Strategic Behaviour

Reading – Ch. 3, 5 & Ch. 15 NW

Sequential games

Sequential games

- We considered simultaneous move games – that is when players made their choices simultaneously
  - This might have simply meant that neither player knew what the other had chosen when they made their choice
  - In many economic and business decision settings, players or economic agents make their choices after overserving the choice of other players
  - That is, players make their choice **sequentially**

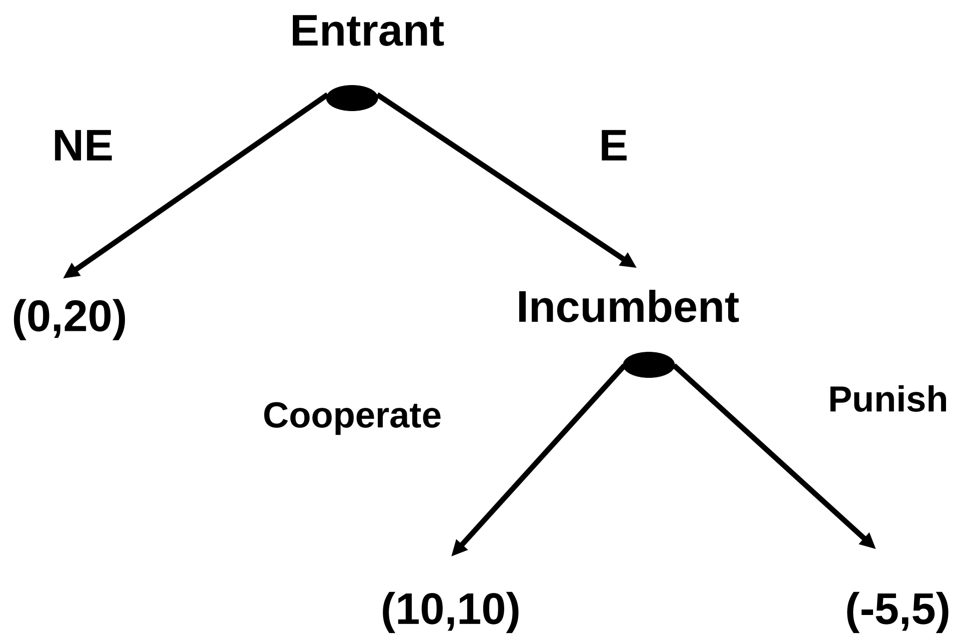
Sequential games

- In some games players move sequentially
  – For example, one firm (Honda) chooses to build a small or large factory ***after*** observing the choice of a rival (Toyota)
  – Woolworths makes a choice about the price of milk ***after*** observing the choice of Coles
- Also think about bargaining settings
  – *One party makes an offer*
  – *The other party accepts, or not, and makes a counter offer ….*
- To solve such problems we will need additional tools

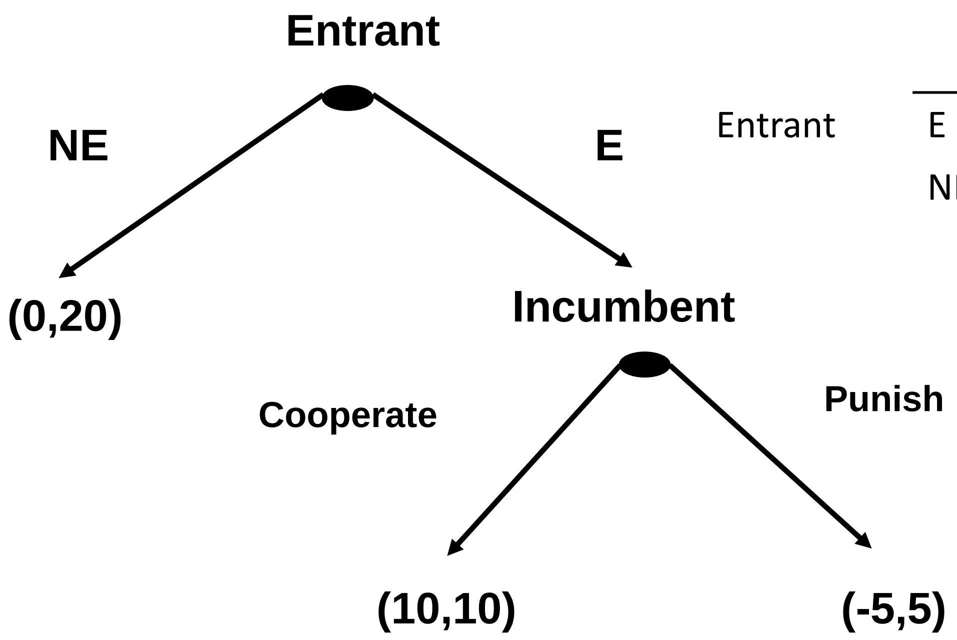
Extensive & normal form

- In the game below we think about two firms, an incumbent and a potential entrant
  - *The potential entrant makes a choice to enter or not*
  - *The incumbent then makes a choice about how to react…*

Extensive and normal form



Extensive and normal form

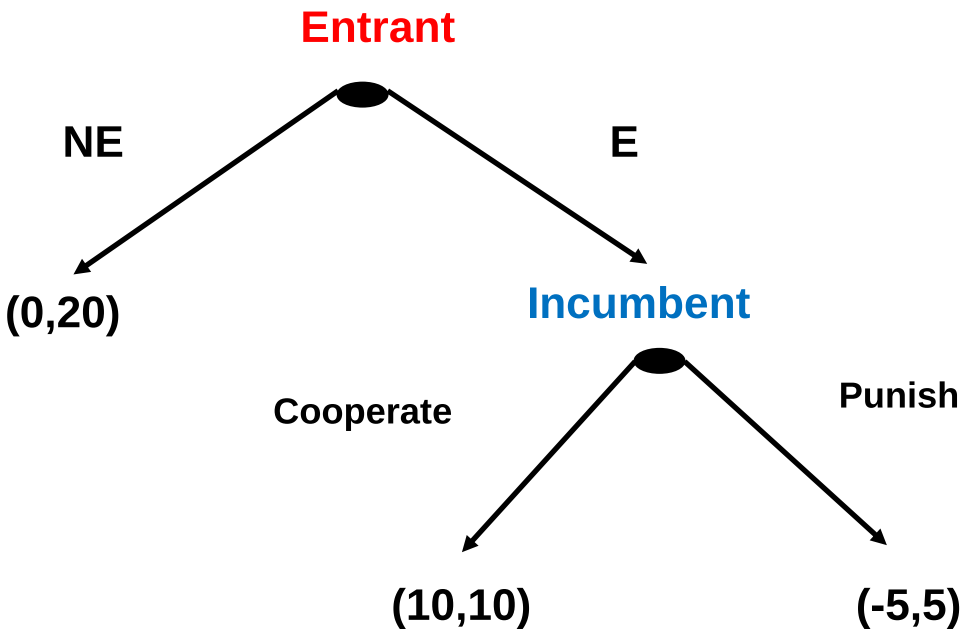


		Incumbent	
		C	P
Entrant	E	(10,10)	(-5,5)
	NE	(0,20)	(0,20)

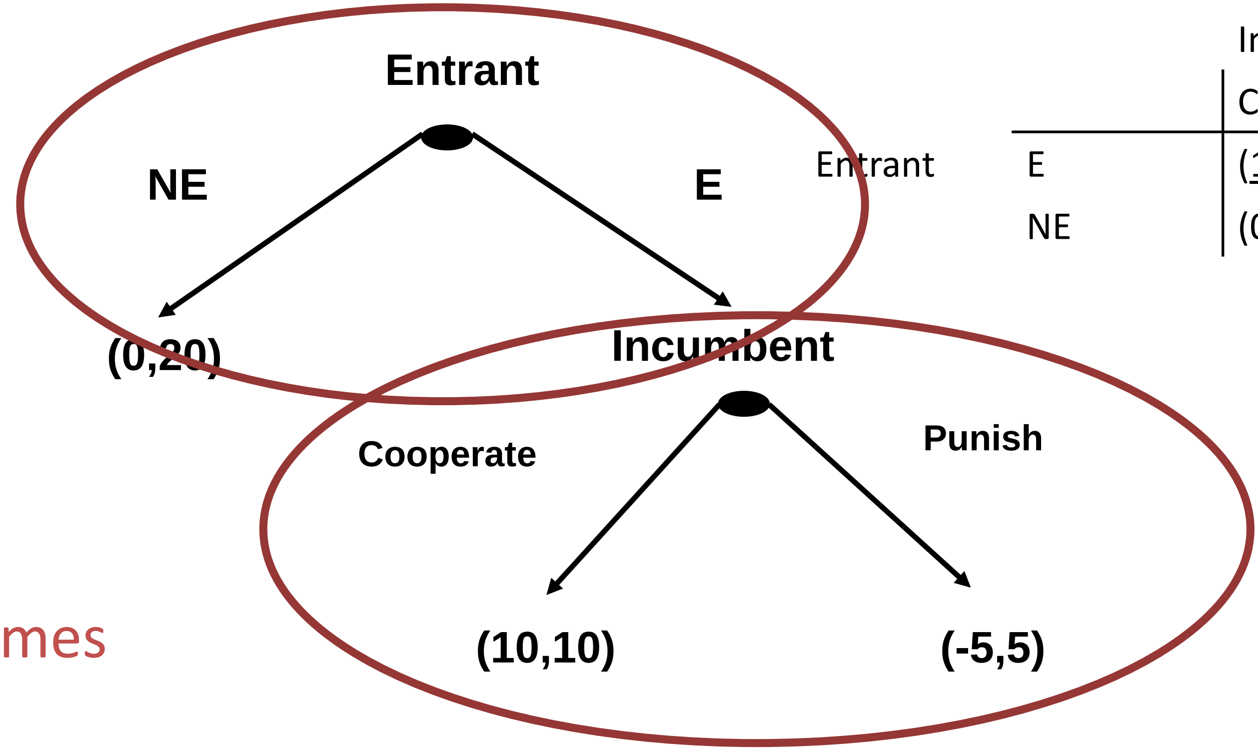
Equilibrium analysis

- Nash Equilibrium in the (normal form) game above are *(NE, P if E) & (E, Cooperate in E)*
- Ask yourself, do these seem sensible?
- Examine the subgames - each subgame consists of one choice by one player
- Hence, Entrant’s choice to enter or not is a sub-game. Also, Incumbent’s choice to punish or not is a subgame.

		Incumbent	
		C	P
Entrant	E	(10,10)	(-5,5)
	NE	(0,20)	(0,20)



Equilibrium analysis



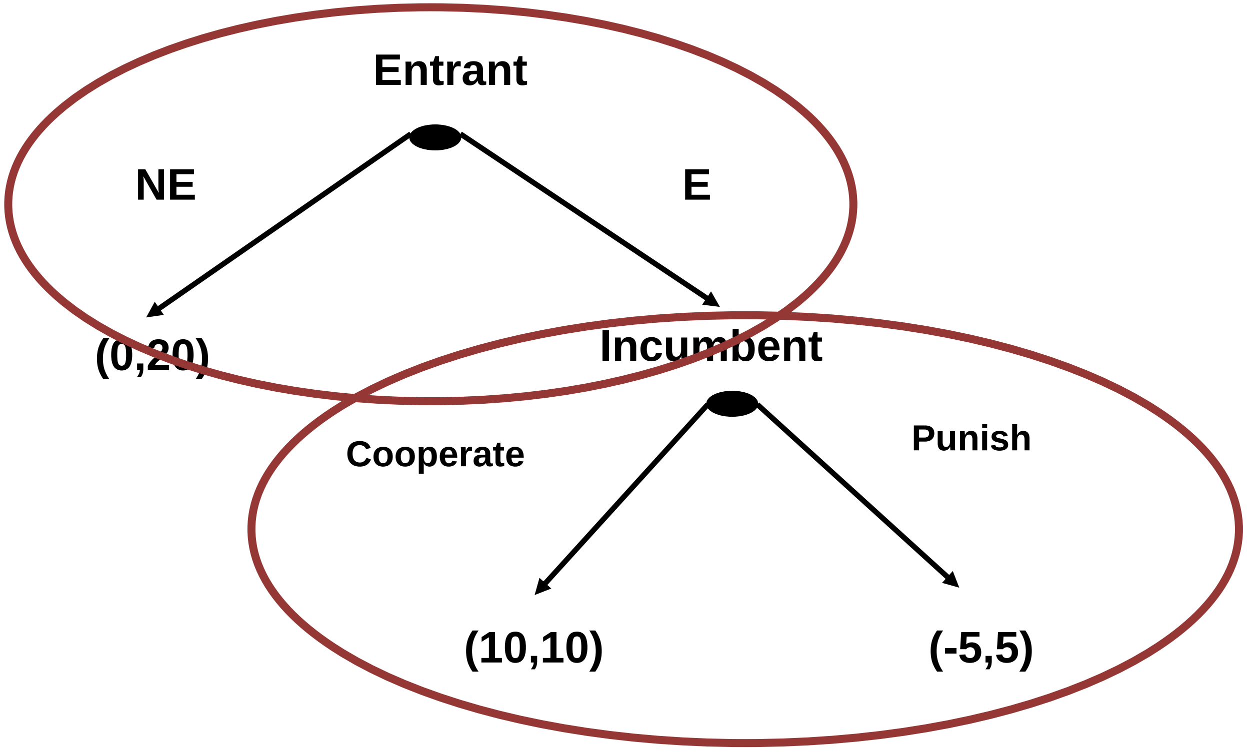
		Incumbent	
		C	P
Entrant	E	(10,10)	(-5,5)
	NE	(0,20)	(0,20)

subgames

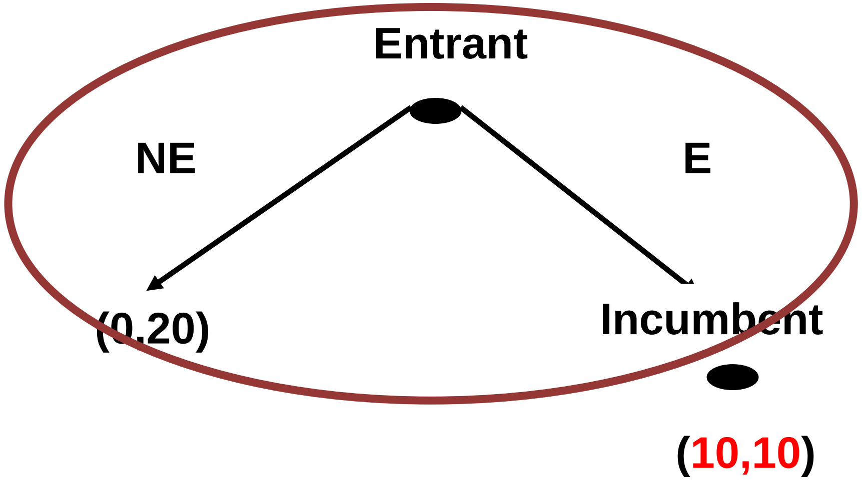
Equilibrium analysis – Subgame Perfect Equilibrium

- Subgame perfect equilibrium – each players strategy must be a NE in every subgame
  - Threats credible – strategy would be adopted if needed
- To solve such games we use backward induction
- This identifies the subgame perfect equilibrium so that every players actions are a Nash equilibrium
- Solving the game in this way identifies credible equilibria by eliminating non-credible strategies

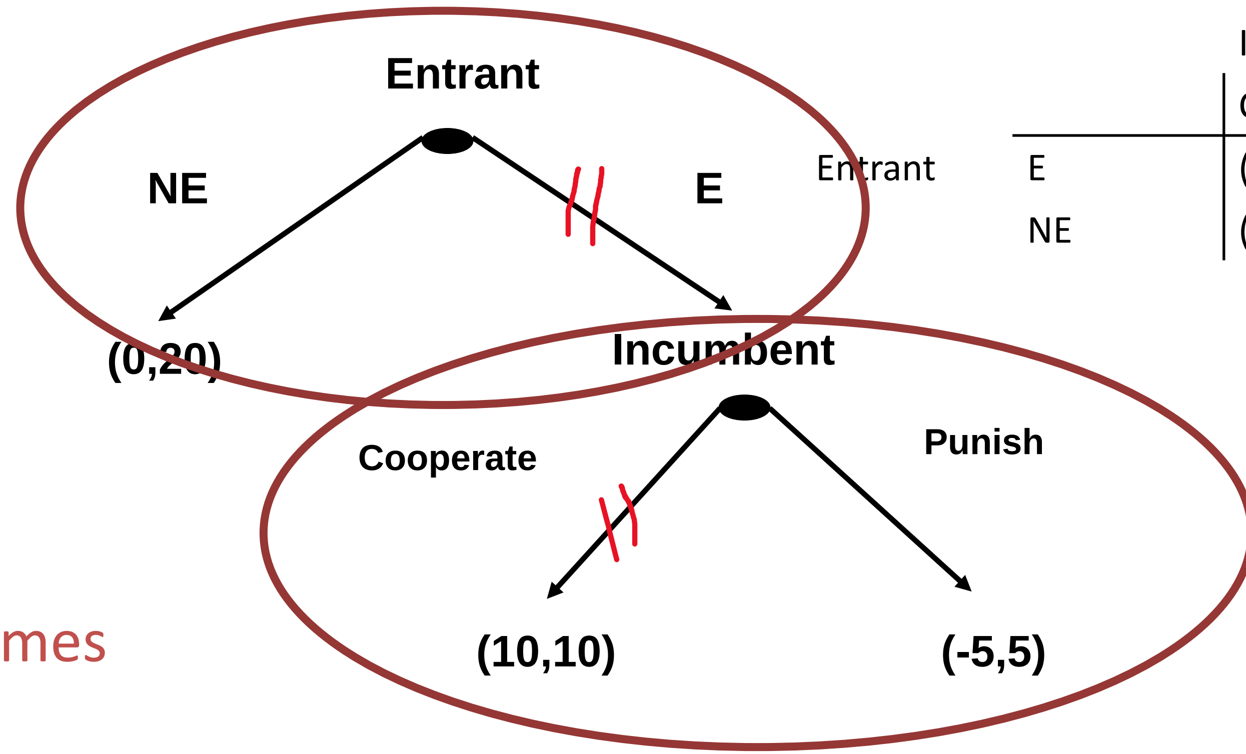
Equilibrium analysis



Equilibrium analysis



Equilibrium analysis – Subgame Perfect Equlibrium



		Incumbent	
		C	P
Entrant	E	(10,10)	(-5,5)
	NE	(0,20)	(0,20)

subgames

(Enter; Cooperate if Enter) is the only Subgame Perfect equilibrium

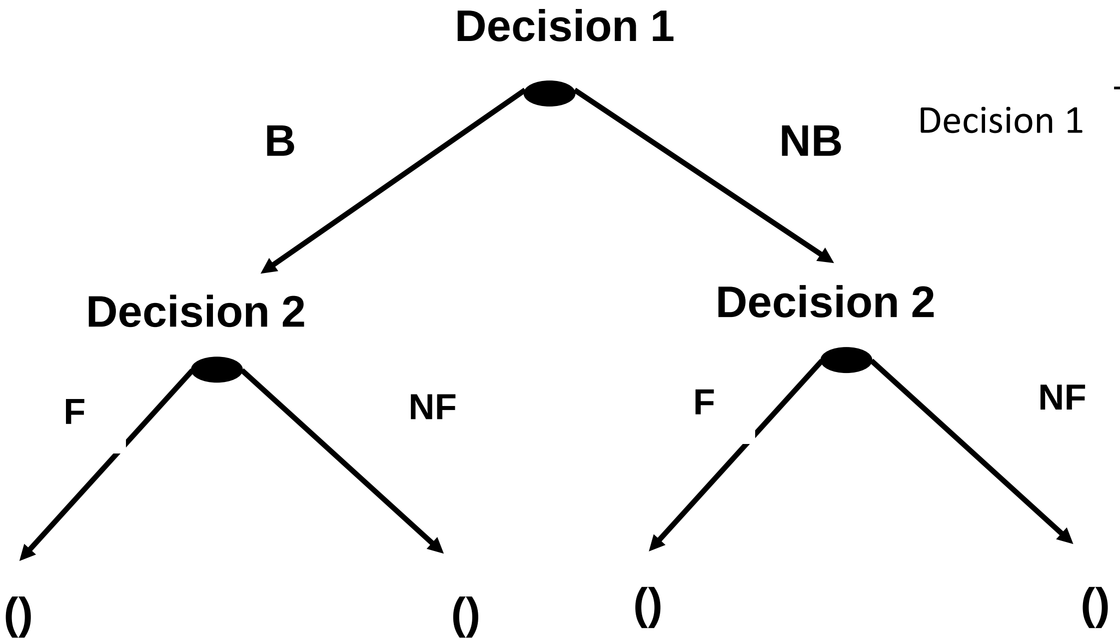
Equilibrium analysis – Subgame Perfect Equlibrium

- Solving the game in this way highlights that we assume that players are rational and forward looking.
- Moreover, just as they did last week each player looks after themselves – they are self-interested.
- Note that the SPE is a Nash Equilibrium, but not all NE are SPE (see the original market entry game)

Commitment

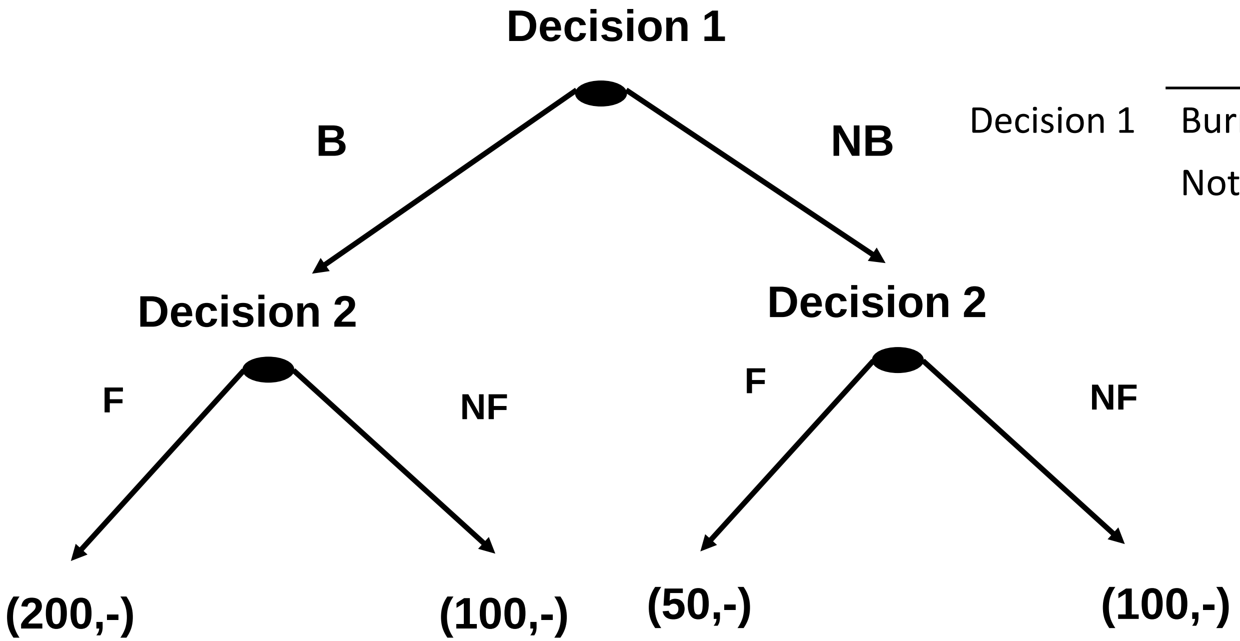
- Vikings land on a beach, after landing they can either burn their boat or leave it intact
- After making their decision they confront villagers nearby. At this point the Vikings can choose to either fight or not fight
- If they burn and fight the Vikings get 200 and the villagers get 0. If they burn and not fight the Vikings and villagers get 100 each. If they do not burn and fight the payoffs are 50 for the Vikings and 150 to the villagers. Finally, if they do not burn and do not fight both parties get a payoff of 100
- Draw the extensive form of this game

Commitment



		Decision 2	
		Fight	Not fight
Decision 1	Burn	(200)	(100)
	Not burn	(50)	(100)

Commitment



		Decision 2	
		Fight	Not fight
Decision 1	Burn	(200)	(100)
	Not burn	(50)	(100)

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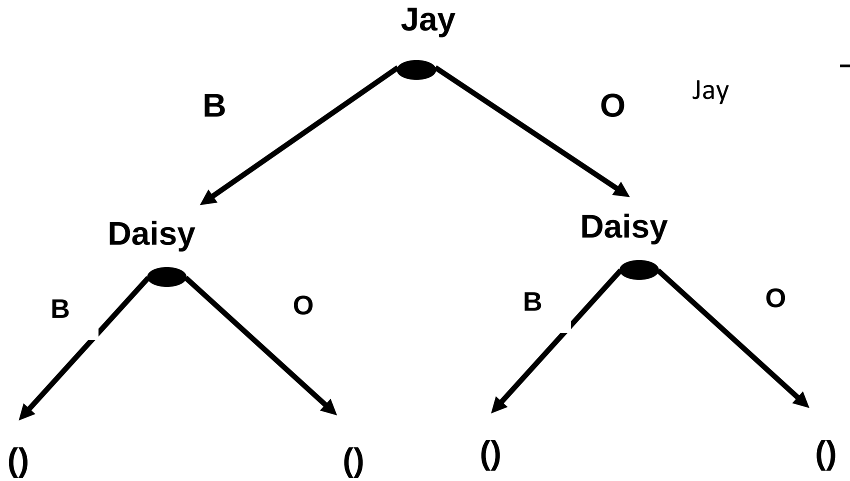
Commitment

- There is a payoff from cutting some options –payoff from making a credible commitment
- By burning their boat the Vikings made a very clear statement that they were not able to undo so the commitment was credible.
- Are there analogies from the business world?
  - Signing a contract?
  - Constructing a large factory or plant? What might this effectively commit a firm to?
  - Making an irredeemable investment in R&D?
- *Usually we think that having a greater range of choices available is better, but this is not always true. You may gain a strategic advantage by limiting choices*

Dating game – see Canvas for recording

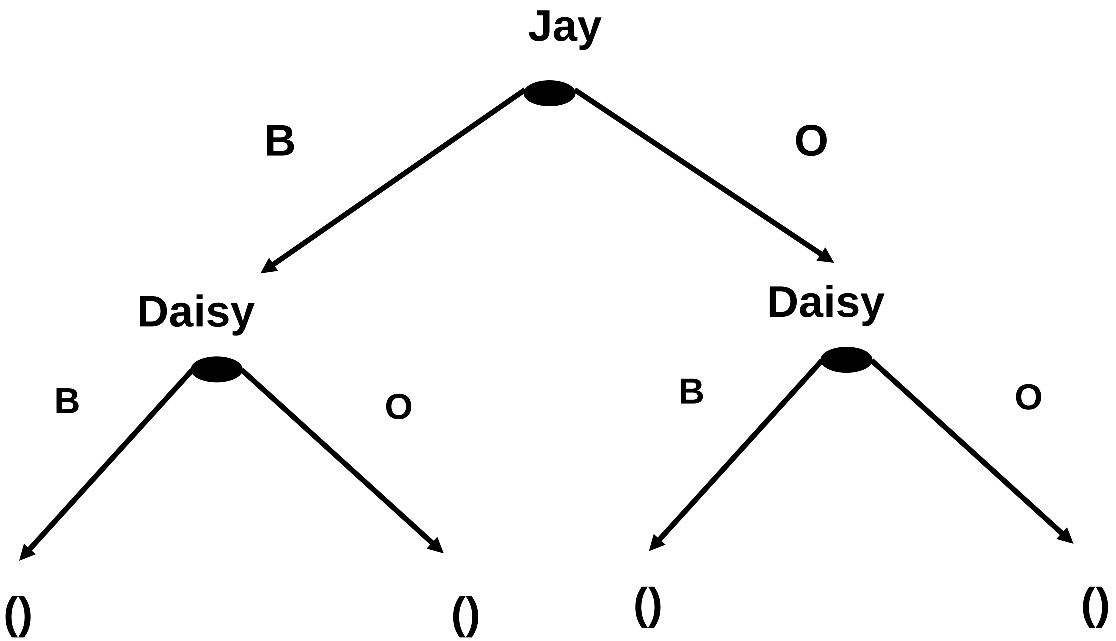
- Jay and Daisy are trying to organise a date. *Jay prefers the opera while Daisy is a UFC (boxing) fan. This is a coordination problem with payoffs below.*
- *Assume Jay makes a choice and then informs Daisy of his choice. At that point, Daisy makes her decision.*

Dating game



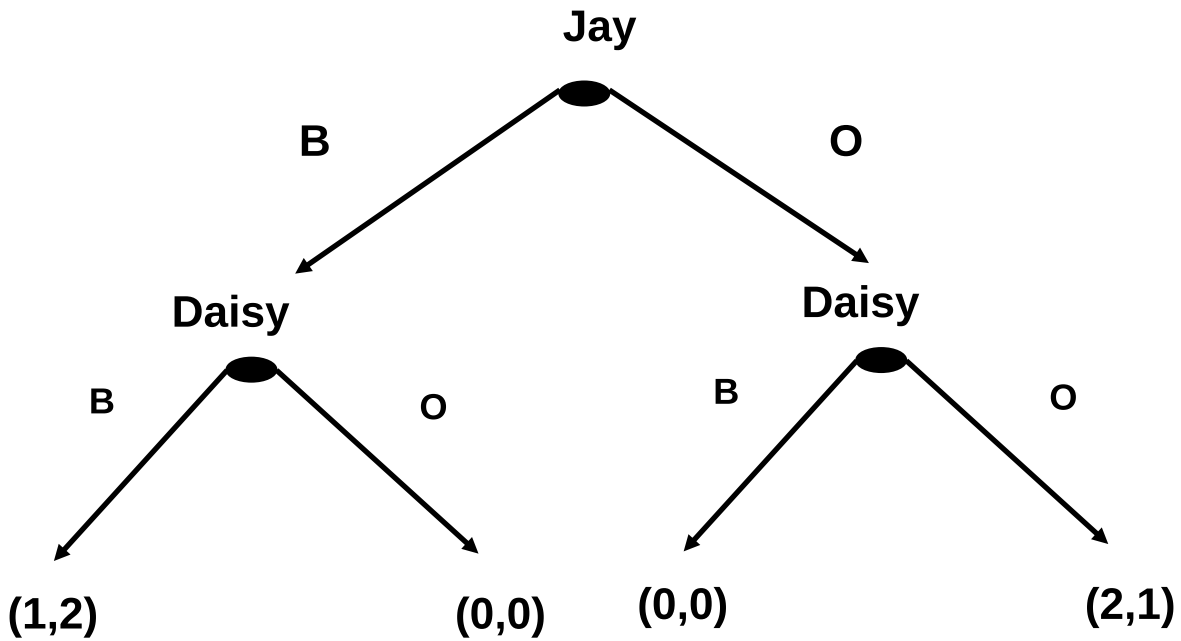
		Daisy	
		B	O
Jay	B	(1,2)	(0,0)
	O	(0,0)	(2,1)

First mover advantage



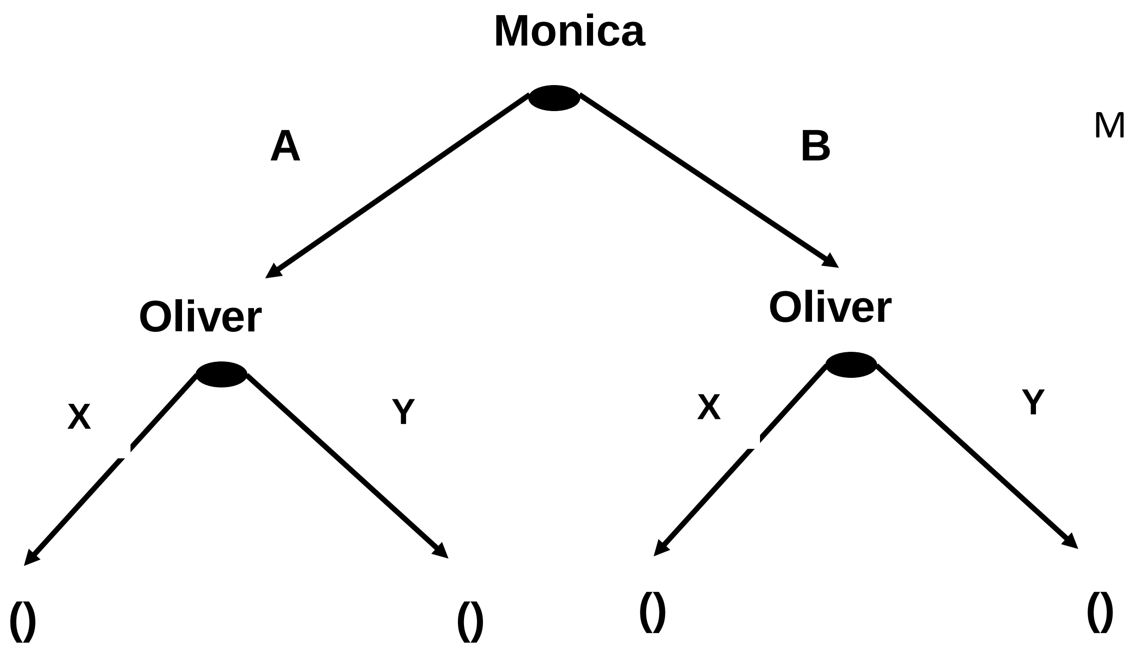
		Daisy	
		B	O
Jay	B	$(\underline{1},\underline{2})$	(0,0)
	O	(0,0)	$(\underline{2},\underline{1})$

First mover advantage



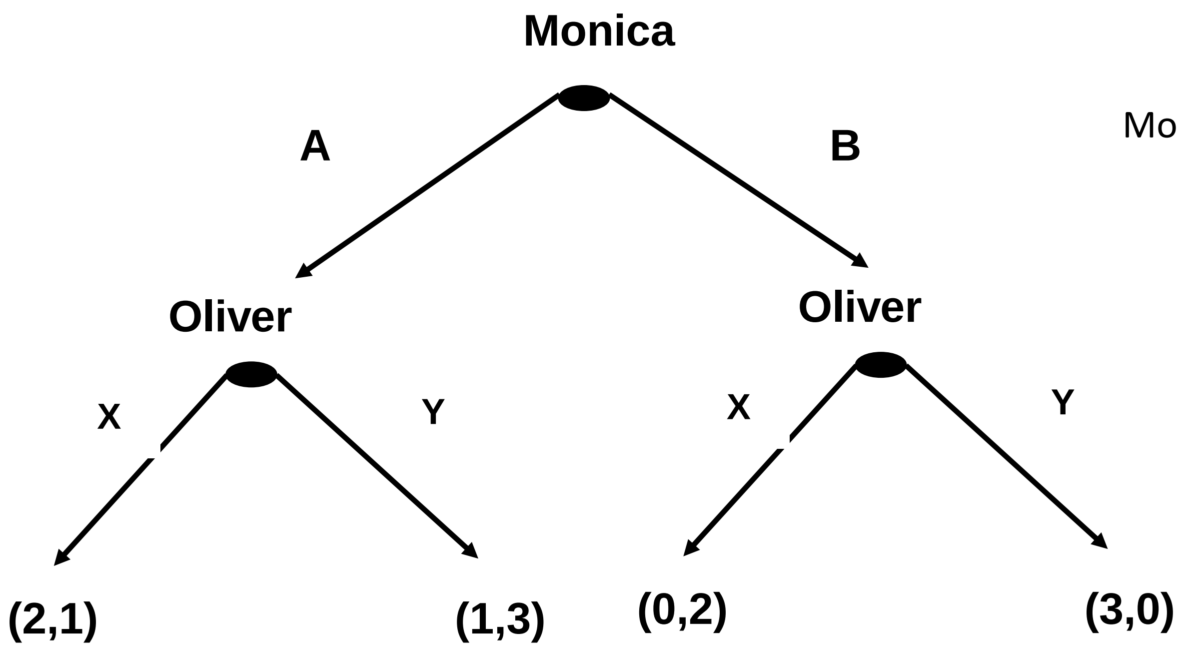
		Daisy	
		B	O
Jay	B	(<u>1</u>,<u>2</u>)	(0,0)
	O	(0,0)	(<u>2</u>,<u>1</u>)

Second mover advantage



		Oliver	
		X	Y
Monica	A	(2,1)	(1,3)
	B	(0,2)	(3,0)

Second mover advantage



		Oliver	
		X	Y
Monica	A	(2,1)	(1,3)
	B	(0,2)	(3,0)

First and second mover advantage

- Sometimes it is better to go first, other times it is better to learn from the mistakes of others
- There is an advantage from being the first mover if a firm can commit to an action. Then, the follower must adapt to the strategy of the leader:
  - *A firm builds a hotel first*
  - *A firm chooses how much output to produce and a rival responds*
  - *Leader makes a choice over technology*
- Sometimes, it is not the first mover who wins
  - *For example, Apple, Microsoft or the iPhone were not the first movers*
  - *Examples: investment free riding, group assignments advertising new products*

Lessons from game theory

- Understanding your rivals – actions and consequences
- Ask – what would my rival do? That is, place yourself in their shoes
- Advantage of moving first or second depends on setting

For the exam you need to know:

- Solve for NE and SPE
- Draw normal and extensive form games
- Explain commitment, first and second mover advantage