

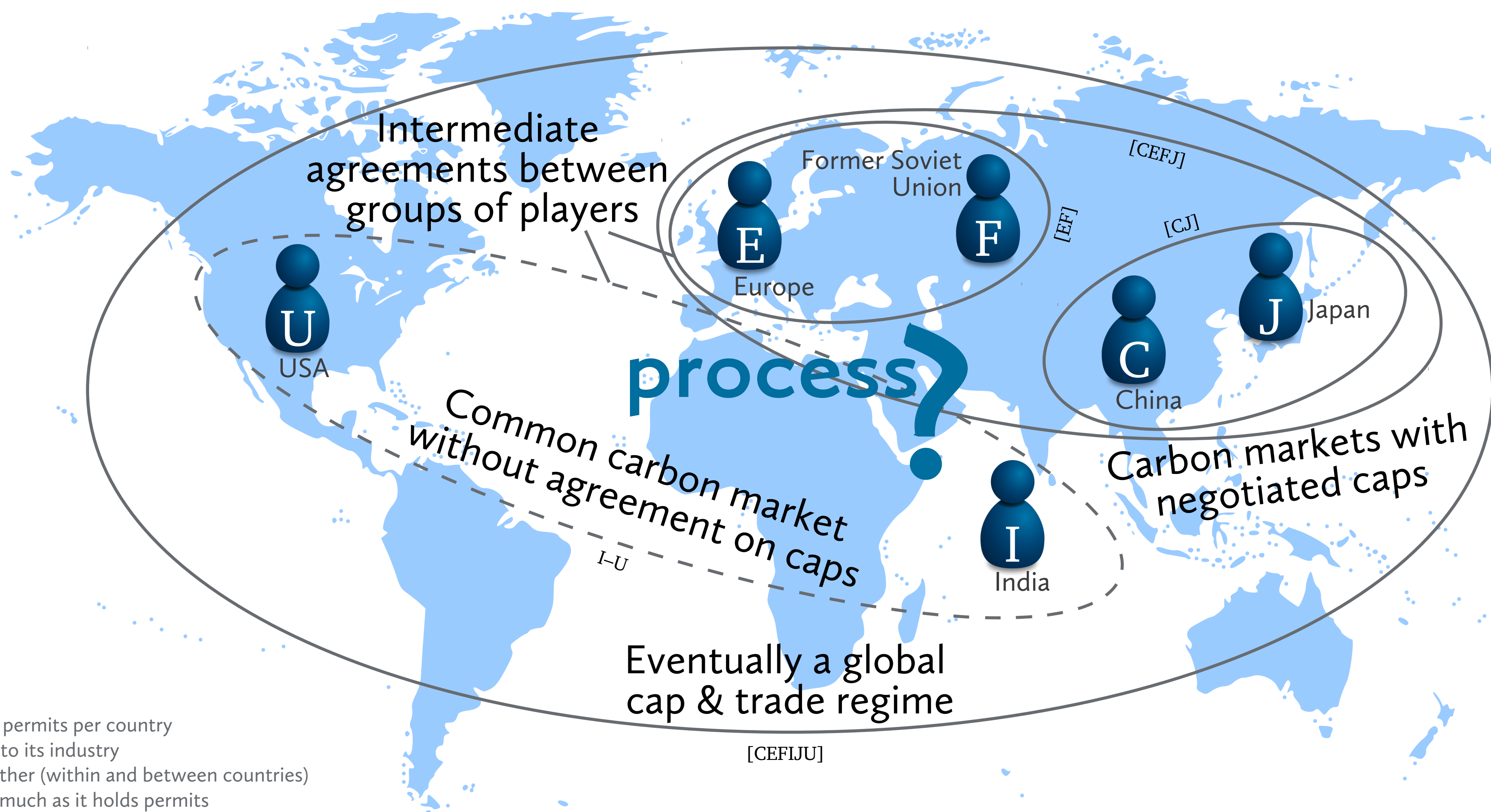
DYNAMICS OF HIERARCHICAL COALITION FORMATION

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Summary

Using the issue of international greenhouse gas emissions reductions as an important example, we study a Markov chain model of the bottom-up formation of cooperative coalitions between rational players. Our results indicate that the emergence of a global cap & trade regime in several steps seems likely.



Cap & Trade

- Countries agree on no. of emissions permits per country
- Each country distributes its permits to its industry
- Firms can trade permits with each other (within and between countries)
- After trading, each firm can emit as much as it holds permits

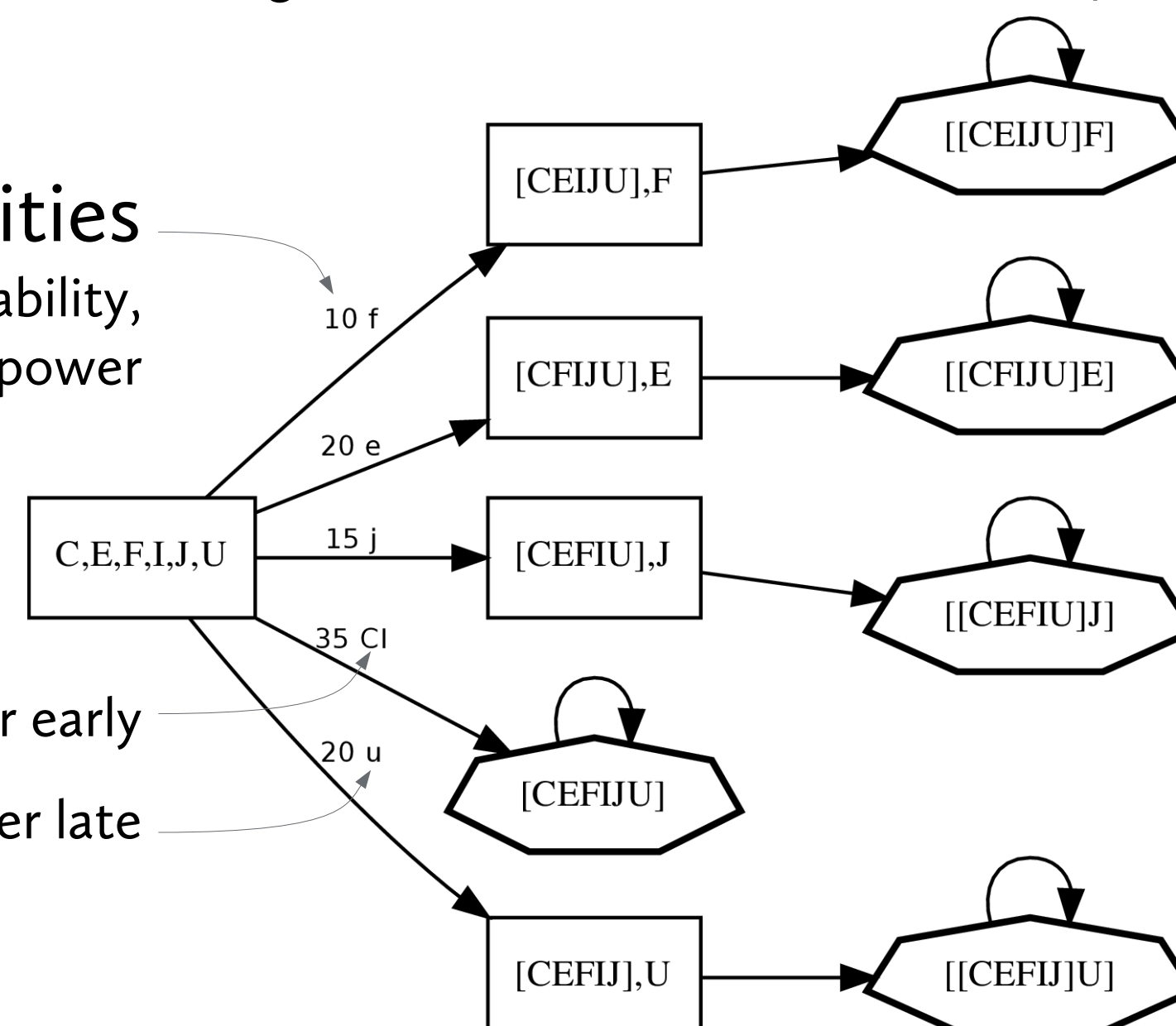
Coalition Formation as a Markov chain

State = what markets and cap agreements exist (thousands of possible states)
Transition = sign or terminate an agreement on market formation and/or cap coordination

Long-term profitability determined from state payoffs, transition probabilities & farsightedness

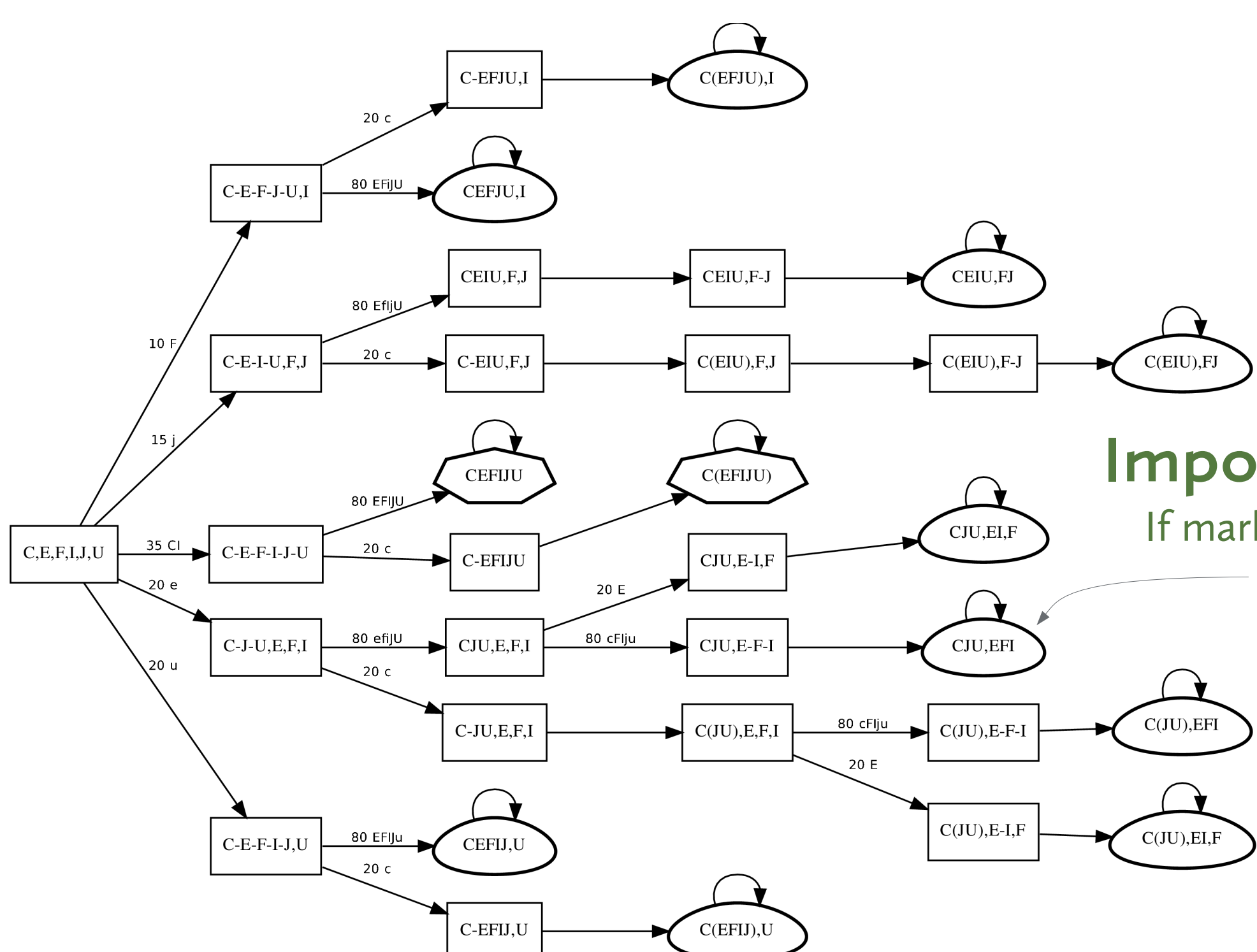
find equilibrium by iterative updating

Transition probabilities determined from profitability, preferences & bargaining power



Major permit sellers typically prefer to enter early
Permit buyers typically prefer to enter late

Typical result for wide range of parameters
Global cap & trade emerges bottom-up in surprisingly few steps

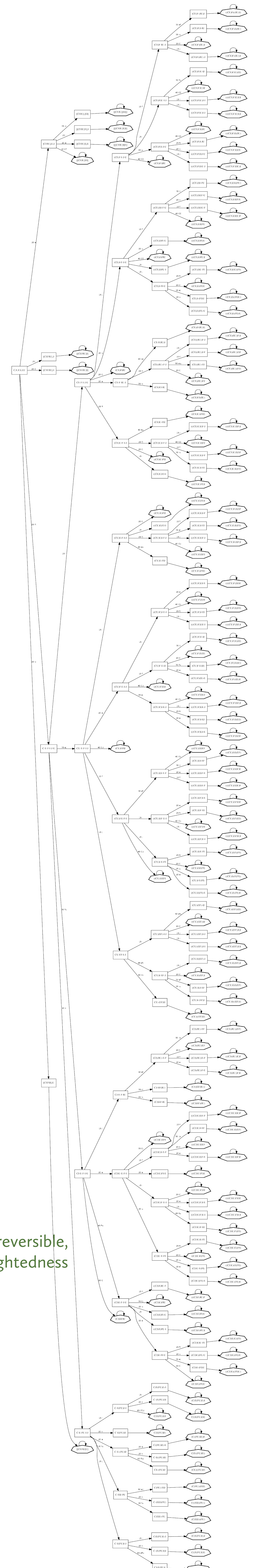


Importance of immediate cap coordination

If market formation and cap coordination requires separate treaties, the process can get stuck with several disjoint markets with internal but not external agreement on caps.

Questions for physicists

- Stability of process & updating?
- Basins of attraction?
- Bifurcations / behaviour when parameters change?



If treaties were irreversible, complexity would increase with farsightedness

Reference

Jobst Heitzig, *Bottom-up strategic linking of carbon markets: Which climate coalitions would farsighted players form?*
EAERE 2012 / GAMES 2012 conference paper