Reputational Bargaining in the Shadow of the Law

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Reputational Bargaining (Abreu and Gul, 2000)

- Two players negotiate to divide a unit pie.
- Each player is
  - rational (flexible and strategic), or
  - persistent (inflexible and behavioral)
- Time is continuous.
- Players persist or concede.

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- Time is continuous.
- Players persist or concede or threaten to go to the court (ultimatum).

Application: Bargaining with Final-Offer Arbitration

- Two parties (e.g. a union and a firm, or partners of a company) negotiate to resolve a conflict.
- Each party is
  - rational/unjustified (no evidence supporting a claim), or
  - persistent/justified (verifiable evidence supporting a claim)
- Two parties can settle the conflict on their own.
- Or they can let the court resolve their conflict when they get the chance.
  - A justified party goes to a third party (e.g., court, arbitrator) whenever there is a chance.
  - An unjustified party may go to the court strategically.

Results

1. How likely a player sends an ultimatum depends on own reputation and opponent's reputation, and is *not* monotonic in time.
2. Having the ultimatum may or may not benefit the challenger.
   - Negative effect "no news is bad news": harder to build reputation.
   - Positive effect "no news is good news": easier to build reputation.
3. Players' limit payoffs depend on discount rates (as in Abreu and Gul (2000)) and the arrival rates of challenge opportunities.
4. Two-sided: Players' reputations do not necessarily build up when both sides can send ultimatums (vs reputations always build up in Abreu and Gul (2000)).

Reputational Bargaining (Abreu and Gul, 2000)

- Players 1 and 2 negotiate to divide a unit pie.
- Time is continuous. Player i's discount rate is r_i.
- With probability z_i player $i = 1, 2$ persistently demands a_i.
- Assume difference $D \equiv a_1 + a_2 - 1 > 0$.
- At each instant, each player can persist or concede.

Equilibrium: War of Attrition

1. Players' reputations (probabilities of being a persistent type) increase over time and reach 1 at the same time.

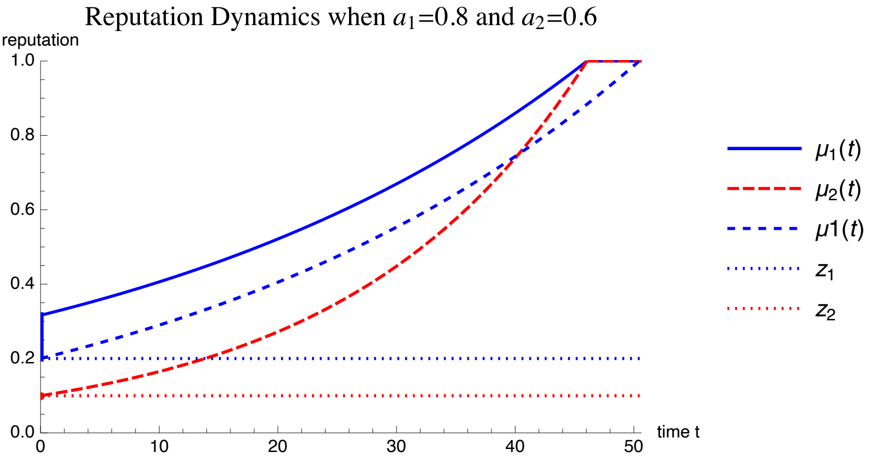
2. Each player mixes between persisting and conceding at a constant rate

$$\lambda_j = \frac{r_i(1 - a_j)}{D}$$

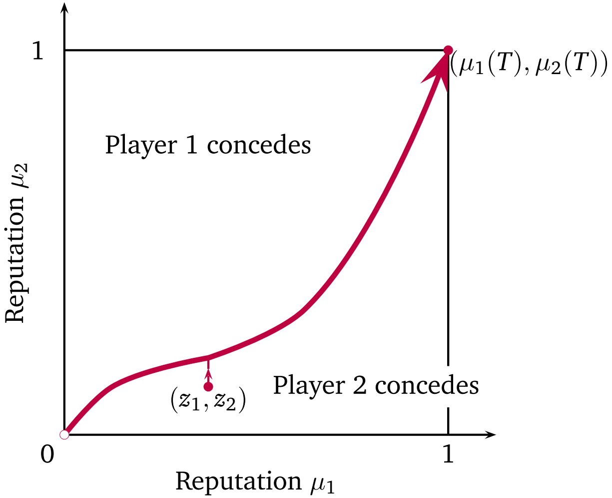
   to make opponent indifferent between persisting and conceding.

3. At most one player concedes with a positive probability at time 0.

Reputation Dynamics



Reputation Coevolution



Reputational Bargaining

- Players 1 and 2 negotiate to divide a unit pie.
- Time is continuous. Player i's discount rate is r_i.
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- Assume $D \equiv a_1 + a_2 - 1 > 0$.
- At each instant, each player can persist or concede.

Reputational Bargaining with One-Sided Challenge

- In addition, player 1 can also challenge:
  - A justified player 1 challenges with Poisson rate γ_1.
  - An unjustified player 1 can (strategically) challenge any time.
- If player 1 pays cost c_1 to challenge, player 2 has to respond.
  - A justified player 2 always sees the challenge.
  - An unjustified player 2 can choose.
- If player 2 yields to the challenge, player 1 gets a_1 and player 2 gets $1 - a_1$.
- If player 2 pays cost c_2 to see the challenge, a court determines outcome:
  - An unjustified player loses to a justified player.
  - An unjustified challenger wins with probability w against an unjustified opponent.

Challenging is like bluffing: it can be beneficial (if the opponent concedes) or harmful (if the opponent calls).

Incentives to Challenge and See the Challenge

- If player 1's reputation is ν_1, player 2 is indifferent between responding and yielding when

$$(1-\nu_1)(1-w)D - c_2 = 0.$$

$$\nu_1 = 1 - \frac{c_2}{(1-w)D} \equiv \nu_1^*.$$

- An unjustified player 1 does not challenge if

$$\mu_2 > 1 - \frac{c_1}{D} \equiv \mu_2^*$$

Player 1's highest gain from challenging is

$$(1-\mu_2)D - c_1.$$

Mutual Indifference in Unique Equilibrium

Unique equilibrium:

- Players concede at Abreu-Gul rates.
- When for $\mu_2 \leq \mu_2^*$, player 2 responds with probability

$$s_2(\mu_2) = \frac{1}{1-w}\left[1 - \frac{c_1}{D}\frac{1}{1-\mu_2}\right].$$

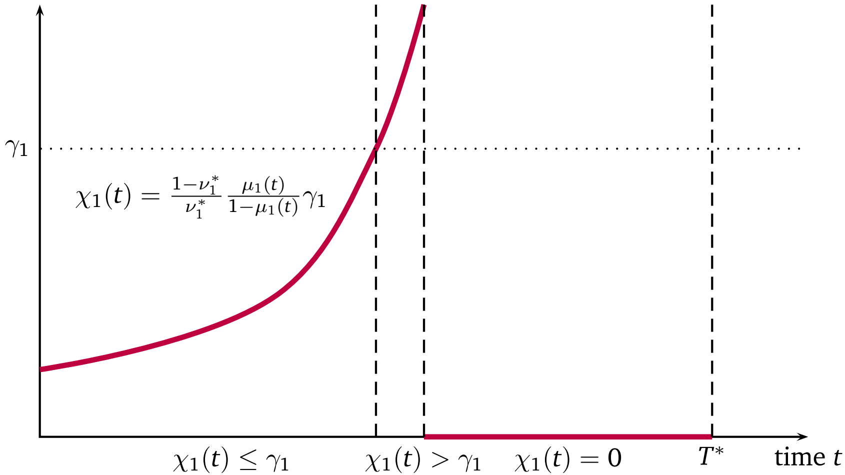
  to make 1 indifferent between challenging and conceding.
- When $\mu_2 < \mu_2^*$, player 1 challenges with rate χ_1:

$$\frac{\mu_1\gamma_1}{\mu_1\gamma_1 + (1-\mu_1)\chi_1} = \nu_1^*$$

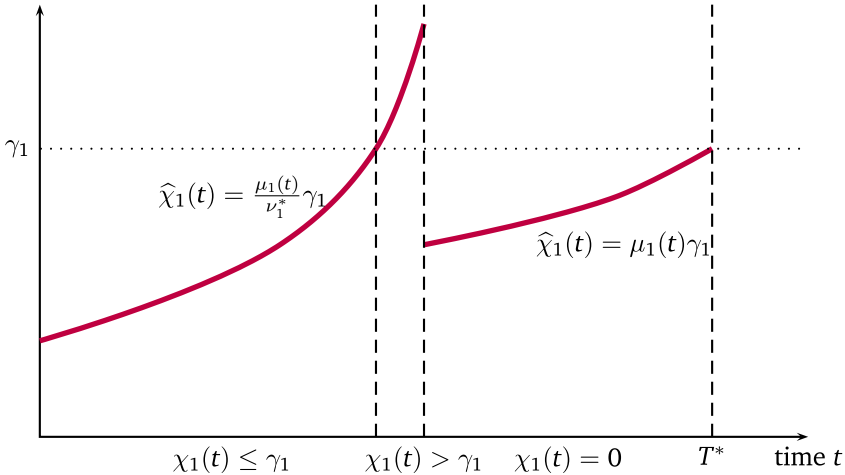
$$\chi_1 = \frac{1-\nu_1^*}{\nu_1^*}\frac{\mu_1}{1-\mu_1}\gamma_1$$

  to make 2 indifferent between responding and yielding to the challenge.

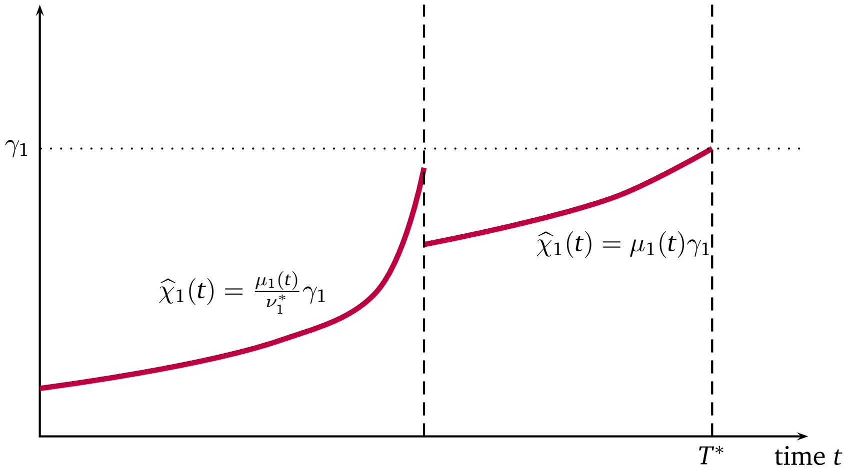
An Unjustified Player's Equilibrium Challenge Rate



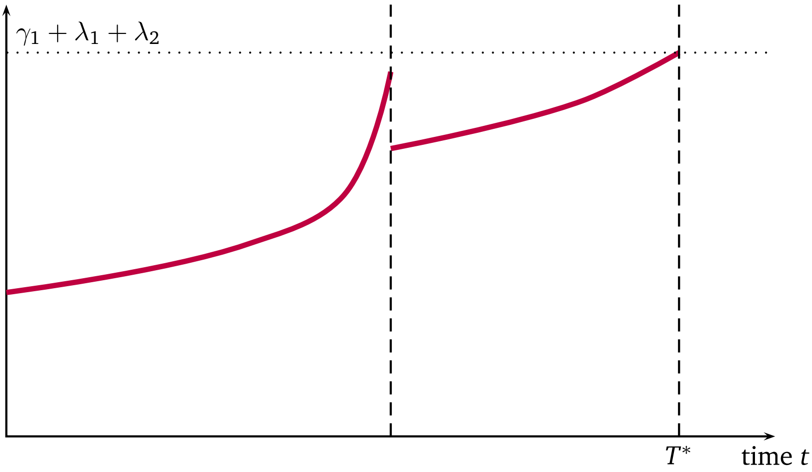
Overall Challenge Rate



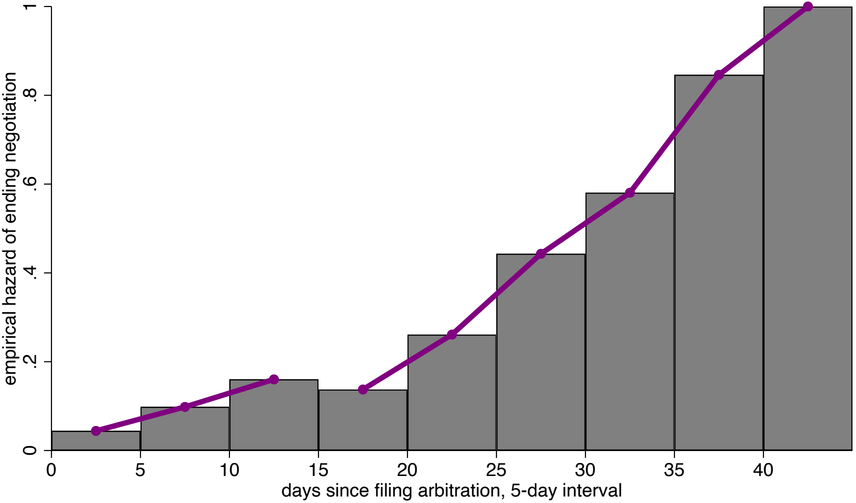
Overall Challenge Rate, Case 2



Predicted Hazard Rate of Ending the Game



MLB Salary Arbitration, 2011-2020



Reputation Dynamics

2's reputation follows

$$\mu_2'(t) = \lambda_2 \mu_2(t).$$

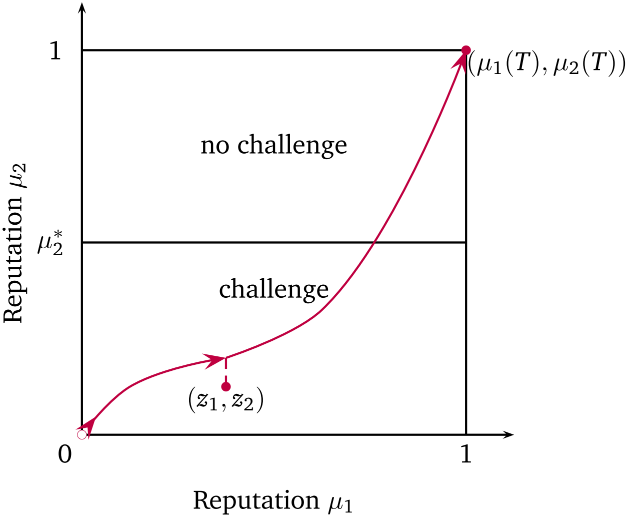
1's reputation follows Bernoulli in the no-challenging phase ($\mu_2 > \mu_2^*$):

$$\mu_1'(t) = \lambda_1 \mu_1(t) - \gamma_1 \mu_1(t) + \gamma_1 \mu_1^2(t) < \lambda_1 \mu_1(t).$$

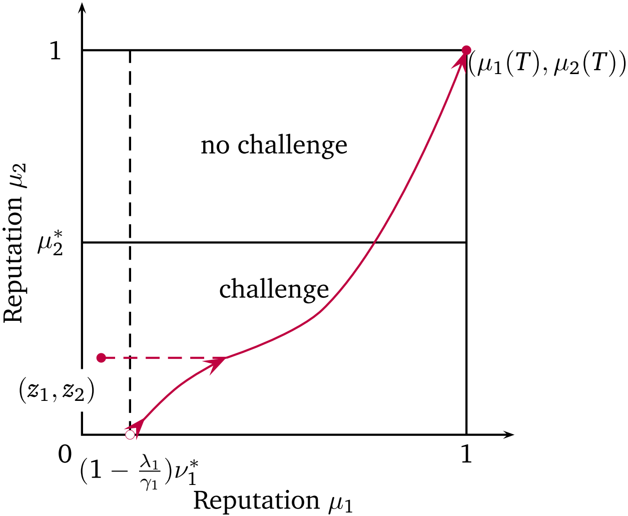
1's reputation follows Bernoulli in the challenging phase ($\mu_2 < \mu_2^*$):

$$\mu_1'(t) = \lambda_1 \mu_1(t) - \gamma_1 \mu_1(t) + \gamma_1 \mu_1^2(t) + \left(\frac{\gamma_1}{\nu_1^*} - \gamma_1\right) \mu_1^2(t) \begin{cases} \leq \lambda_1 \mu_1(t) & \text{if } \mu_1(t) \leq \nu_1^* \\ > \lambda_1 \mu_1(t) & \text{if } \mu_1(t) > \nu_1^* \end{cases}.$$

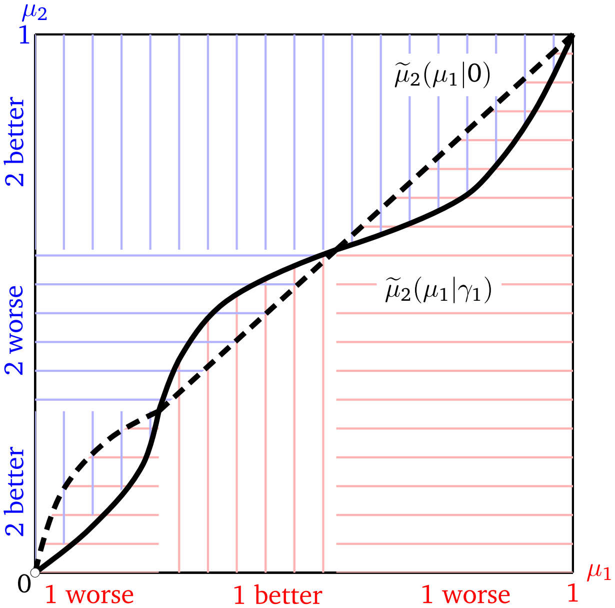
Reputation Coevolution: $\gamma_1 \leq \lambda_1$



Reputation Coevolution: $\gamma_1 > \lambda_1$



Who Benefits from Challenge Opportunity?



Multiple Types

Suppose players can choose their initial demands a_i and a_j from finite sets A_i and A_j, respectively.

Unique Equilibrium

There exists a unique sequential equilibrium.

Limit Payoffs

"Sufficiently rich" sets and small probabilities of persistence:

- Agreements are efficient: limit payoffs add up to 1.
- Player 1's limit payoff in Abreu and Gul (2000) is Rubinstein (1982) payoff

$$\frac{r_2}{r_1 + r_2}.$$

- Player 1's limit payoff in bargaining with one-sided challenge is

$$\frac{r_2}{\max\{r_1, \gamma_1\} + r_2}.$$

Bargaining with Two-Sided Challenges

- Player 1 and player 2 bargain to divide a unit pie.
- With probability z_i player i persistently/irrationally demands a_i.
- Assume $d \equiv a_1 + a_2 - 1 > 0$.
- Time is continuous. Player i's discount rate is r_i.
- At each instant, each player can persist or concede, **or**
  - A justified player $i = 1, 2$ challenges with Poisson rate γ_i.
  - An unjustified player $i = 1, 2$ can challenge any time.
- If player i pays cost c_i to challenge, player $j \neq i$ has to respond.
  - A justified player j always sees the challenge.
  - If player j yields to the challenge, player i gets a_i and player j gets $1 - a_j$.
  - If player j pays cost c_j to see the challenge, a court determines outcome:
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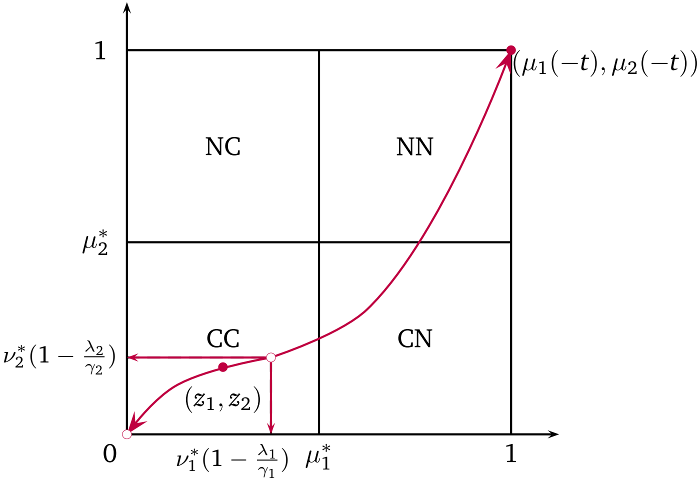
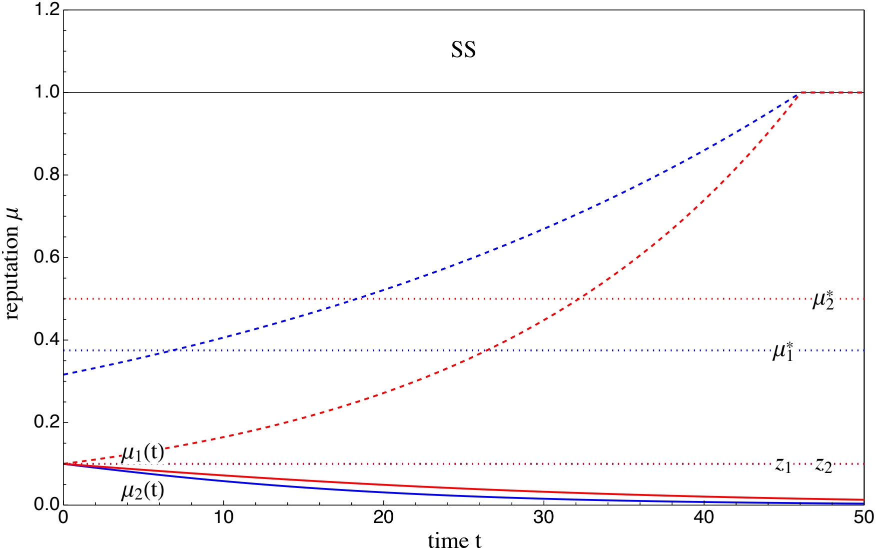
Reputation Not Building Up



Reputation Not Building Up



Conclusion

- The paper builds a model of reputational bargaining with an opportunity to challenge the opponent.
- A player increases the challenge rate initially, and then does not challenge at all.
- The challenge opportunity may or may not benefit the challenger.
- Neither player's reputation may build up when the opportunity to go to court is abundant (e.g., it is easy for a justified player to collect supporting evidence).
- The paper incorporates the continuous-time bargaining model of Abreu and Gul (2000) as a special case, and provides an economic interpretation and application of "irrationality"/"persistence".

THANK YOU!

References I

Abreu, Dilip and Faruk Gul, "Bargaining and Reputation," *Econometrica*, 2000, *68* (1), 85–117.

Rubinstein, Ariel, "Perfect Equilibrium in a Bargaining Model," *Econometrica*, January 1982, *50* (1), 97–108.