

The failure of Copenhagen from a game-theoretical perspective

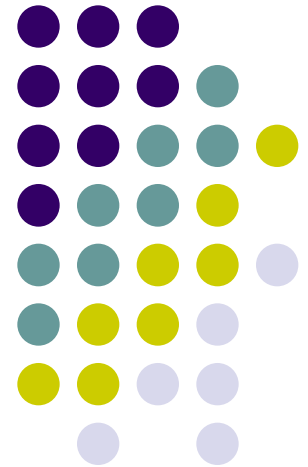
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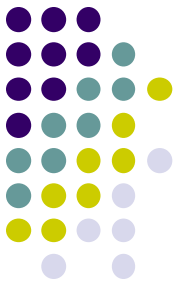
1.- International Environmental Agreements (IEAs)



- It is difficult to achieve IEAs due to:
 - The environment is a public good (no rivalry and no exclusion)

And pollution a global bad
 - The participants (if signatories) find more profitable to violate the agreement (or, simply, they chose not to sign). They face a “prisoners’ dilemma” with a “non-cooperative” solution.

International Environmental Agreements (II)

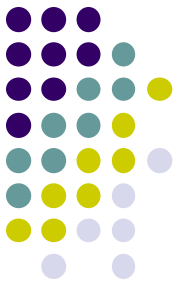


- The “prisoners’ dilemma” with a “non-cooperative” solution
- Dominant strategy: not to reduce emissions /not to cooperate

Figure 1. International Environmental Agreement before Kyoto

		Rest of the countries	
		A few reduce	Many reduce
Country A	To reduce	-10	10
	Not to reduce	0	20

2.- The fulfilment of Kyoto Protocol: cooperative strategies (I)



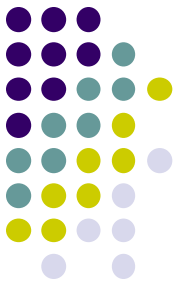
- 1.- Outstanding increase of pollution
- 2.- Establishment of fines
- 3.- Emission trading system
- 4.- Technological change

2.- The fulfilment of Kyoto Protocol: cooperative strategies (II)



- 1.- Outstanding increase in pollution
- 2.- Fine, to be effective it must be:
 - High enough to solve the prisoner's dilemma.
 - Imposed by an international organization that enforce cooperation.
- 3.- Emission trading system, that:
 - Be effective and efficient
 - Clear and transparent information and rules
 - To facilitate the emission abatement

2.- The fulfilment of Kyoto Protocol: cooperative strategies (III)

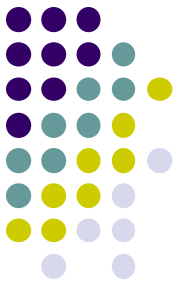


- A global agreement. One example if:
 - Evident climate change
 - Effective fine
 - Efficient emissions trade system

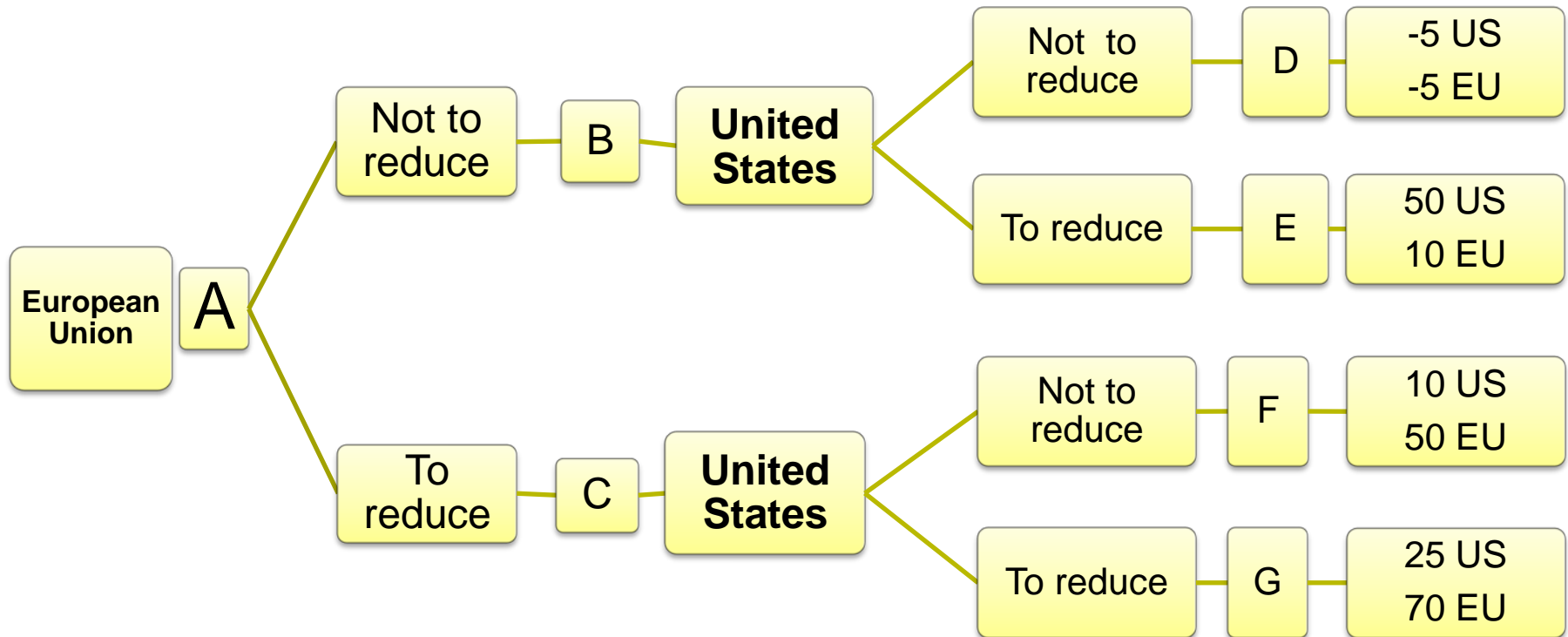
Figure 2. Global Agreement

		Rest of the countries	
		A few reduce	Many reduce
Country A	To Reduce	-15	10
	Not to reduce	-20	0

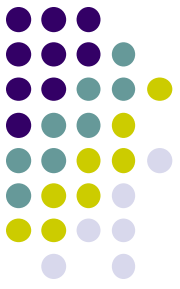
2.- The fulfilment of Kyoto Protocol: cooperative strategies (IV)



4.- Technological change: Leader country (EU) and the rest as followers (US).

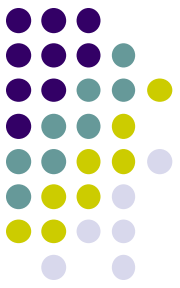


2.- The fulfilment of Kyoto Protocol: cooperative strategies (V)



- Leader-follower model of Stackelberg
 - The dominant strategy for the EU is “to reduce”:
 - Technological innovation
 - Energy efficiency
- A diagram illustrating the relationship between inputs and outputs. On the left, two bullet points are grouped by a right-facing curly bracket. A yellow arrow points from this bracket to another right-facing curly bracket on the right, which groups two bullet points.
- Cost reductions
 - Less emissions
- The strategy for the US is to be “the follower”

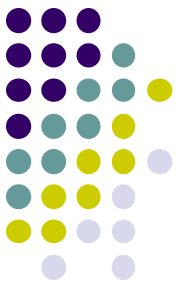
2.- The fulfilment of Kyoto Protocol: cooperative strategies (VI)



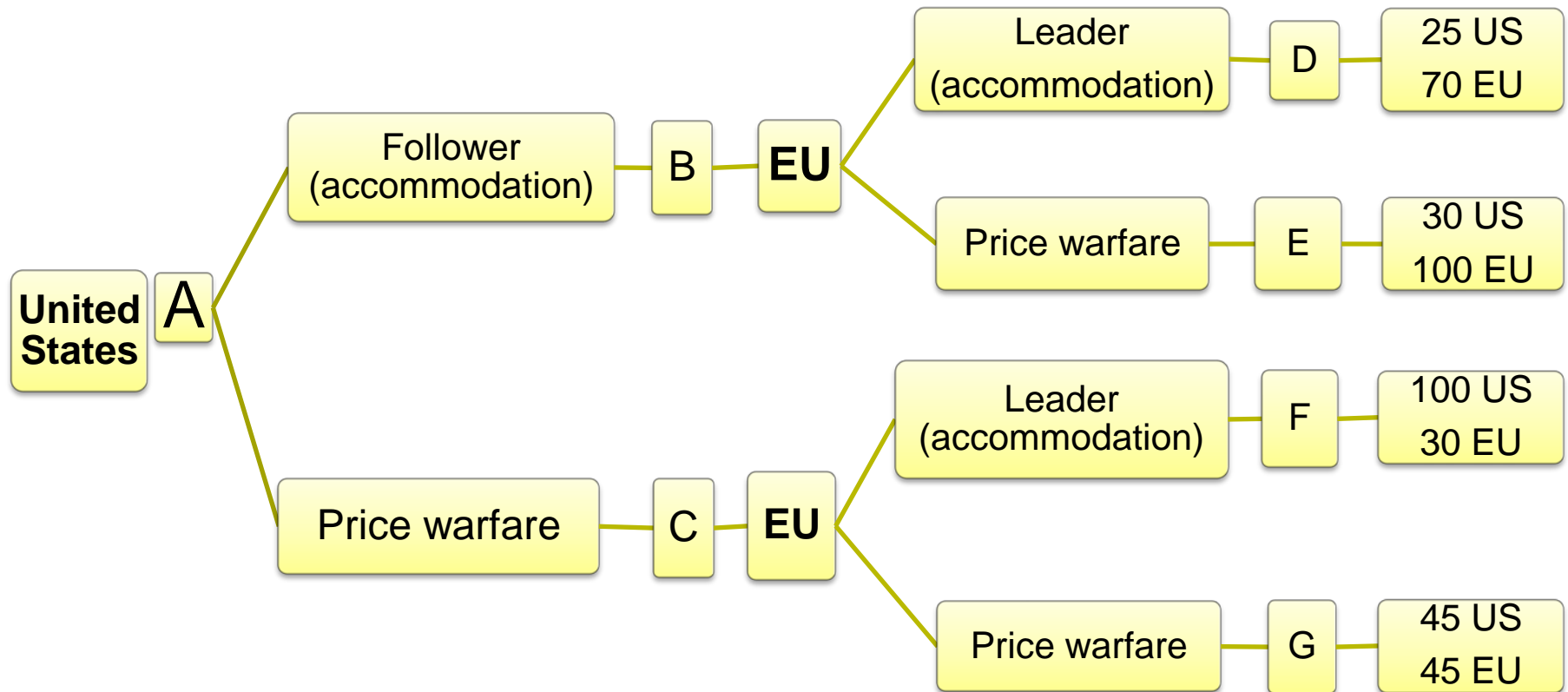
Why the US did not act as a follower?

Was the attitude of the US one of the elements that made the Copenhagen Meeting to fail?

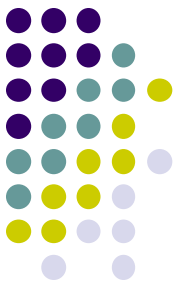
2.- The fulfilment of Kyoto Protocol: cooperative strategies (VII)



Leader-follower model: possible payoffs

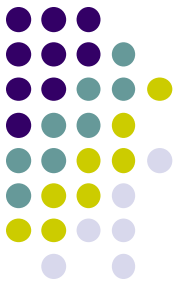


2.- The fulfilment of Kyoto Protocol: cooperative strategies (VIII)

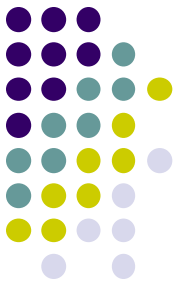


- Price warfare:
 - The results, in the long term, for the US are worse than the obtained if the US acts as follower.
 - Therefore the EU expected the US to be a follower (and reduce the greenhouse emissions)
- Why the US is not a follower? Has the EU discouraged the US to participate?

3.- Is the EU discouraging the participation of the US?

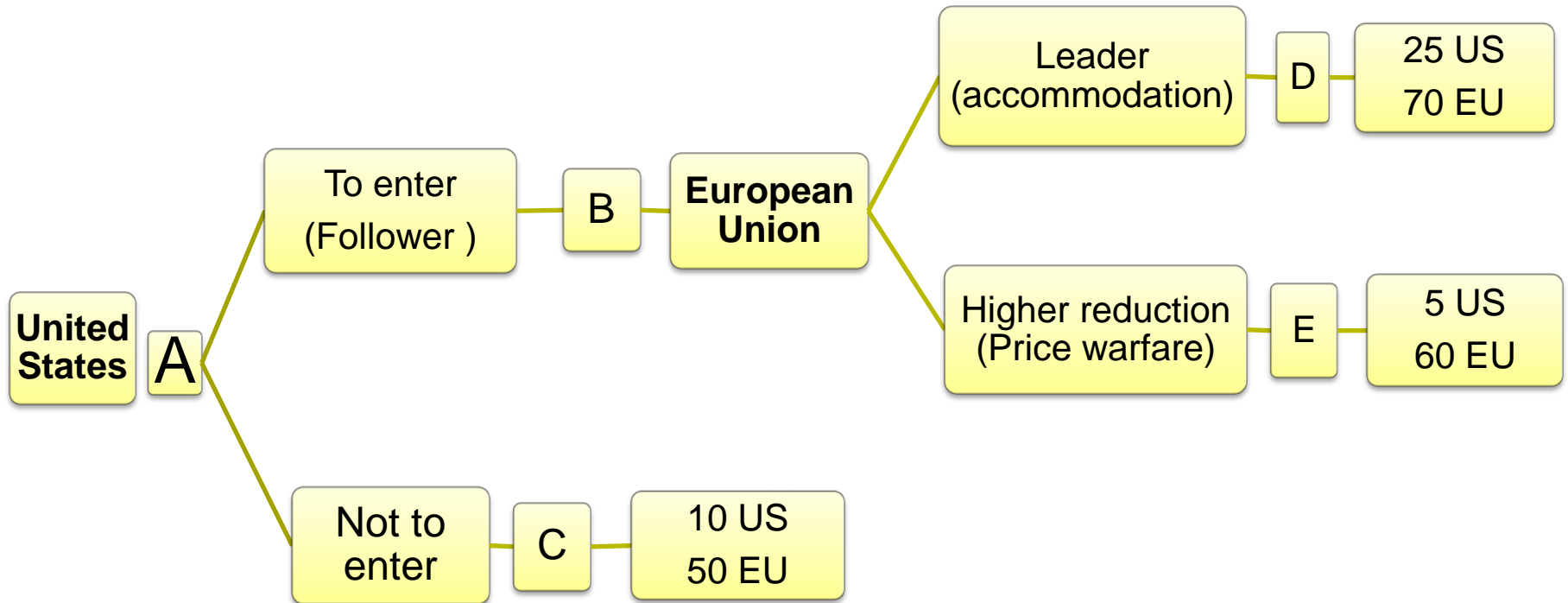


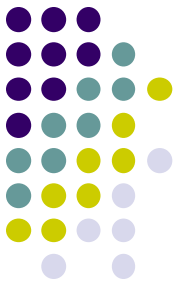
- Two options:
 - Entry deterrence
 - Credible threats



3.1.- Entry Deterrence (I)

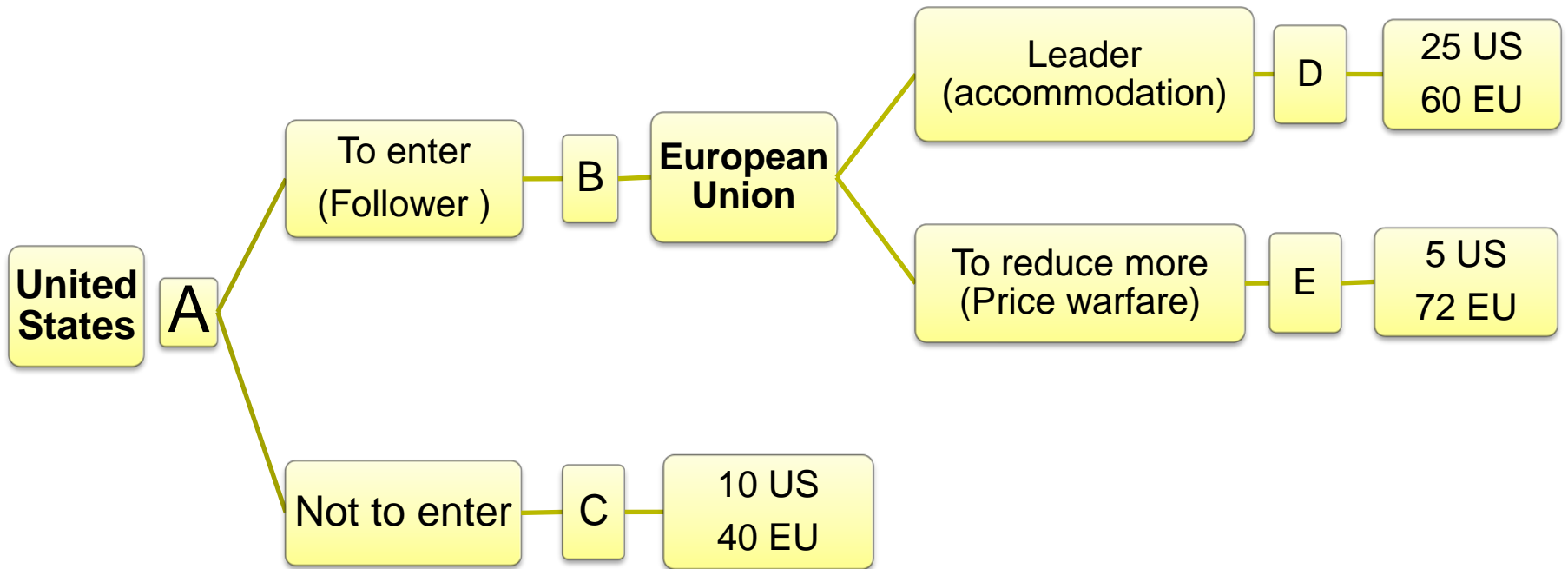
- Initial situation

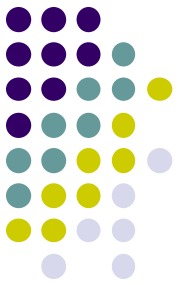




3.1.- Entry Deterrence (II)

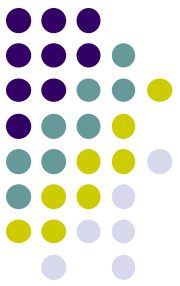
- Final situation





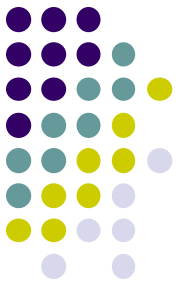
3.2- Credible threats

- The threats, to be credible, must comply with:
 - The expected “decision tree” for each country must be similar (same results forecast)
 - Good reputation of the players



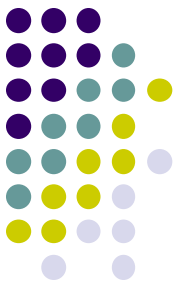
4.- Conclusions (I)

- It is difficult to reach an International Environment Agreement, but feasible.
- We have focused in one cooperative solution: the Stackelberg model
- The best results are achieved being the US the follower, then, why did it refuse this role?



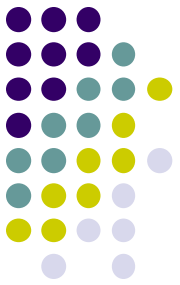
4.- Conclusions (II)

- Two options
 - Entry deterrence
 - Empty threats
- Probably the real situation is a mix of the two
 - Under these considerations, the Copenhagen Meeting was condemned to fail.



4.- Conclusions (III)

- It is interesting to pay attention to two new issues:
 - The importance of the figures has increased
 - The best strategy in the prisoners' dilemma is "tit for tat".
- Finally, it is important to highlight that the lack of cooperation has been also due to the high number of participants and the continuing changes in costs and demand conditions.



Thank you for your attention

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