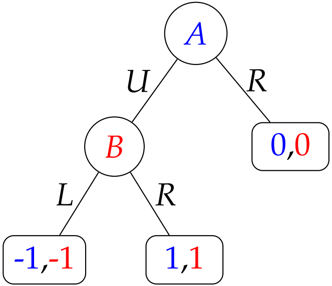

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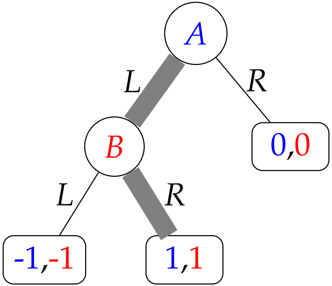

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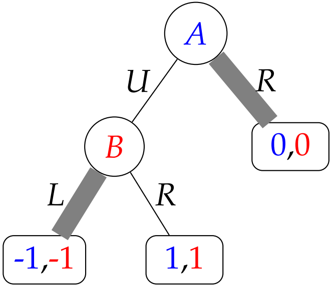

	L if *U*	*R* if *U*
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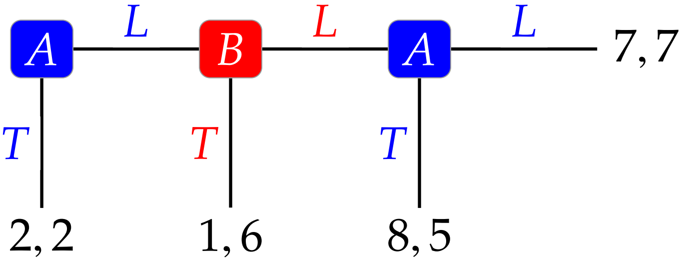
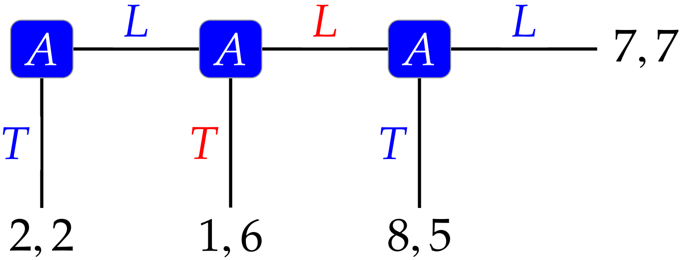
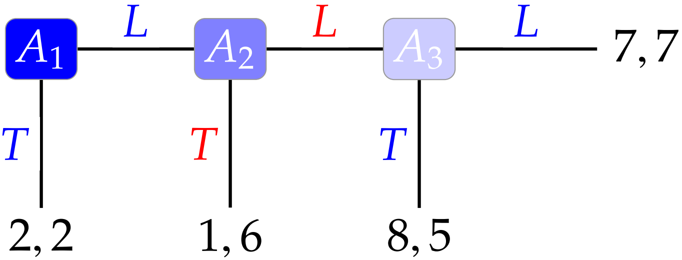
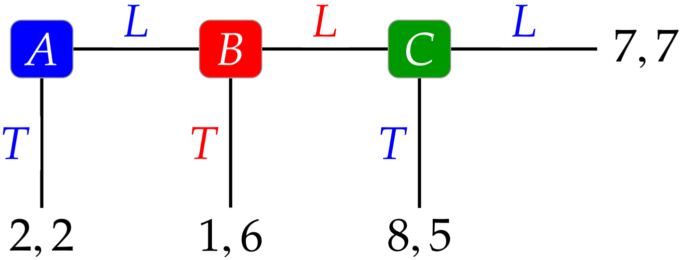
Incredible threat


A
L
B
L
A
L
7, 7
T
T
T
2, 2
1, 6
8, 5

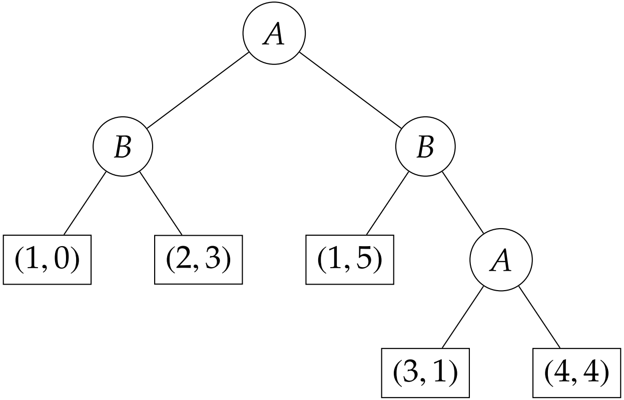

A
L
A
L
A
L
7, 7
T
T
T
2, 2
1, 6
8, 5


A_1
A_2
A_3
L
L
L
$7,7$
T
T
T
$2,2$
$1,6$
$8,5$



A
B
C
L
L
L
T
T
T
$7,7$
$2,2$
$1,6$
$8,5$

Backward Induction



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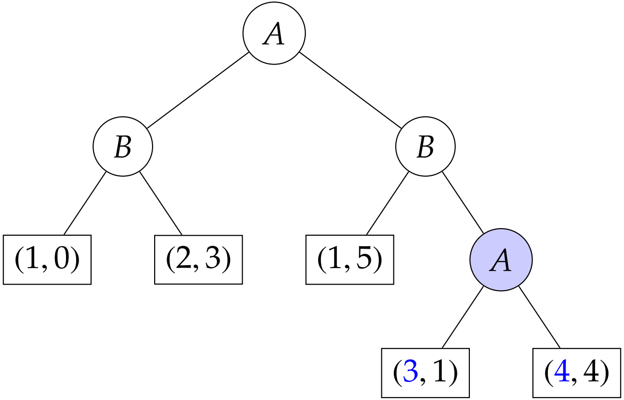

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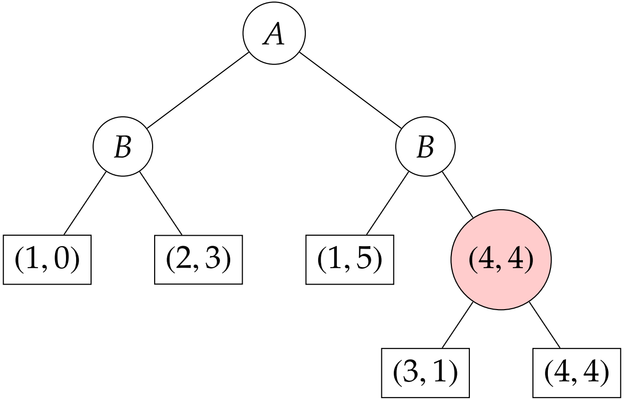
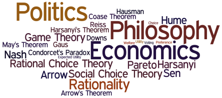
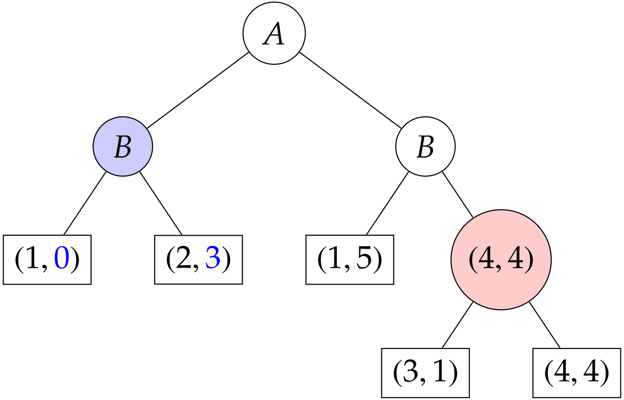


Backward Induction





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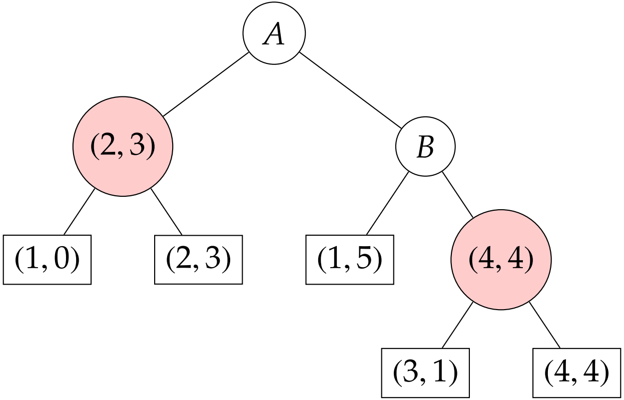

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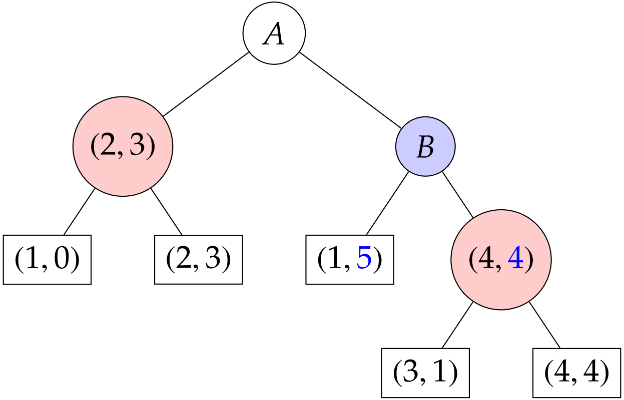
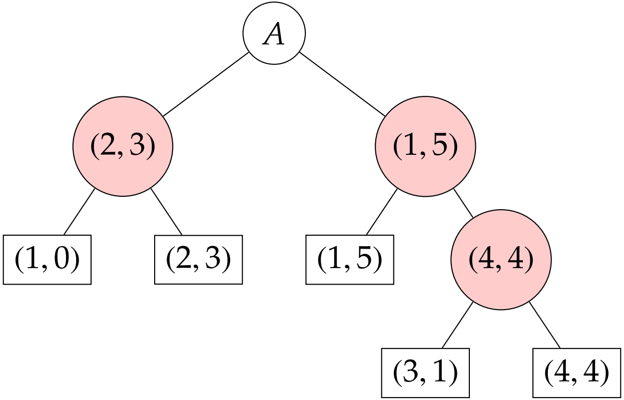
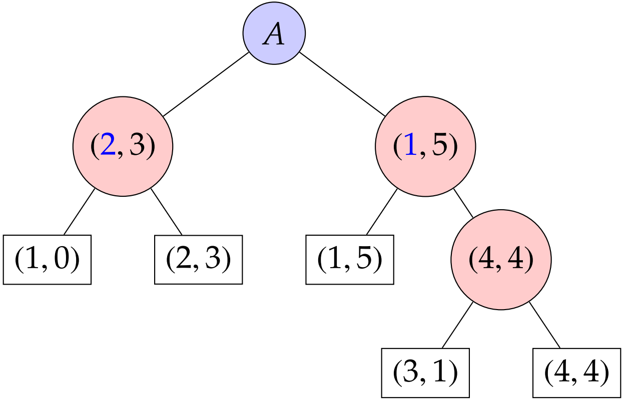


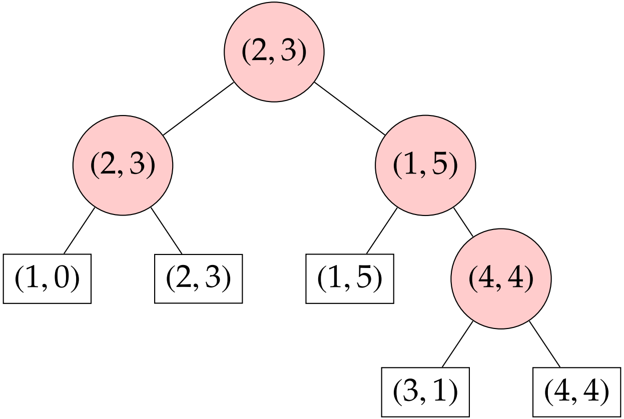
Backward Induction



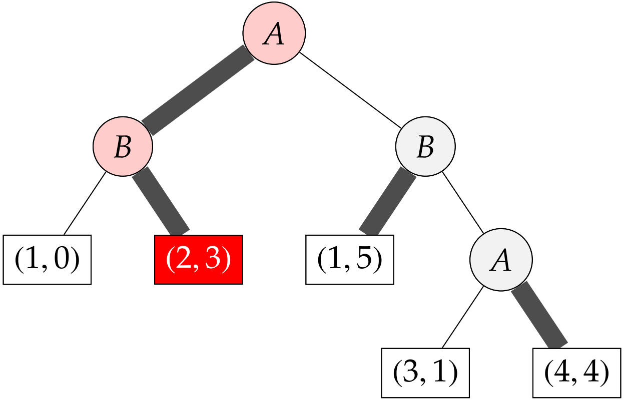
Backward Induction



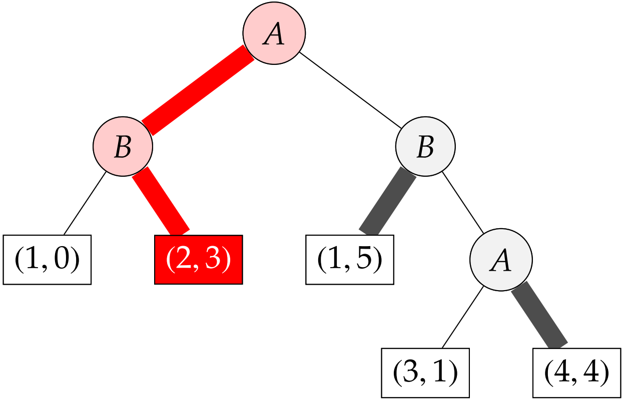
Backward Induction



Backward Induction

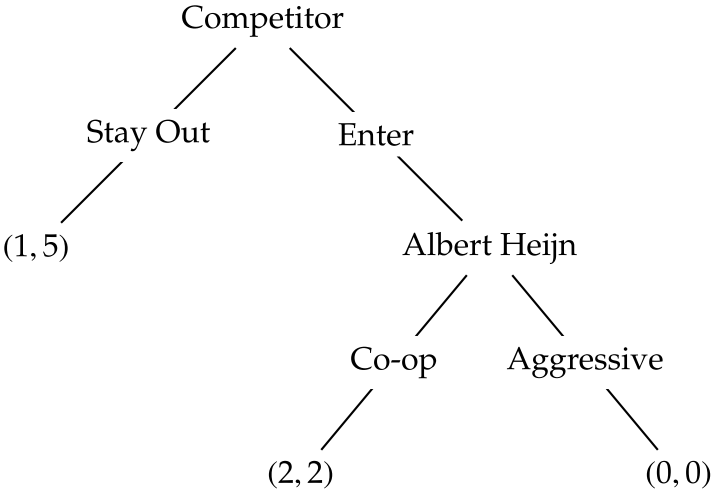


Backward Induction



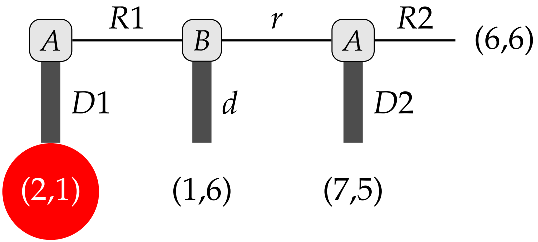
Chain-store paradox: A chain-store has branches in 20 cities, in each of which there is a local competitor hoping to sell the same goods. These potential challengers decide one by one whether to enter the market in their home cities. Whenever one of them enters the market, the chain-store responds either with aggressive predatory pricing, causing both stores to lose money, or cooperatively, sharing the profits 50-50 with the challenger.

Intuitively, the chain-store seems to have a reason to respond aggressively to early challengers in order to deter later ones. But Selten's (1978) backward induction argument shows that deterrence is futile.

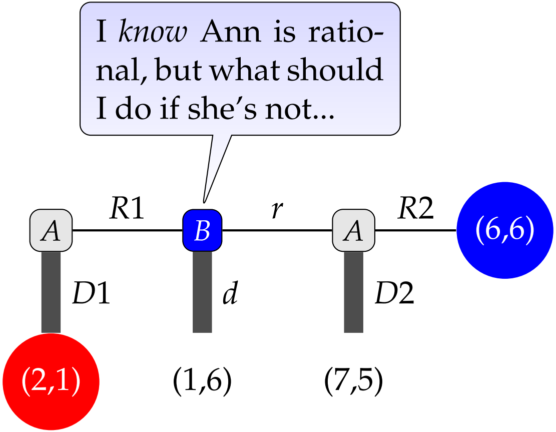

Competitor
Stay Out
Enter
(1, 5)
Albert Heijn
Co-op
Aggressive
(2, 2)
(0, 0)

“I would be very surprised if it failed to work. From my discussions with friends and colleagues, I get the impression that most people share this inclination. In fact, up to now I met nobody who said that he would behave according to [backward] induction theory. My experience suggests that mathematically trained persons recognize the logical validity of the induction argument, but they refuse to accept it as a guide to practical behavior.”
(Selten 1978, pp. 132 - 33)

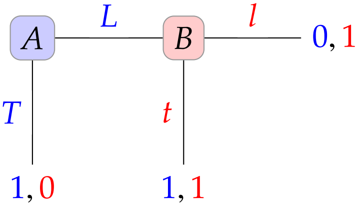
BI Puzzle?



BI Puzzle?

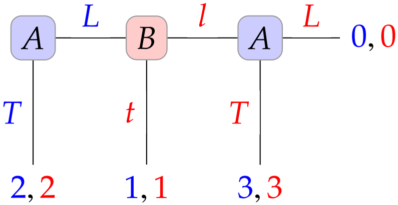

I *know* Ann is rational, but what should I do if she's not...
A
R1
B
r
A
R2
(6,6)
D1
d
D2
(2,1)
(1,6)
(7,5)

Ann \ Bob	t	l
T	1,0	1,0
L	1,1	0,1



- The strategies of both players are rationalizable.
- Only T is *perfectly rational* for Ann and t is *perfectly rational* for Bob.

Ann \ Bob	t	l
T	2,2	2,2
LT	1,1	3,3
LL	1,1	0,0



Materially Rational: every choice actually made is optimal (i.e., maximizes subjective expected utility).

Substantively Rational: the player is materially rational and, in addition, for each *possible* choice, the player *would* have chosen rationally if she had had the opportunity to choose.

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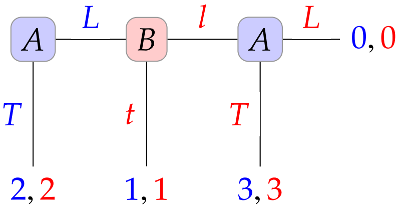
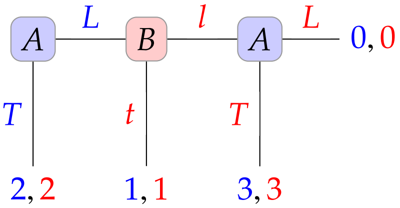
E.g., Taking keys away from someone who is drunk.

Ann \ Bob	t	l
T	2,2	2,2
LT	1,1	3,3
LL	1,1	0,0

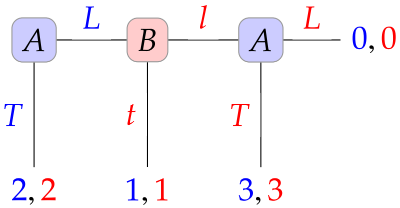


- Suppose that Bob believes that Ann will choose T with probability 1; what should he do? This depends on what he thinks Ann would on the hypothesis that his belief about her is mistaken.
- Suppose that if Bob were surprised by her, then he concludes she is irrational, selecting L on her second move. Bob's choice of t is perfectly rational.

Ann \ Bob	t	l
T	2,2	2,2
LT	1,1	3,3
LL	1,1	0,0



- Suppose Ann is sure that Bob will choose t, which is the only perfectly rational choice for Bob. Then, Ann's only rational choice is T.
- So, it might be that Ann and Bob both know each other's beliefs about each other, and are both perfectly rational, but they still fail to coordinate on the optimal outcome for both.



- Perhaps if Bob believed that Ann would choose L are her second move then he wouldn't believe she was fully rational, *but it is not suggested that he believes this*.
- Divide Ann's strategy T into two TT: T, and I *would* choose T again on the second move if I were faced with that choice" and TL: "T, but I *would* choose L on the second move..."
- Of these two only TT is rational
- But if Bob **learned he was wrong**, he would conclude she is playing LL.

“To think there is something incoherent about this combination of beliefs and belief revision policy is to confuse epistemic with causal counterfactuals—it would be like thinking that because I believe that if Shakespeare hadn’t written Hamlet, it would have never been written by anyone, I must therefore be disposed to conclude that Hamlet was never written, were I to learn that Shakespeare was in fact not its author”

(pg. 152, Stalnaker)

“Rationality has a clear interpretation in individual decision making, but it does not transfer comfortably to interactive decisions, because interactive decision makers cannot maximize expected utility without strong assumptions about how the other participant(s) will behave. In game theory, common knowledge and rationality assumptions have therefore been introduced, but under these assumptions, rationality does not appear to be characteristic of social interaction in general.” (pg. 152, Colman)

A. Colman. *Cooperation, psychological game theory, and limitations of rationality in social interaction*. Behavioral and Brain Sciences, 26, pgs. 139 - 198, 2003.

Ultimatum Game

There is a good (say an amount of money) to be divided between two players.

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Suppose the players meet only once. It would seem that the Proposer should propose 99% for herself and 1% for the Disposer. And if the Disposer is instrumentally rational, then she should accept the offer.

Ultimatum Game

But this is not what happens in experiments: if the Disposer is offered 1%, 10% or even 20%, the Disposer very often rejects. Furthermore, the proposer tends demand only around 60%.

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A typical explanation is that the players' utility functions are not simply about getting funds to best advance their goals, but about acting according to some norms of fair play. But acting according to norms of fair play does not seem to be a goal: it is a principle to which a person wishes to conform.

Dictator Game

Similar to the ultimatum game, there is a proposer and a second player. The proposer determines an allocation of some pot of money (say $100). The second player simply receives the portion of the money from the proposer (i.e., the second player is completely passive).

Dictator Game

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Proposers often allocate some money to the second player...

D. Kahneman, J. Knetsch, and R. Thaler. *Fairness And The Assumptions Of Economics*. The Journal of Business, 59, pgs. 285- 300, 1986.

Can the decision problem be *separated* from the game situation?

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Are strategies merely neutral access routes to consequences?

utility must be measured *in the context of the game itself*.

I. Gilboa and D. Schmeidler. *A Derivation of Expected Utility Maximization in the Context of a Game*. Games and Economic Behavior, 44, pgs. 184 - 194, 2003.

The following two outcomes are not equivalent:

- "I get \$90"
- "I get \$90 and choose to leave \$10 to my opponent"

The following two outcomes are not equivalent:

- "I get \$10 and player one gets \$90, and this was decided by Nature"
- "I get \$10, player one gets \$90 and this was decided by Player one".