Formal Analysis: Arms competition and war

Andy Eggers

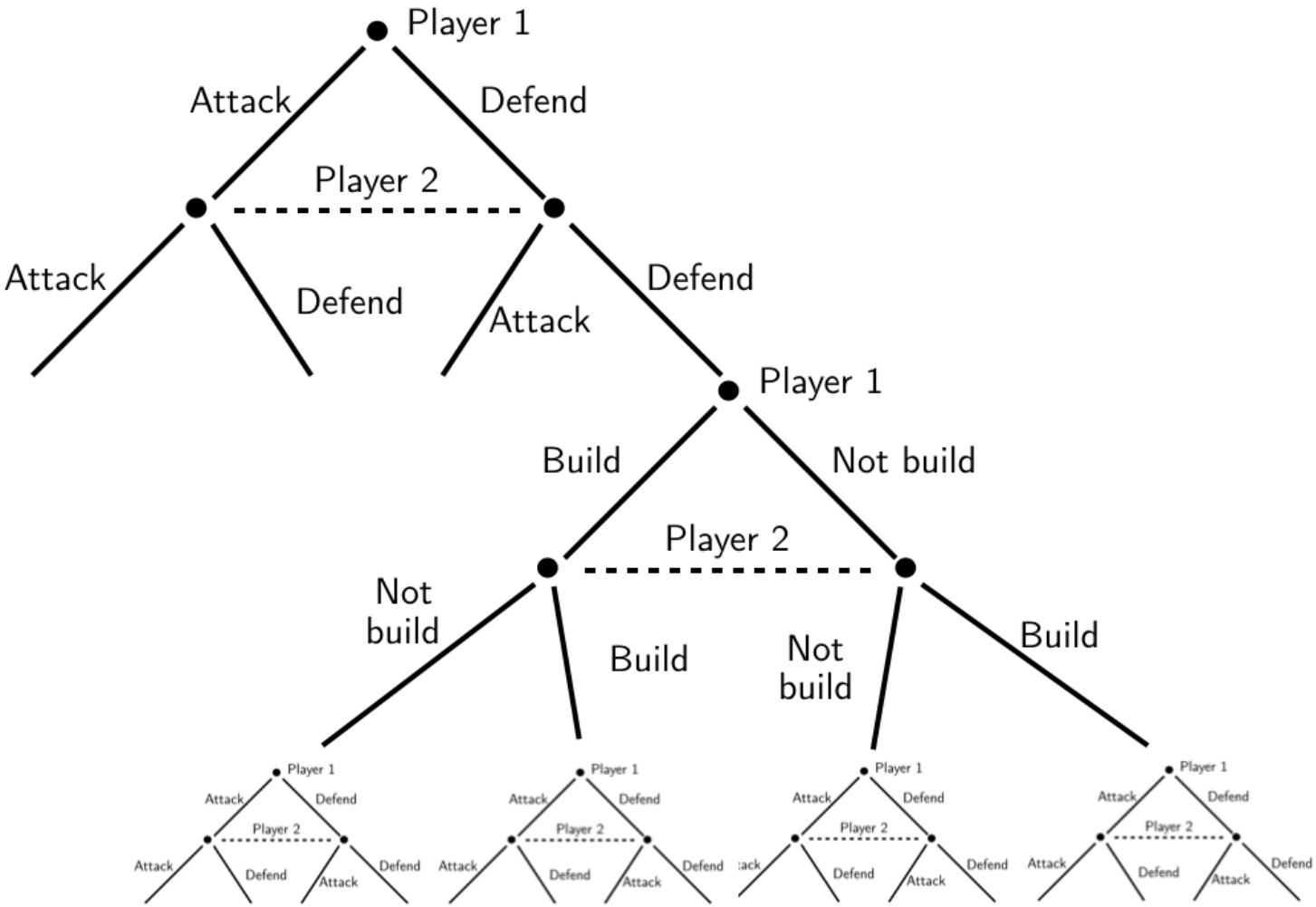
Week 5 Session 1

Arms-War game

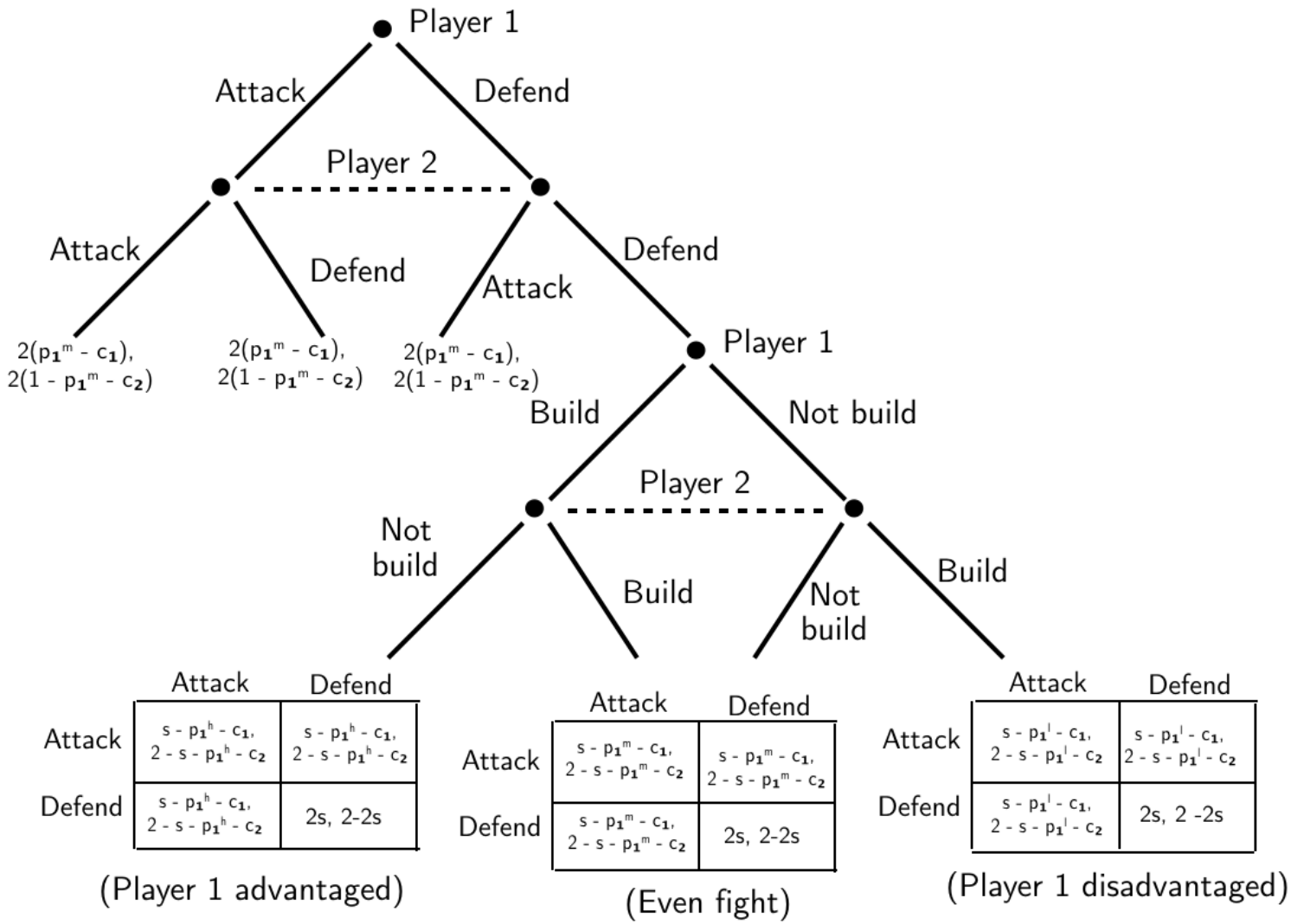
Key features

- War if either player attacks (cf chapter 6)
- 2 rounds: chance to attack in first round; if no attack first round, can invest in arms buildup; chance to attack in second round
- By assumption, players would only attack if advantaged (and possibly not then)

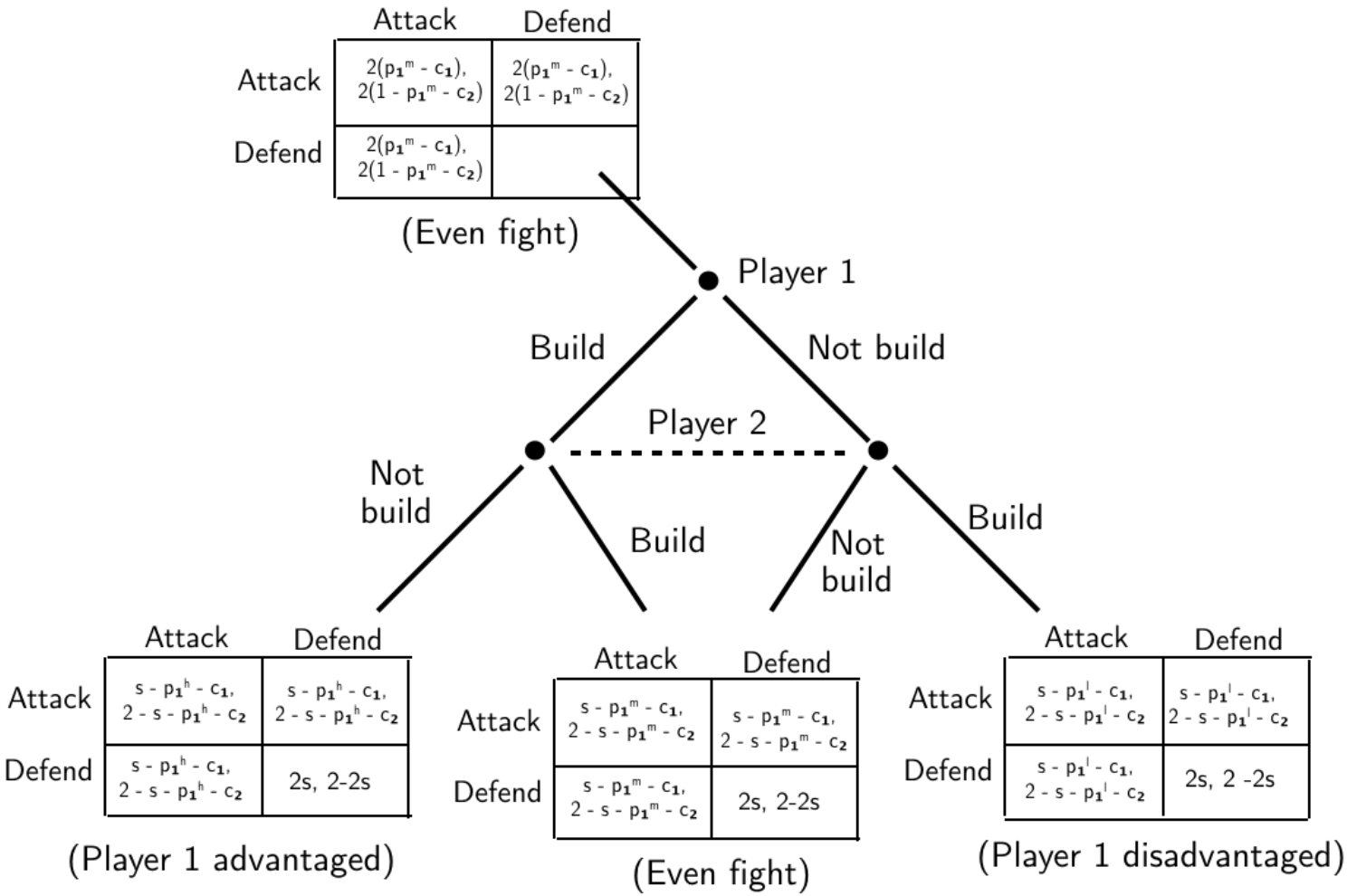
Diagramming the game



Diagramming the game (2)

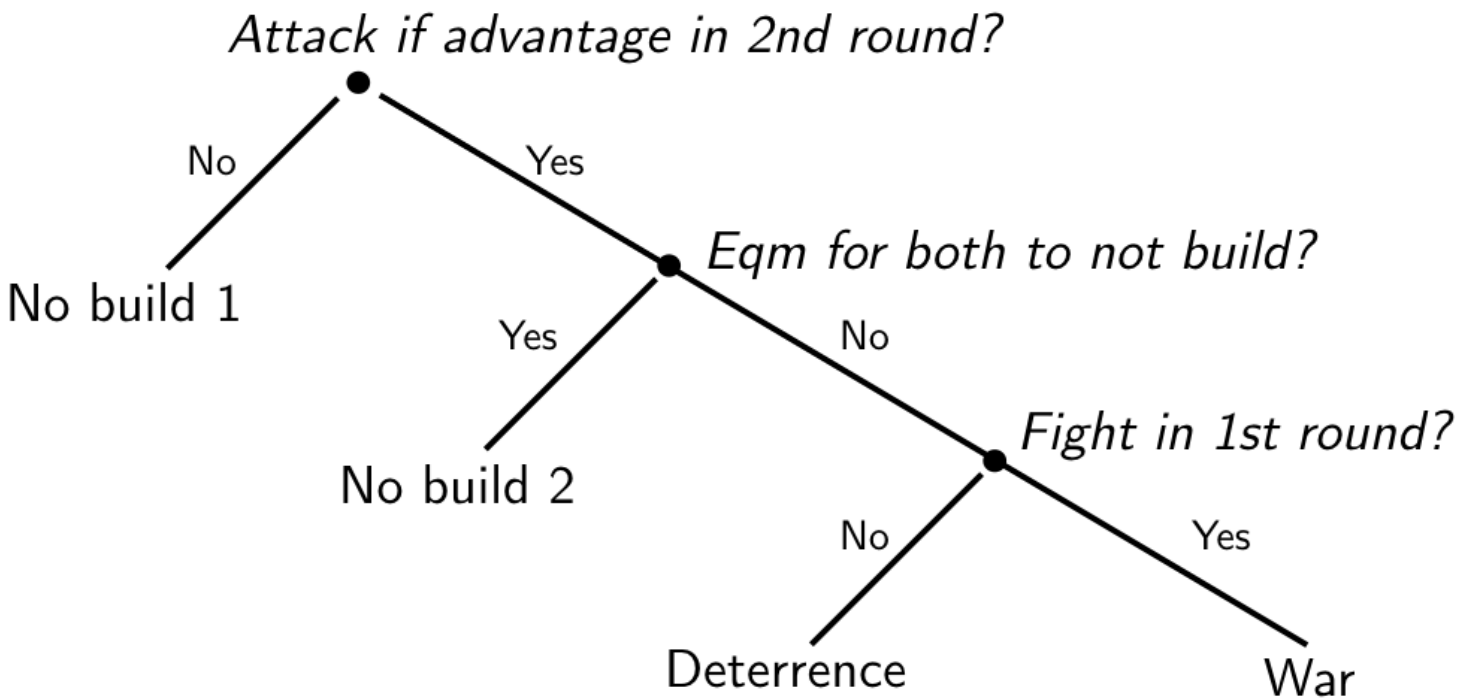


Diagramming the game (3)



Approach to solving the game

1. Restrict scope: assume attacking on even terms not beneficial; restrict to symmetric equilibria
2. Categorize the remaining possibilities
3. For each possibility, state conditions under which no profitable deviation



Risk-return tradeoff and deterrence

Two equivalent games

1. Arms choice game of chapter 3: players value power, measured as $\frac{m_i}{m_1+m2}$, and pay $\gamma_i m_i$ for it.
2. Sketch of deterrence game in section 7.2: players value a resource; they choose a level of arms m_i at cost $\gamma_i m_i$ and then bargain over the resource, with player 1 making an offer and player 2 accepting or attacking (and $p_1 = \frac{m_1}{m_1+m_2}$).

Risk-return tradeoff via incomplete information

To note: Kydd establishes conditions for **one** equilibrium, where

- status quo types do not build and never attack
- greedy types build and attack if they have an advantage

Like much of this literature, an approach based on showing **existence**.