MECHANISM DESIGN

PSC/IR 265: CIVIL WAR AND INTERNATIONAL SYSTEMS

WILLIAM SPANIEL

WILLIAMSPANIEL.COM/PSCIR-265-2015

Overview

1. Mechanism Design
2. Incentive Compatibility
3. Revelation Principle
4. Individual Rationality
5. When We Can Guarantee Peace
6. Is War Inevitable?
7. Subsidizing Peace

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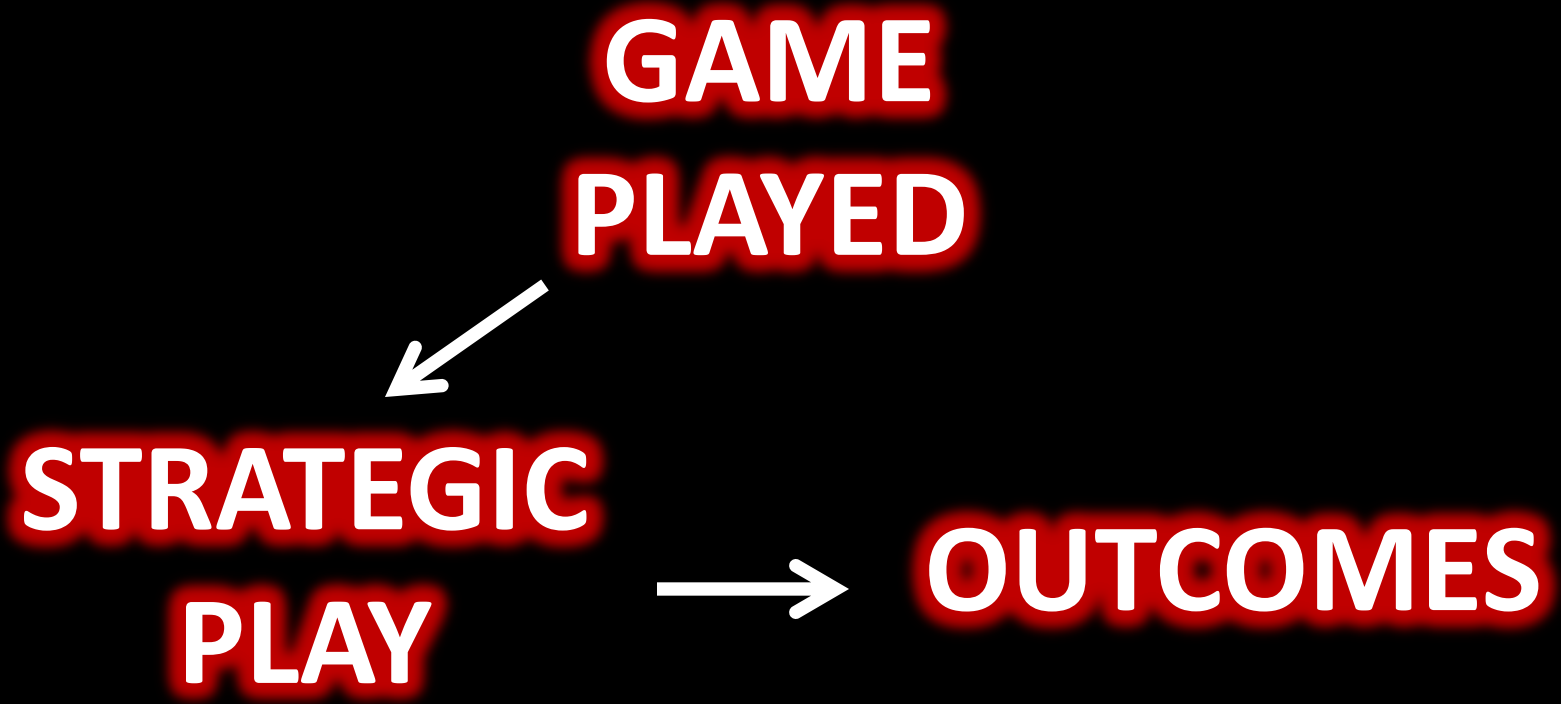
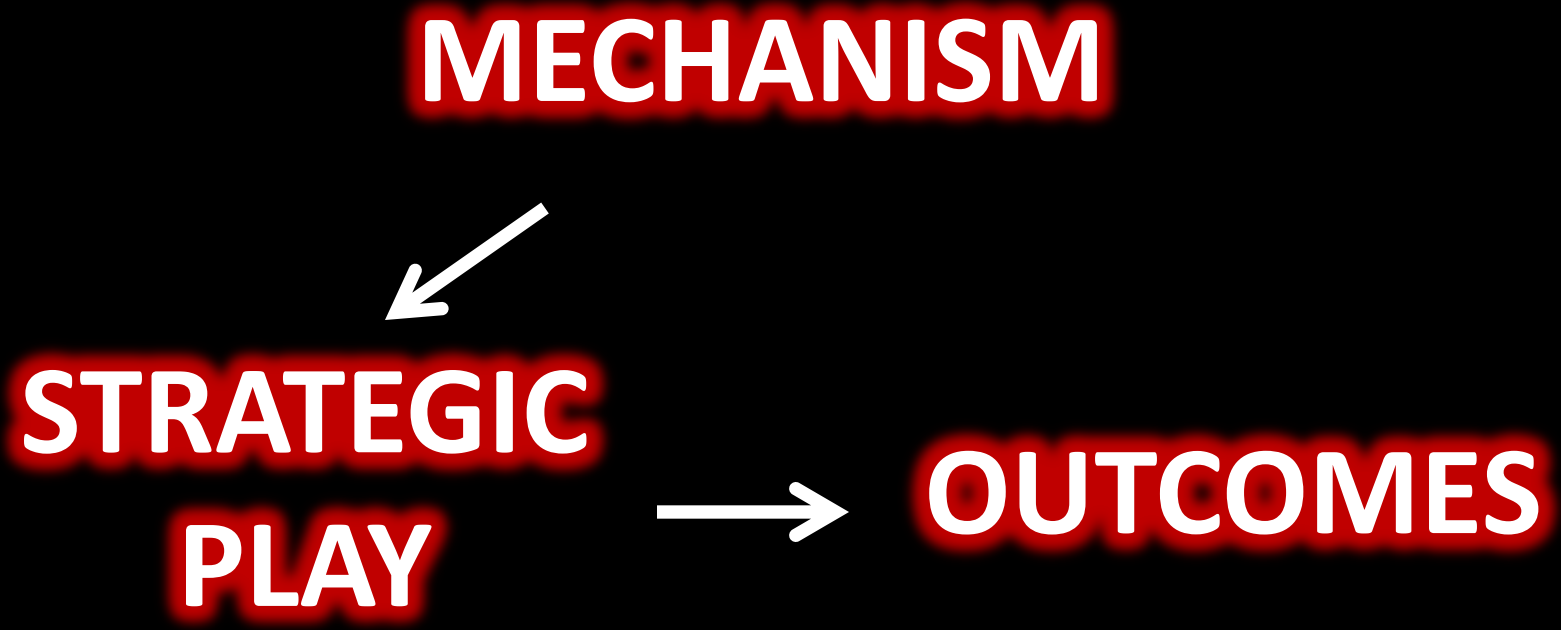
Background

- We have only analyzed one way parties might negotiate with each other (ultimatum game)
- What about every other way?

STRATEGIC PLAY → OUTCOMES


GAME
PLAYED
STRATEGIC
PLAY
OUTCOMES


MECHANISM
STRATEGIC PLAY
OUTCOMES

Mechanism Design

- We need to study the all the games that combatants could play
- Two challenges
  - Infinitely many
  - Strategic play in all of them

Different Mechanisms

- Ultimatum game
- Ultimatum game plus one counteroffer
- Ultimatum game plus two counteroffers…
- Message sent at beginning, then ultimatum
- Messages sent at any given time…

Strategic Play

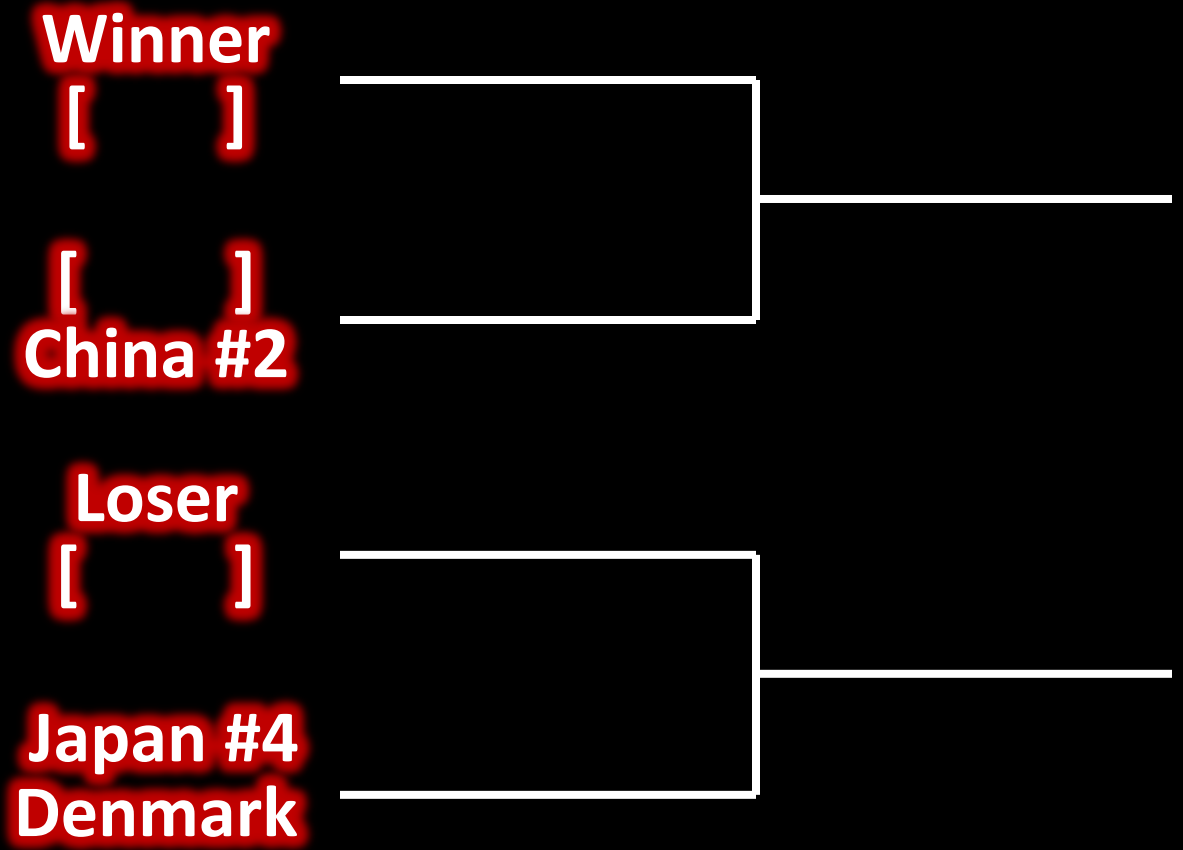
- You can’t induce people to do things by telling them to do it
- Need to create incentive structure that does not encourage gaming of the system

2012 Olympic Badminton Scandal

- Women's doubles
- 4 groups with 4 teams each
  - Round robin group play
  - Top two finishers from each group advance to single elimination bracket

Blame ~~Canada~~ Denmark

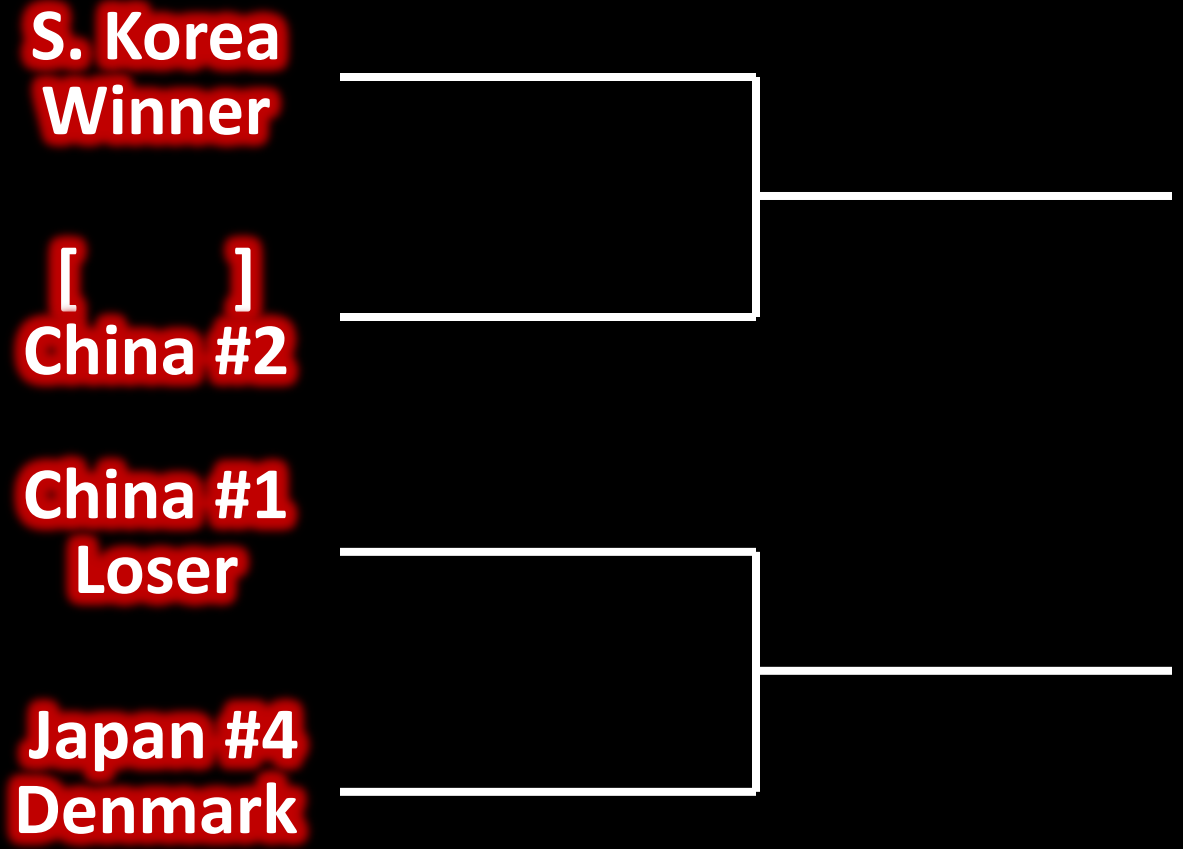
- China had top two teams in the world
- On the final day of RR, Denmark upset the Chinese #2 seed
- Later, Chinese #1 seed played against South Korea


Winner
[ ]
[ ]
China #2
Loser
[ ]
Japan #4
Denmark

http://youtu.be/7mq1ioqiWEo?t=8m40s

Result

- Both China and South Korea tank the match in increasingly humorous ways
- China tanks better, South Korea wins


S. Korea
Winner
[ ]
China #2
China #1
Loser
Japan #4
Denmark

Scandal

- Bureaucrats get upset
  - (Do bureaucrats do anything else?)
- Both teams later disqualified for “not using best efforts” and “conducting oneself in a manner that is clearly abusive or detrimental to the sport”

Don’t Hate the Player, Hate the Game

- If the bureaucrats want them to play to win, they need to design institutions that incentivize players to win
- 2012 setup encouraged players to play to lose while pretending to try to win

Designing Peace

- We can’t just tell governments and rebels to get along
- The incentive structure we place in front of them actually needs to promote that behavior

Problem Set Bonus

- Give an example of an incentive structure that unintentionally undermines its creator's desires
- Sports, work, IR, or everyday life
- Worth up to 1 point

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Incentive Compatibility

- A mechanism is incentive compatible if players would want to tell the truth given that everyone else tells the truth as well

Mechanism #1

- Tell me how much money you have in your wallet. I will pay you $1000 – x, where x is that amount.

Mechanism #2

- Tell me how much you value an avocado. If you value it at more than $2, I will sell you one for $2. If you value it at less than $2, no transaction takes place.

Mechanism #3

- Tell me how much you value an avocado. If you value it at more than $2, I will sell you one for $2. If you value it between $1 and $2, I will sell it to you for $1. If you value it at less than $1, no sale takes place.

Mechanism #4

- Tell me whether you are resolved or unresolved. If you are resolved, I will give you a lot of territory. If you are unresolved, I will give you less territory.

Mechanism #1

- Tell me how much money you have in your wallet. I will pay you $1000 – x, where x is that amount.

Mechanism #2

- Tell me how much you value an avocado. If you value it at more than $2, I will sell you one for $2. If you value it at less than $2, no transaction takes place.

Mechanism #3

- Tell me how much you value an avocado. If you value it at more than $2, I will sell you one for $2. If you value it between $1 and $2, I will sell it to you for $1. If you value it at less than $1, no sale takes place.

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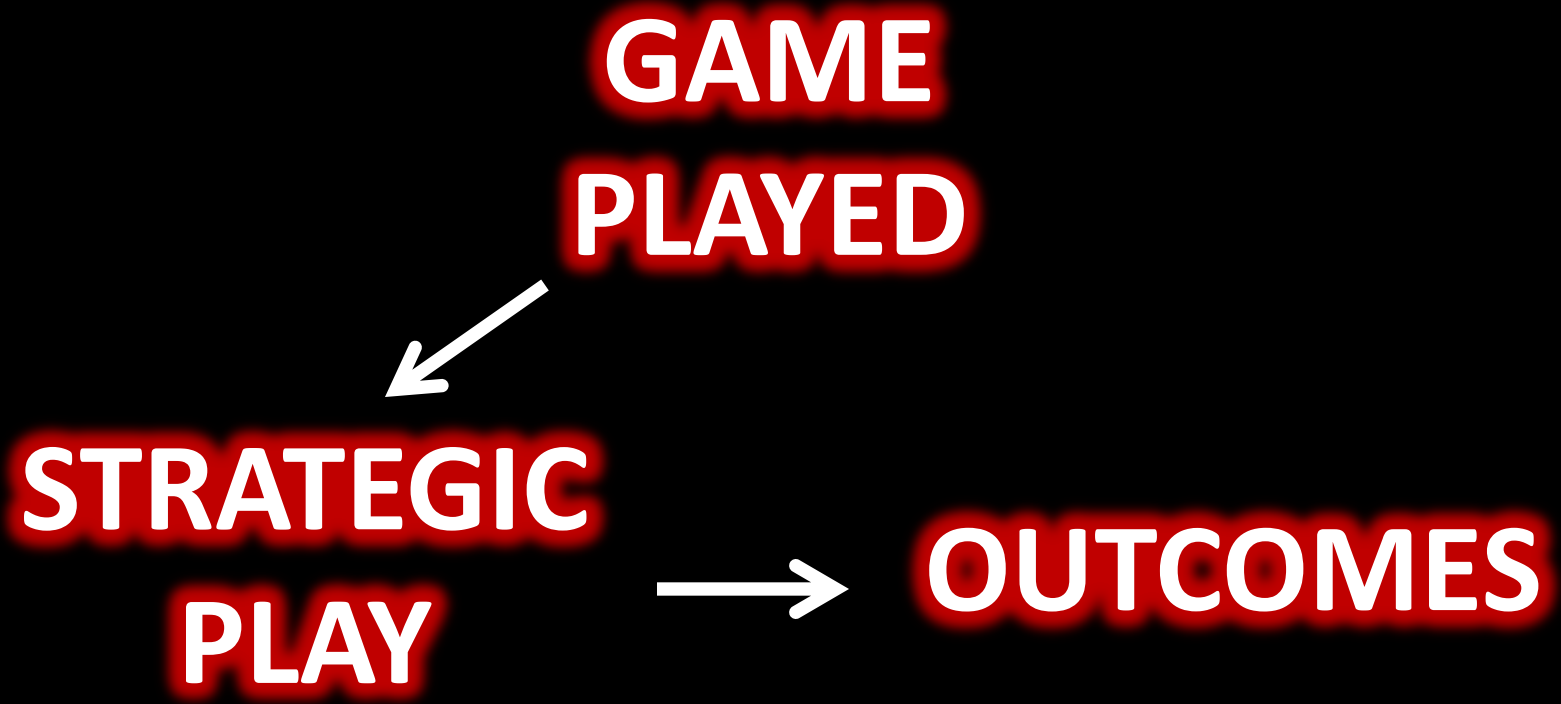
Revelation Principle

- If an outcome of a game is the result of optimal play, then an incentive compatible direct mechanism exists
  - A “direct” mechanism duplicates the outcome of the game with optimal play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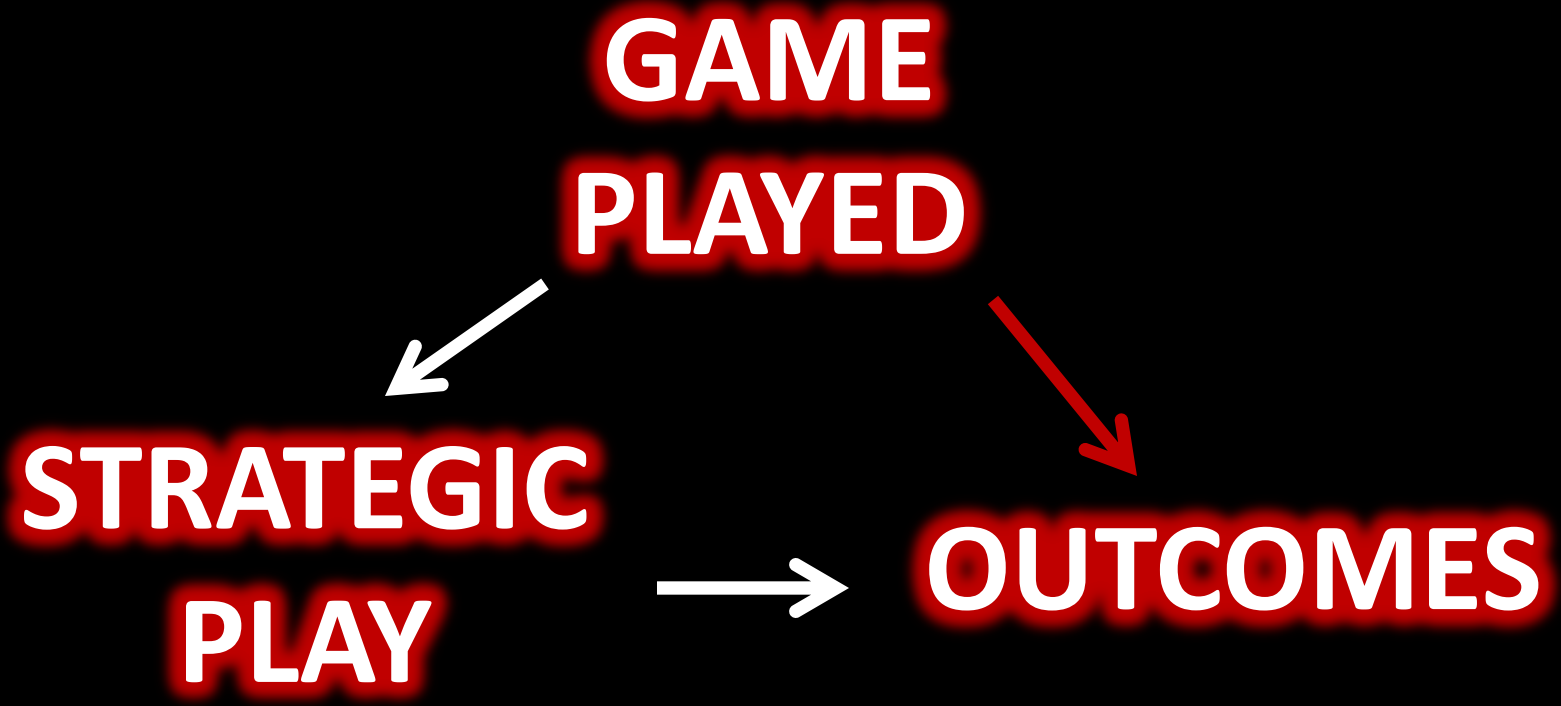
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In Words

- Rather than play the game, the actors could just tell the game master their private information
- Game master can then simulate the game and assign payoffs based on what would have happened
- Players are willing to tell the truth (incentive compatibility) because game master does the bluffing for them

Example

- Recall the incomplete information game, where the rebel group was strong (p_R') or weak (p_R)
- If probability weak is sufficiently high, government offers $p_R - c_R$
  - Weak type accepts
  - Strong type rejects

Incentive Compatible Direct Mechanism

- Rebel group tells game master its strength
  - If weak, game master divides good at $p_R - c_R$, $1 - p_R + c_R$
  - If strong, game master starts a war

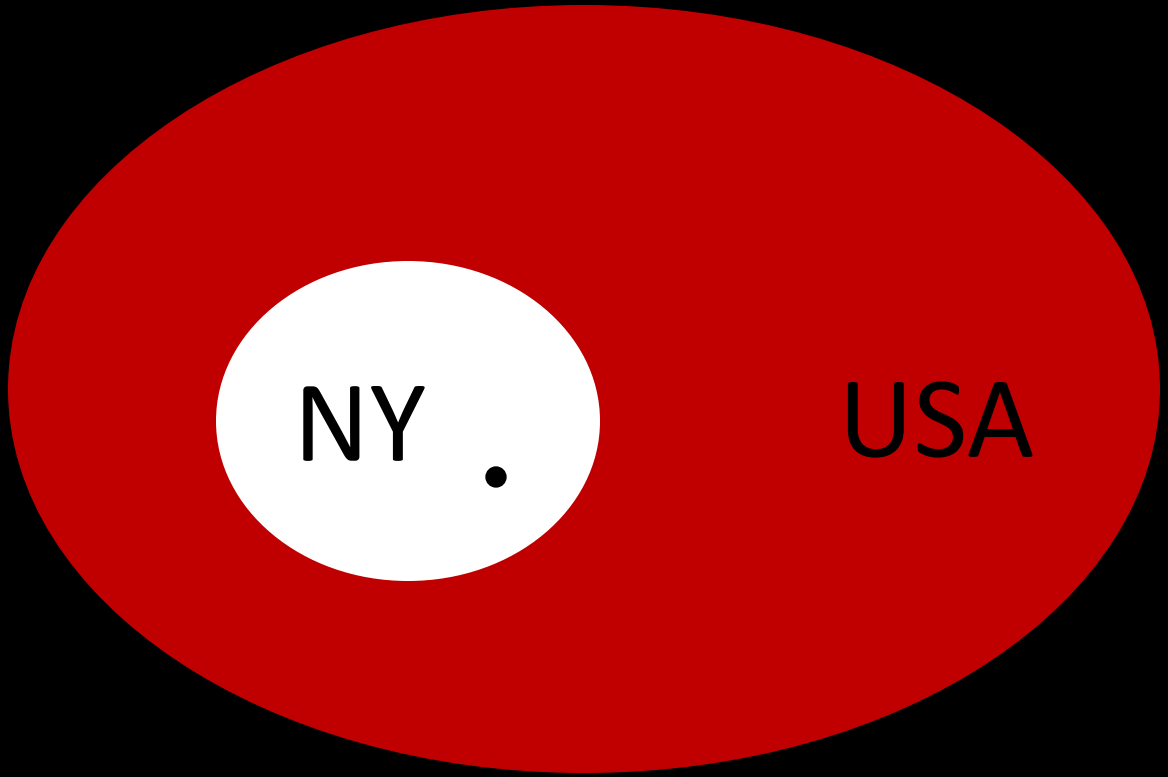
The Bite

- Seems trivial—why does it matter that a game master could simulate the game?
- The contrapositive of the statement is amazingly powerful

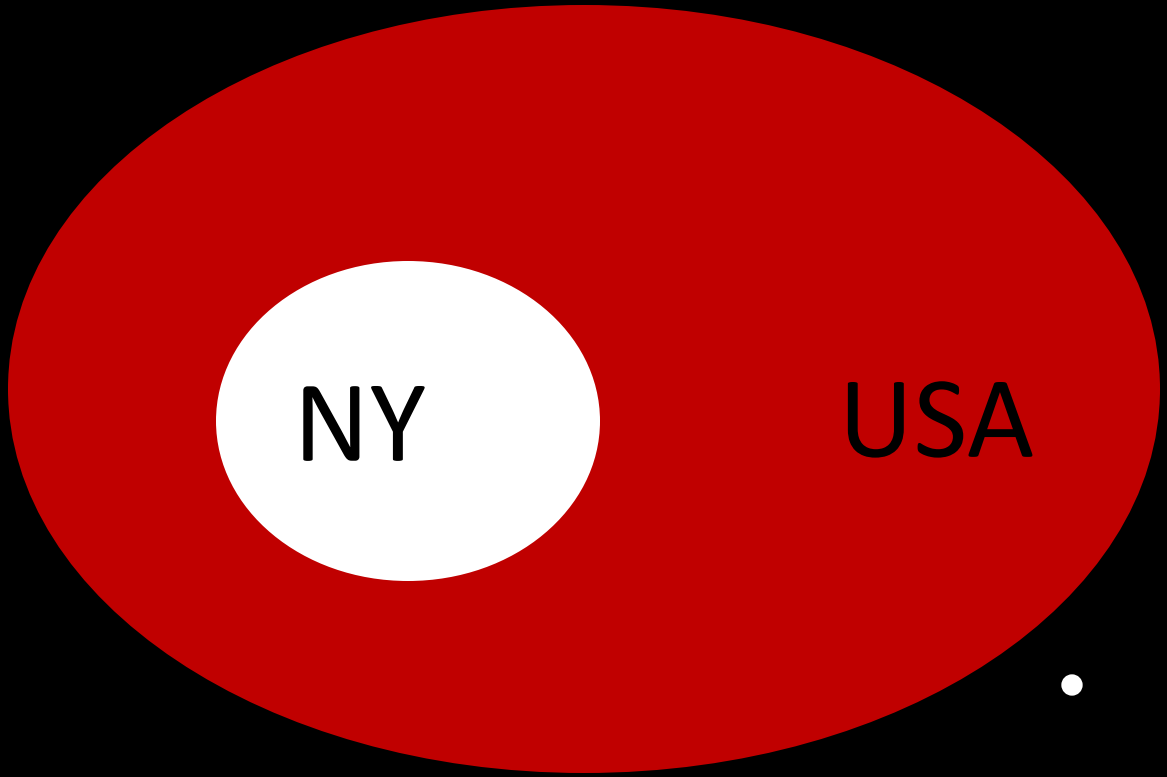
Contrapositive

- The following are logically equivalent
  - If p, then q
  - If not q, then not p

If I am in New York, then I am in the U.S.



If I am not in the U.S., then I am not in New York.



Other Examples

- If I am Drake, then I started from the bottom and now I am here.
- If it is not the case that I started from the bottom and now I am here, then I am not Drake.

Other Examples

- If you are in PSC/IR 265, then you had a bad day on Tuesday.
- If you did not have a bad day on Tuesday, you are not in PSC/IR 265.

Other Examples

- If you are Yulia Tymoshenko, you have awesome hair.
- If you do not have awesome hair, you are not Yulia Tymoshenko.

Other Examples

- If you live in Rochester, you are ready for winter to be over.
- If you are not ready for the winter to be over, you do not live in Rochester.

Revelation Principle's Contrapositive

- If no incentive compatible direct mechanism exists, then an outcome of a game is not the result of optimal play
  - So if players are playing optimally, the outcome of the game must be different

Why This Is Really, Really Cool

- We want to know whether we can guarantee peace or not
- If UN-sponsored negotiations fail, is it because the UN messed up or because the UN was put in an impossible situation?

Why This Is Really, Really Cool

- Revelation principle says we do not have to sort through all possible institutional structures

Why This Is Really, Really Cool

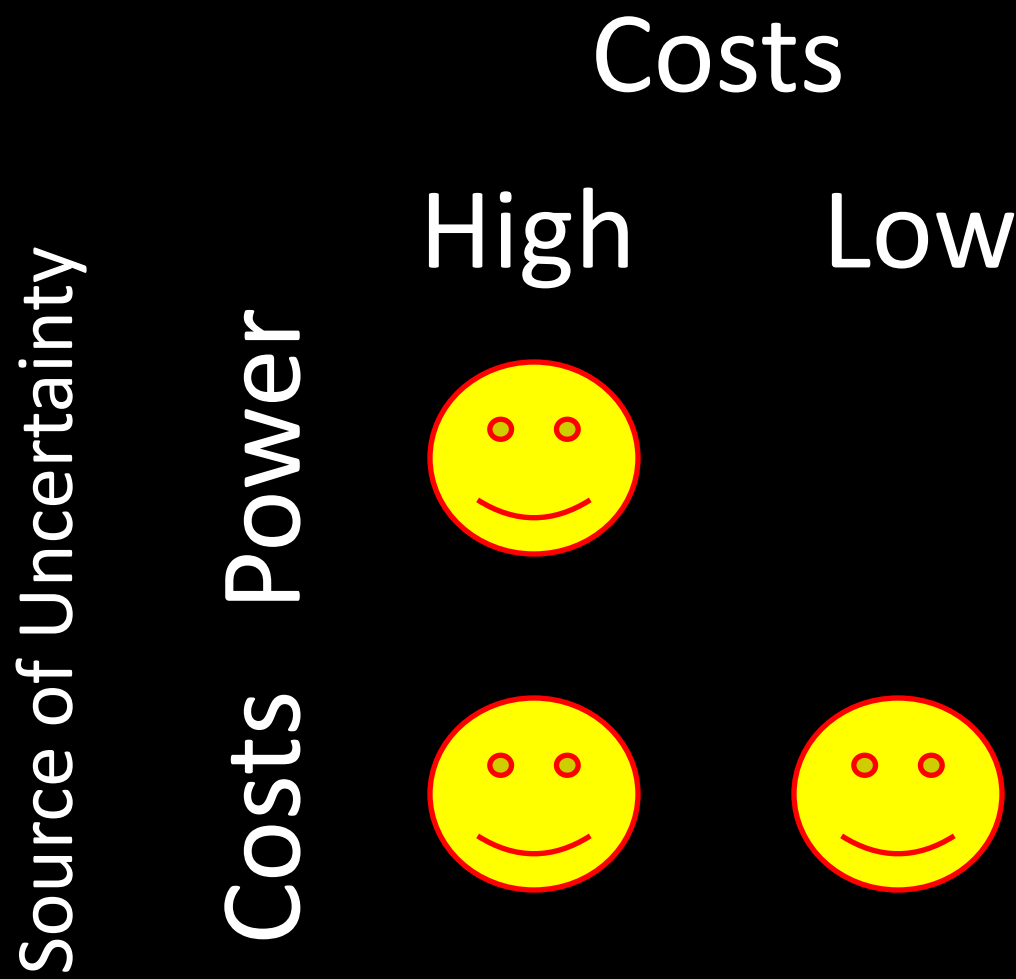
- All we need to do is see if we can create a peaceful direct mechanism that encourages truth-telling
- If no such mechanism exists, then it is impossible to guarantee the peace

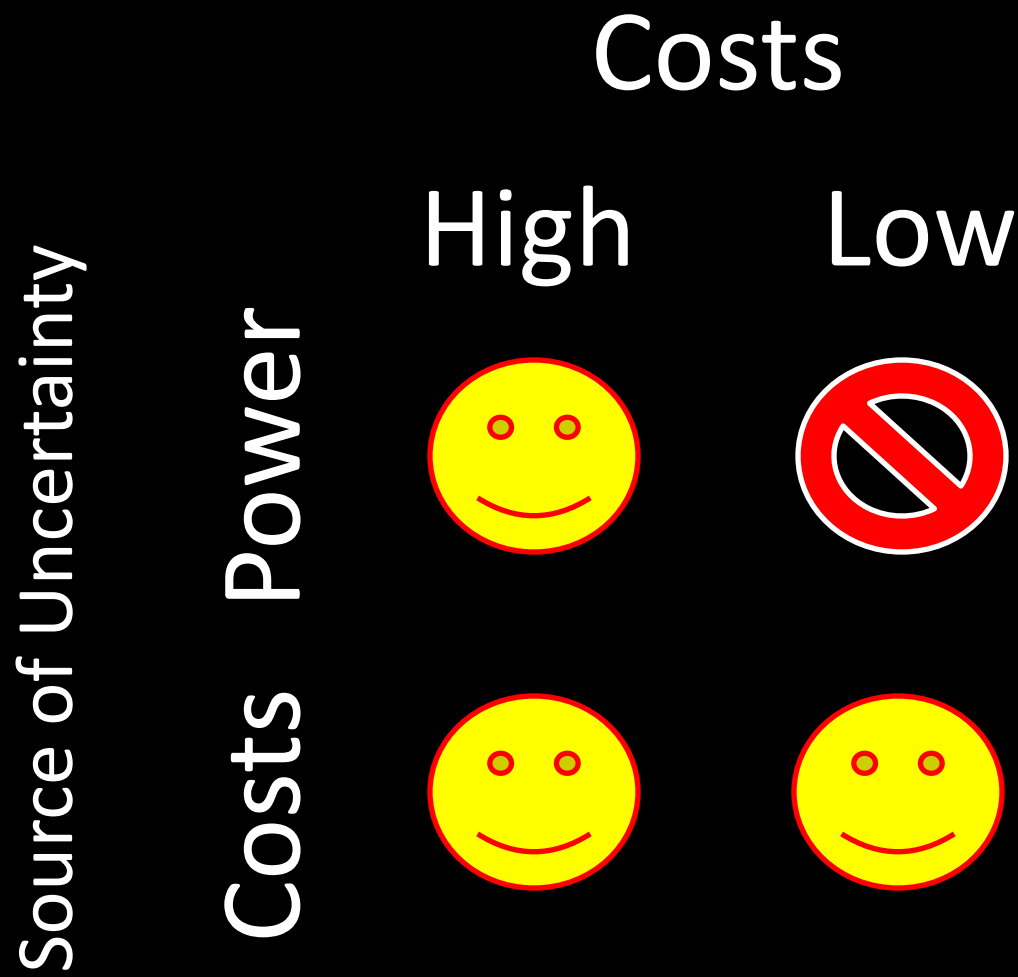
Source of Uncertainty

Costs Power

Costs

High Low


Costs
High
Low
Source of Uncertainty
Costs Power


Costs
High
Low
Source of Uncertainty
Power Costs

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Limits of Anarchy

- International community cannot compel rebels of governments to participate in mechanisms
- Mechanisms must therefore be at least as good as fighting a war

Individual Rationality

- Limits our discussion of mechanisms that generate *at least* the same payoff for all players and all types than if that type blindly fought a war

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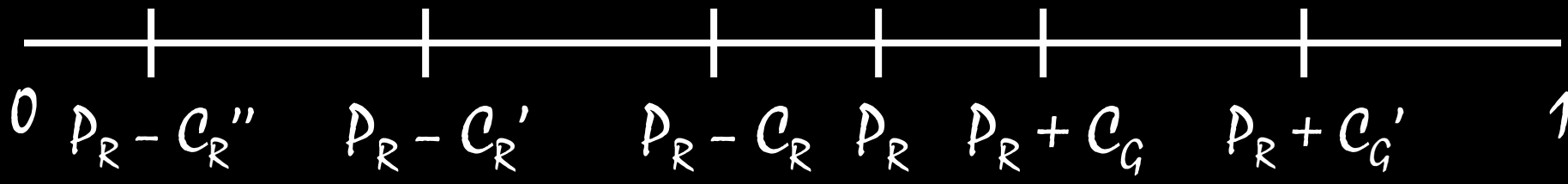
Uncertainty about Costs

- Suppose p is common knowledge
- c_R and c_G are private

Uncertainty about Costs

- Is there a way to distribute the good peacefully such that:
  1. All types receive at least their war payoffs (individual rationality)
  2. All types would want to reveal their type to the game master (incentive compatibility)


0
p_R
1


0
$p_R - c_R''$
$p_R - c_R'$
$p_R - c_R$
p_R
$p_R + c_G$
$p_R + c_G'$
1

Uncertainty about Costs

- Settle at p_R regardless of type
- Better for all types than war
  - Receive same amount but pay costs
- Incentive compatible
  - If you lie, you receive the same amount

Takeaway

- Wars due to uncertainty over costs are not unavoidable

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Uncertainty about Power

- We can guarantee the peace if the cost of war is high
- Impossible to guarantee the peace if the cost of war is low

Numerical Example

- ½ probability R is strong, ½ weak
- ½ probability R is strong, ½ weak
  - If both strong or weak, R wins w/probability .55
  - If R strong and G weak, R wins w/probability .75
  - If R weak and G strong, R wins w/probability .35

Numerical Example

- Suppose each pays cost .05 if they fight

		½	½
		G Strong	G Weak
½	R Strong	.5, .4	.7, .2
½	R Weak	.3, .6	.5, .4

Individual Rationality

- All types of all players must receive at least their blind war payoffs

		½	½
		G Strong	G Weak
½	R Strong	.5, .4	.7, .2
½	R Weak	.3, .6	.5, .4

Individual Rationality

- All types of all players must receive at least their blind war payoffs
  - Strong R must receive at least .6

		½	½
		G Strong	G Weak
½	R Strong	.5, .4	.7, .2
½	R Weak	.3, .6	.5, .4

Individual Rationality

- All types of all players must receive at least their blind war payoffs
  - Strong R must receive at least .6
  - Strong G must receive at least .5

Incentive Compatibility

- All types must be willing to honestly report their type
- Types only matter for war payoffs
- Probability of war must be 0 to guarantee peace

Incentive Compatibility

- Can the game master give different peaceful payoffs to different types?

Incentive Compatibility

- Can the game master give different peaceful payoffs to different types?
  - No: if one type receives more, other type has incentive to lie
    - Incentives to misrepresent strike again

Really Cool Result We Just Proved

- If negotiations always end in peace, the terms of the agreement are identical for all types

Bringing Everything Together

- Strong R must receive at least .6
  - So weak R must receive at least .6 as well
- Strong G must receive at least .5
  - So weak G must receive at least .5 as well

Bringing Everything Together

- Need to divide at least .6 + .5 = 1.1 between the parties
- Object is only worth 1, so impossible!
  - No peaceful direct mechanism exists
  - It is impossible to avoid war here

When Costs Are High

- Before, war costs were .05 each
- Now suppose they are .15 each

		½	½
		G Strong	G Weak
½	R Strong	.4, .3	.6, .1
½	R Weak	.2, .5	.4, .3

Individual Rationality

- All types of all players must receive at least their war payoffs

		½	½
		G Strong	G Weak
½	R Strong	.4, .3	.6, .1
½	R Weak	.2, .5	.4, .3

Individual Rationality

- All types of all players must receive at least their blind war payoffs
  - Strong R must receive at least .5

		½	½
		G Strong	G Weak
½	R Strong	.4, .3	.6, .1
½	R Weak	.2, .5	.4, .3

Individual Rationality

- All types of all players must receive at least their blind war payoffs
  - Strong R must receive at least .5
  - Strong G must receive at least .4

Incentive Compatibility

- For each player, all types receive same payoff
  - Strong R must receive at least .5
    - So weak R must receive at least .5 as well
  - Strong G must receive at least .4
    - So weak G must receive at least .4 as well

Bringing Everything Together

- Need to divide at least .5 + .4 = .9 among the parties
- Object is only worth 1
  - Peaceful direct mechanisms exists
  - Possible to avoid war here

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What Have We Learned?

- All problems are solvable if costs are high
- Sometimes, costs of war are not naturally high enough
- Third-parties can help with peace subsidies

Why Pay?

- Wars create negative externalities—losses in utilities for states not involved in the conflict
  - Pakistan in U.S/Afghanistan War
  - Everyone around Syria

Why Pay?

- Civil wars cause spillovers
  - Two states, no civil wars: 2.1% chance of a militarized interstate dispute per year
  - Two states, one civil war: 4.3% chance of a militarized interstate dispute per year

Why Pay?

- War is costly for you
- You might want to pay a little to support peace than pay more in warfare
  - Seems intuitive but is hard to actually detect in practice

Camp David Accords

- Israel/Egypt make peace
- U.S. promises to throw money at both of them

The effect is real. Subsidies increase when information and commitment problems are most likely and decrease when they are least likely.

Muslim Brotherhood

- Comes to power during the (ongoing) Egyptian revolution
- Implements policies United States does not like very much

Stop, or we'll cut the subsidies.

Stop, or we'll cut the subsidies.

You do realize that the subsidy is the what's keeping the peace, right?