Commitment and conflict in unanimity bargaining

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AEJ Microeconomics, June 2024

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Motivation

- "The unanimity rule has meant that some key proposals for growth, competitiveness and tax fairness in the Single Market have been blocked for years." (European Commission press release, Jan 15th 2019)
    - Jean-Claude Juncker & Pierre Moscovici & Ursula von der Leyen:"the unanimity rule should be abandonned in favor of the so called *qualified majority rule*"
- UNFCCC has not been able to reach a comprehensive and binding agreement on how to limit carbondioxide emissions
- World Trade Organization's (WTO) Doha Development Round has failed to meet its deadline several times
- The entry of Finland and Sweden to NATO was blocked by Turkye and Hungary. Expert obervers interpreted this as an attempt to extract concessions from the U.S. and other NATO members (Bloomberg, 2022)
- Many references by specialists and practitioners to the problems with unanimity when a single party can hold others as hostage (Ehlermann, Ehring, 2005)

Motivation

Buchanan & Tullock (1965):

- Fundamental tradeoff between "external costs" and the "decision costs" associated with a given q-majority rule
- Higher q comes with
  - a lower chance of imposing external costs on a non-agreeing party (lower chance of violation of Pareto)
  - longer duration of reaching an agreement (or even chance of breakdown of negotiations)
- Their argument was informal, however. Up to date no formalization of this tradeoff.
- In this paper, we abstract from "external costs" and provide a formalization of "decision costs."

Motivation

- Complete information models of multilateral bargaining (starting with Baron & Ferejohn, 1989) typically predict immediate agreement in settings where delay is inefficient.
  - irrespective of the decision rule or the number of players (Banks and Duggan, 2000; Eraslan and Evdokimov, 2019).
  - settings in which delay can be efficient, in which case majority rule may lead to inefficient early agreement such that unanimty becomes the more efficient rule (Banks and Duggan, 2006; Eraslan and Merlo, 2017; Merlo and Wilson, 1995, 1998).
- Feddersen and Pesendorfer (1997, 1998) show that information aggregates efficiently for all rules other than unanimity.

This paper

- We study multilateral negotiations as a struggle to commit (Schelling, 1956; Crawford, 1982; Muthoo, 1992; Ellingsen and Miettinen, 2008, 2014; Dutta, 2023; reviewed in Miettinen, 2022). reached in equilibrium

Questions

Negotiating parties can attempt tying their hands credibly prior to negotiations in order to force concessions from others

- Is it optimal to resort to such tactics in multilateral settings?
- How is efficiency (delay) affected?
- How do the results depend on the voting rule (unanimity vs. supermajority)?
- How is efficiency affected by the number of parties involved?

This paper

- Formal symmetric information model of multilateral bargaining which sheds light on the way unanimity might translate to inefficient delay.
- Only inefficient equilibria may exist under unanimity.
- All less-than-unanimity rules are efficient, however.
- More parties leads to longer inefficient delay.

Related literature

- *Multilateral:* Baron & Ferejohn (1989), Baron and Kalai (1993); Banks and Duggan (2000); Eraslan (2002), Eraslan & Merlo (2002); Yildirim (2007) – efficient; unanimity more egalitarian
- *Reputational:* Fanning & Wolitzky (2022), Myerson (1991), Kambe (1999); Abreu & Gul (2000), Compte & Jehiel (2002) - bilateral with behavioral types (except Ma, 2023)
- *Delegation:* Jones (1989), Segerdorff (1998), Harstad (2008; 2010): side-payments and delegation; Harstad (2010): voting rule and delegate bias
- *Information aggregation:* Austen-Smith & Banks (1996), Feddersen & Pesendorfer (1997, 1998); Bond & Eraslan (2009): voting rule and information aggregation
- *Sources of inefficiency:* incomplete information, non-stationarity, misalignment of principal-agent incentives, (multiplicty of equilibria) – see also Fearon (1995), Jackson and Moretti (2011)

Model

- Baron-Ferejohn (1989) multilateral bargaining model with a random proposer
- n players, (risk-neutral, for simplicity)
- negotiating over a pie the size of which is normalized to one (implicit: side payments)
- at the beginning of each round, one player is recognized to propose, each with probability $1/n$.
- the proposer proposes a deal $(d_1, ..., d_n)$, s.t. $\sum_{i=1}^{N} d_i \leqslant 1$, to the responders who simultaneously either reject or accept.
- payoff is the exponentially discounted share of the pie and zero payoff for no deal where δ is the discount factor

Model

- $q \in \{1, ..., n\}$ is the exogenously given voting rule determining how many need to give their consent for the proposed deal to pass
- Now n players and at least q needed for a deal to arise
- **Unanimity:** $q = n$
- (Random) dictatorship: $q = 1$
- **Supermajority:** q satisfies $n/2 < q < n$
- Simple majority: $q = (n+1)/2$

No commitment benchmark

- Baron-Ferejohn (1989) multilateral bargaining model with a random proposer (simple case without amendment & symmetric players)
- symmetric stationary equilibrium: the proposer assigns shares equal to continuation values $\delta v^* = \delta/n$ to $q-1$ responders and grabs $1-(q-1)\delta/n$ for herself
- efficient outcomes and no delay (agreement in the first round)

Commitment - some notation

- At each round, now two stages: (i) *commitment stage* & (ii) *bargaining stage*
- at the commitment stage, each player i chooses *a commitment attempt* $x_i \in [0,1]$
- between (i) & (ii), an attempt can potentially fail (loophole).
- The *commitment status* (observable)*at the bargaining stage,* s_i equals
  - x_i (success) with probability ρ and
  - 0 (fail) with probability $1-\rho$. (i.i.d. across players).
- i automatically rejects if $d_i < s_i$ ($s_i = x_i$ or $s_i = 0$).
- commitments must be reattempted in each round
- the solution concept: Stationary Subgame Perfect Equilibrium (SSPE), $\psi^* = (\psi_1^*, ..., \psi_n^*)$

Equilibrium

- Let v_i^*, the equilibrium value for player i at SSPE
- $(x_1^*, ..., x_n^*)$ the profile of commitment attempts.
- i accepts if $d_i \geqslant= \hat{x}_i = max\{\delta v_i^*, s_i\}$ where s_i is the player's current commitment status, ($s_i = x_i$ or $s_i = 0$).
- Let l index responders in ascending order the commitment statuses and let player j be the proposer. Then
  - if $1 - \sum_{l=1}^{q-1} \hat{x}_l \geqslant \hat{x}_j$, the proposer proposes $\hat{x}_l$ to each responder $l < q$, 0 to the other responders, and $1 - \sum_{l=1}^{q-1} \hat{x}_l$ to herself
  - Otherwise disagreement with continuation payoff δv_i^* for each player.

Equilibrium

At the commitment stage each player i's commitment attempt satisifies the following in equilibrium

$$argmax_{x_i \in [0,1]} E\{\pi_i(x_i, x^*_{-i})|\psi^*\}$$

Analysis

1. *Unanimity:* Existence of inefficient equilibrium with aggressive commitments.
2. *Unanimity:* Existence of efficient equilibrium with compatible commitments?
3. *Supermajority:* Only efficient equilibrium exists.

Aggressive commitment, 3 players, unanimity

- Equilibrium commitment characterized by aggressive commitment x^*
- target to be the only player to succeed with the commitment (everyone does this in a symmetric eq.)
- let the 2 other players with failed commitment have their continuation value δv^*
- choose a commitment which is just compatible with those shares

$$x^* = 1 - 2\delta v^*$$

- thus the commitment targets to make each of the players with failed commitent indifferent between
  - continuing playing, δv^* ,
  - and conceding to a unique successful commitment status, $1 - \delta v^* - x^*$,

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Commitment, 3 players, unanimity

Three contingencies:

- No failed commitments (probability ρ^3),
  - No deal. The game continues with continuation values $(\delta v^*, \delta v^*, \delta v^*)$. Delay & inefficiency.
- Only one failed commitment (probability $3(1-\rho)\rho^2$),
  - No deal. The game continues with continuation values $(\delta v^*, \delta v^*, \delta v^*)$. Delay & inefficiency.
- Two loopholes (probability $3\rho(1-\rho)^2$),
  - The players with failed commitments earn the continuation value δv^*. The player with successful commitment earns $x^* = 1 - 2\delta v^*$. The game ends.
- All commitments fail (probability $(1-\rho)^3$),
  - The proposer earns $1 - 2\delta v^*$. The responders earn the continuation value δv^*. The game ends.

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Commitment, 3 players, unanimity, deviations?

- Committing to a share which leads to an immediate deal with two successful commitments? But that must yield no more than δv^* given the other players' commitments.
- Committing more aggressively? Never concessions to such a commitment since conceding player's payoff would be lower than δv^*. Thus earns δv^* which is less than what is earned by committing to x^*.
- Stay flexible? Conditional on being responder, yields payoff δv^* which is smaller than what is earned by committing. Conditional on being proposer, does not matter (to reach a deal when another player is committed requires commitment no larger than δv^*).
- Clearly, there are no profitable deviations regarding proposed deals.

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Unanimity, n players, inefficient equilibrium

Theorem

Under unanimity, there always exists an inefficient SSPE.

Unanimity, n players, inefficient equilibrium

- Since there is positive chance of disagreement in each round, the equilibrium is inefficient, $v^* < 1/n$.
- As under unanimity in Baron Ferejohn (1989), one player gets the lion's share ($\delta < 1$) and others the continuation value.
- But now
  - lion's share can eventually go to a committed responder,
  - more unequal outcome than B&F(1989), $x^* = 1 - (n-1)\delta v^* > 1 - (n-1)\delta/n$.

Unanimity, n players, efficient equilibrium

Theorem

No efficient SSPE exists iff

$$\rho < \left(\frac{n-1}{2n-1}\right)^{\frac{1}{n-1}}.$$

Unanimity, n players, efficient equilibrium

- The symmetric efficient commitment profile: $nx_0^* = 1$, also successfully committed player's price.
- Each non-committed player's price is the continuation value, $\delta v_0^* = \delta / n$.
- Obviously, no deviation to a smaller commitment can be profitable.

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Unanimity, n players, efficient equilibrium

- Deviation upward to a more aggressive commitment y by player i?
- Successful deviation y designed to allow a deal if at least k players other than i have a loophole:

$$y \leqslant 1-(n-1-k)x_0^* - k\delta v^* = x_0^* + k(x_0^* - \delta v^*)$$

- y attempts to appropriate chunks, $x_0^* - \delta v_0^* = (1-\delta)/n$ otherwise accruing to the proposer if commitments fail.

Unanimity, n players, efficient equilibrium

- If i is successful responder and there are at least k loopholes among the $n-1$ other players:
  - gain: $k(x_0^* - \delta v^*)$
  - probability $\frac{n-1}{n}\rho\eta(n-1,k)$
- However, if the commitment succeeds and there are fewer than k loopholes:
  - loss: $x_0^* - \delta v_0^*$,
  - probability $\rho[1-\eta(n-1,k)]$
- Thus, deviation pays strictly pays off iff

$$\rho[1-\eta(n-1,k)] < k\frac{n-1}{n}\rho\eta(n-1,k)$$

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Unanimity, *n* players, efficient equilibrium

- It turns out (discrete log-concavity of binomial & An, 1999) that a $k-$chunk deviation pays off only if a $1-$chunk deviation deviation pays off:

$$\rho[1-\eta(n-1,1)] < \frac{n-1}{n}\rho\eta(n-1,1)$$

- From binomial, $\eta(n-1,1) = 1-\rho^{n-1}$ we reach the following lemma

Lemma

An efficient symmetric SSPE requiring no loopholes for agreement to be reached exists iff

$$\rho \geqslant \left(\frac{n-1}{2n-1}\right)^{\frac{1}{n-1}}.$$

Unanimity, n players, efficient equilibrium

- Are there other (asymmetric) efficient equilibria?
- Suppose there is. Order players by their chunks $x_i^* - \delta v_i$ from smallest to largest.
- Consider a one-chunk deviation upwards by player one.
- Player 1 gains $(x_1^* - \delta v_1^*)$with probability $\frac{n-1}{n}\rho\eta(n-1,1)$
- Player 1 loses a chunk $x_1^* - \delta v_1^*$ with probability $\rho[1-\eta(n-1,1)]$
- Thus, $\rho < \left(\frac{n-1}{2n-1}\right)^{\frac{1}{n-1}}$ a sufficient condition for the non-existence of *any* efficient equilibrium.
- Then again, $\rho \geqslant \left(\frac{n-1}{2n-1}\right)^{\frac{1}{n-1}}$ is sufficient and necessary for the existence of a *symmetric* efficient equilibrium

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Unanimity, n players, efficient equilibrium

Theorem

No efficient SSPE exists iff

$$\rho < \left(\frac{n-1}{2n-1}\right)^{\frac{1}{n-1}}.$$

- Remark: Bound increasing in the number of negotiating parties, n.

Unanimity, n players, efficient equilibrium

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Supermajority, $q < n$

Theorem

There is no inefficient SSPE under any rule with $q < n$.

Commitment, 3 players, majority

- Proof is involved.
- Let's illustrate by showing that there are no symmetric equilibria in the three player case.

Commitment, 3 players, majority

- Assume $n = 2$ & $q = 2$ and assume, to the contrary, that there exists a symmetric inefficient equilibrium with commitment profile x^*
- Then
  - $\delta v^* < \delta/3$ as equilibrium is inefficient.
  - Thus, any uncommitted player accepts if offered any $d \geqslant \delta v^*$.
  - $x^* > 1/2$ as otherwise two players could reach an agreement when both are successful.
- Suppose that the proposer's commitment fails but the two responders' commitments both succeed.
  - At least one of them must be included with probability strictly less than one.
  - Deviating to $x^* - \varepsilon$ with ε infinitesimally small but positive means that player's chance of being included increases to one.
  - Thus, gains in that contingency and loses at most ε in any other. QED
- Thus, essentially a Bertrand argument.

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Discussion

- Legislative bargaining: scholarly support for unanimity (Buchanan & Tullock, 1962; McGinnis & Rappaport 2004, 2013; Schwartzberg, 2014)
  - the advantage of using unanimity is legitimity / national sovereignty / protection of minority / equality.
- This theoretical excercise suggests that unanimty results in inefficiencies, especially if the number of negotiating parties is large.
- According to the presented theory, even the $\underline{n} = n - 1$ supermajority rule would be enough to improve things drastically.
- Unanimity can be both more inefficient and more unequal than majority
- Contributing to understanding failures with more comprehensive WTO or failure of all-inclusive UNFCCC deal?
- Suggests that EU enlargement with institutional reform: unanimity -> very demanding qualified majority?

Discussion

- Commitment tactic as a source of inefficiency & transaction cost
  - can be overcome by competition
  - novel & simple & tractable & plausible source of inefficiency
  - alternative to incomplete information (empirical hazard rates not consistent with incomplete info: Kiefer, 1989; Kessler 1996)
- Tractable and simple even in multilateral settings
- Applications: theory of the firm; strikes, litigation, political economy, war & conflict, ...