Relational Political Contribution under Common Agency

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(The paper available from http://personal.lse.ac.uk/ISHIHAR1/research/index.html)

27 July 2009 / U. of Tokyo ISS IO Workshop

Introduction

- Monetary transfer in political process
  - Lobbyists often affect the politician through the (in)pecuniary compensation
  - e.g., Each industry is willing to control the trade tariff through campaign contribution (Grossman and Helpman (1994), Goldberg and Maggi (1999))
- Framework: Common agency model (Bernheim and Whinston (1986, hereafter BW), Grossman and Helpman (1994))
  - Multi principals (Lobbyists) and one common agent (politician)
  - Compensation contract contingent on the agent's decision
  - It can be fully committed or enforced by a third-party
- Rather we should consider self-enforced agreements

Relational Contract

- Relational contracts:
  - Implicit agreements being self-enforced due to dynamic concern
  - Formally, infinitely repeated interaction of decision making by the agent and voluntary compensation by the principal
- They have already studied in employment relations or procurements (MacLeod and Malcomson (1989), Baker et al. (2002), Levin (2003), etc)
- This paper applies them into
  - political contribution
  - allowing multiple principals
  - (no asymmetric information)

Question (1): How to Punish

- Credible punishment is necessary to lead the voluntary payment
- E.g., in employment relation,
  - each player can terminate their relation and go to her outside option if she wants
  - Under some mild assumptions, the optimal punishment on a deviator would be to go to the outside option forever
- Between the lobbyist and the politician, no such outside options
  - E.g., in case of protection for sale,
    - the industry group and politicians always cares about imports and/or exports from foreign countries
    - It is influenced by the tariff policy but not the event to access the politician
    - $\rightarrow$ reasonable to presume that the players cannot escape from the agent's decision

Issue (1): How to Punish

- The punishment is a little bit complicated, especially for principals
- Results; the punishment on a deviating principal is either
  - "One-shot sanction" (or so-called "stick and carrot"):
    - the terrible decision for the deviator is made first
    - if the deviator pays some "fine", go to a desirable decision
  - "Exclusion":
    - the terrible decision for the deviator is chosen forever
- both could be optimal, depending on the agent's decision space and the payoff function.

Issue (2): Equilibrium Payoff Set

- Is the static outcome (in BW) valid in the relational situation?
- To answer it,
  - characterize the set of the stationary equilibrium payoff
  - compare it with the static common agency (*a la* BW)
- Results
  - The static equilibrium is more likely to be supported if the players are patient
    - If they are not patient, the amount paid by principals is less than the static model
  - It could be the case that the static equilibrium payoff can never supported no matter how patient the players are

Outline

1. Setting
2. Characterize the punishment
3. Characterize Stationary Eq. and compare it with the corresponding static equilibrium
4. Conclusion
5. (Related Literature)

Players, Action, and Timing

- $N+1$ players, indexed by $0, 1, \dots, N$
  - $j \in \mathcal{N} := \{1, \dots, N\}$: Principals
  - 0: one agent
- All of them live for infinite periods $t = 0, 1, \dots$ with common discount factor $\delta \in [0, 1)$
- Each period has 2 stages;
  - Stage 1: The agent chooses $a_t \in \mathcal{A}$ (the decision set)
  - Stage 2: Each of the principals pays $b_t^j \geq 0$ to the agent
- Both a_t and b_t^j are observable but not contractible

Payoff

- Player $i \in \mathcal{N} \cup \{0\}$'s one-shot benefit $v^i(a_t) \in \mathbb{R}$ if the agent chooses $a_t \in \mathcal{A}$
- $\rightarrow$ the one-shot payoffs are
  - Principal j: $v^j(a_t) - b_t^j$
  - Agent: $v^0(a_t) + B_t$ where $B_t := \sum_{k=1}^{N} b_t^k$
- Each maximizes his/her average payoff of the discounted sum;
  - Principal j: $(1-\delta)\sum_{\tau=0}^{\infty} \delta^\tau [v^j(a_\tau) - b_\tau^j]$
  - Agent: $(1-\delta)\sum_{\tau=0}^{\infty} \delta^\tau [v^0(a_\tau) + B_\tau]$

Assumptions

- Assume that
  - $\mathcal{A} \subset \mathbb{R}^M$ is compact
  - $v^i(\cdot)$ is continuous for all i
- The maximum and minimum are well-defined;

$$\overline{A}^i := \arg\max_{a \in \mathcal{A}} v^i(a), \qquad \underline{A}^i := \arg\min_{a \in \mathcal{A}} v^i(a),$$
$$\overline{v}^i := \max_{a \in \mathcal{A}} v^i(a), \qquad \underline{v}^i := \min_{a \in \mathcal{A}} v^i(a)$$

- A representative element is written as $\underline{a}^i \in \underline{A}^i$ and $\overline{a}^i \in \overline{A}^i$
- Let $s(a) := \sum_{i=0}^N v^i(a)$ and $A^* := \arg\max_{a \in \mathcal{A}} s(a)$

Example 1

- $N = 2$
- $\mathcal{A} = \{l, c, r\}$
- $v^j(\cdot)$ is given as follows ($G, C, D > 0$)

Decision	l	c	r
$v^1(a)$	$-D$	0	G
$v^2(a)$	G	0	$-D$
$v^0(a)$	$-C$	0	$-C$

- E.g. $\underline{A}^1 = \{l\}$ and $\underline{v}^1 = -D$. $\overline{A}^0 = \{c\}$ and $\overline{v}^0 = 0$

Strategy and Equilibrium

- Define the history as following;
  - History: $h_t := (a_0, \mathbf{b}_0, a_1, \mathbf{b}_1, \ldots, a_{t-1}, \mathbf{b}_{t-1})$ where $\mathbf{b}_\tau = (b_\tau^1, b_\tau^2, \ldots, b_\tau^N)$
- (Pure) strategy
  - Agent: $\sigma^0(h_t) \in \mathcal{A}$
  - Principal j: $\sigma^j(h_t, a_t) \in \mathbb{R}_+$
- Let $u^i(\sigma)$ be the average payoff when the strategy profile is σ
- Subgame perfect equilibrium (SPE); each strategy on SPE is best response to the opponents' strategy given any history

Strategy and Equilibrium

- Suppose that $\hat{\sigma}$ generates $(\hat{a}_0, \hat{\mathbf{b}}_0, \hat{\sigma}_1)$ on the path where $\hat{\sigma}_1$ is the continuation strategy
- Let $\sigma(i)$ be a SPE which yields the lowest equilibrium payoff for player i : "optimal penal code" (OPC)
- Abreu (1988) shows that $\hat{\sigma}$ is SPE iff
  - $\hat{a}_0$ is incentive compatible (see next slide)
  - $\hat{b}_0^j$ is incentive compatible for all $j \in \mathcal{N}$ (see next slide)
  - $\hat{\sigma}_1$ is SPE

Incentive Compatibility

- $\hat{a}_0$ is IC iff

$$u^0(\hat{\sigma}) \equiv (1-\delta)\left[v^0(\hat{a}_0)+\hat{B}_0\right]+\delta u^0(\hat{\sigma}_1) \geq (1-\delta)\overline{v}^0+\delta u^0(\sigma(0))$$

- RHS: the payoff when
  - the agent deviates $\hat{a}_0$ to $\overline{a}^0 \in \overline{A}^0$ (maximum gain by deviation)
  - the players punish him by the lowest SPE payoff (pay nothing and play $\sigma(0)$)
- b_0^j is IC iff

$$u^j(\hat{\sigma}) \equiv (1-\delta)\left[v^j(\hat{a}_0)-b_0^j\right]+\delta u^j(\hat{\sigma}_1) \geq (1-\delta)v^j(\hat{a}_0)+\delta u^j(\sigma(j))$$

What Will Be Done

1. Derive $u^i(\sigma(i))$
2. Characterize stationary equilibrium payoff
3. Compare it with the static common agency equilibrium

OPC on Agent

- What is $u^0(\sigma(0))$?
- SPE when the game is one-shot
  - the principals pay nothing
  - the agent chooses $\overline{a}^0 \in \overline{A}^0$
  - $\rightarrow$ the agent payoff: $v^0(\overline{a}^0) = \overline{v}^0$
- Repeating the one-shot SPE is also SPE in the repeated game
- This is the minimax value for the agent
- In general, no SPE leads less than the minimax value of the stage game.
- Then $u^0(\sigma(0)) = \overline{v}^0$

OPC on Principal j

- Principal j
  - The minimax value of the one-shot game:
    - the agent chooses $\underline{a}^j$
    - (all the principals pay nothing.)
    - $\rightarrow$ the minimax value: $\underline{v}^j$
  - In general, this is not SPE payoff in the one-shot game
  - $\rightarrow$ not clear as $u^0(\sigma(0))$
- Go to the minimization problem

Minimization Problem

- $\sigma(j)$ minimizes j's payoff subject to that $\sigma(j)$ is SPE
- Let $(a_0(j), b_0(j), \sigma_1(j))$ be the realization on the eq. path
- It has to satisfy;

$$\min_{(a_0(j),\{b_0^i(j)\}_{i=1}^N,\sigma_1(j))} \quad u^j(\sigma(j)) \equiv (1-\delta)[v^j(a_0(j)) - b_0^j(j)] + \delta u^j(\sigma_1(j)) \quad (1)$$

$$\text{subject to} \quad (1-\delta)[v^0(a_0(j)) + B_0(j)] + \delta u^0(\sigma_1(j)) \geq \overline{v}^0 \quad (2)$$

$$0 \leq b_0^i(j) \leq \frac{\delta}{1-\delta}[u^i(\sigma_1(j)) - u^i(\sigma(i))] \quad \text{for } i \in \mathcal{N}$$

$$\sigma_1(j) \in \Sigma^*.$$

where Σ^* is the set of SPE

Minimization Problem

- WLOG $b_0^j(j) = (\delta/(1-\delta))[u^j(\sigma_1(j)) - u^j(\sigma(j))]$ for all $i \in \mathcal{N}$
- Substituting it into (1) yields;

Lemma (3)

$$u^j(\sigma(j)) = v^j(a_0(j)) \qquad \textit{for all } j \in \mathcal{N}.$$

- Lemma 3 tells us that the punishment payoff is completely characterized by $a_0(j) \in \mathcal{A}$

Minimization Problem

- The problem can be reduced to

$$\min_{(a_0(j),\sigma_1(j))} v^j(a_0(j)) \qquad \text{subject to } \sigma_1(j) \in \Sigma^*$$

and

$$(1-\delta)v^0(a_0(j)) + \delta\left[\sum_{i=1}^{N}\left(u^i(\sigma_1(j)) - u^i(\sigma(i))\right)\right] + \delta u^0(\sigma_1(j)) \geq \overline{v}^0$$

$$\iff \frac{\delta}{1-\delta}\left[\sum_{i=0}^{N} u^i(\sigma_1(j)) - \left(\overline{v}^0 + \sum_{i=1}^{N} u^i(\sigma(i))\right)\right] \geq \overline{v}^0 - v^0(a_0(j))$$

- $\sigma_1(j)$ should maximize the total surplus subject to that it is SPE

Minimization Problem

- Such $\sigma_1(j)$ can be found in the class of the "stationary" strategy SPE;
  - the agent chooses the same decision repeatedly and
  - each principal pays the same amount every period
- It means that
  - $a_t(j) = a_1(j)$ for all $t \geq 1$
  - $b_t^j(j) = b_1^j(j)$ for all $t \geq 1$

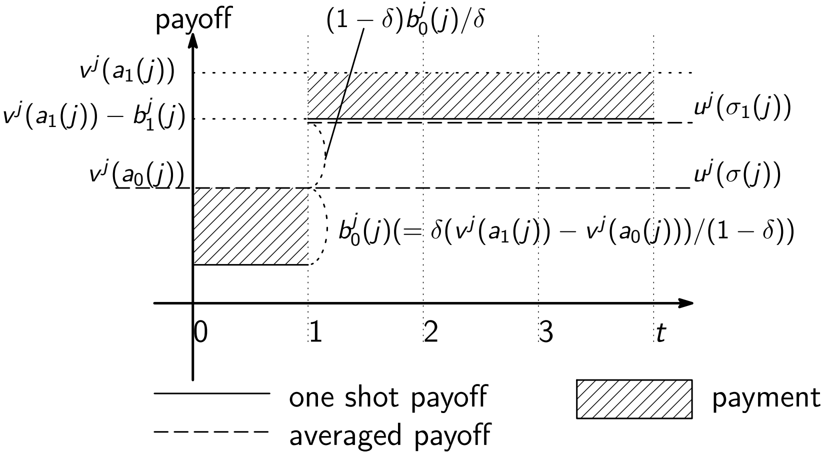
How to Punish

- Notice that (provided $\delta > 0$)

$$v^j(a_0(j))(= u^j(\sigma(j))) = (1-\delta)(v^j(a_0(j)) - b_0^j(j)) + \delta(v^j(\hat{a}) - b_1^j(j))$$
$$\iff v^j(a_0(j)) = v^j(a_1(j)) - \frac{(1-\delta)}{\delta} w_0^j(j) - b_1^j(j)$$

- $\rightarrow v^j(a_0(j)) \leq v^j(a_1(j))$ (since $b_0^j(j), b_1^j(j) \geq 0$)
- If $v^j(a_0(j)) < v^j(a_1(j))$, the following "one-shot sanction" happens

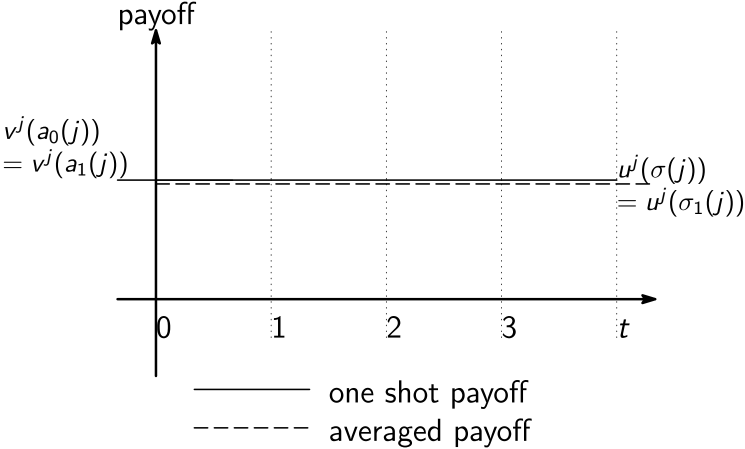
Punishment by One-shot Sanction



- Similar to the so-called "stick and carrot" strategy by Abreu (1986)

Punishment by Exclusion

- If $v^j(a_0(j)) = v^j(a_1(j))$, $\rightarrow$ repeat the same things



When Sanction / Exclusion

- Interestingly,
  - in some cases a Sanction-type is strictly optimal and
  - in other cases an Exclusion-type is strictly optimal
- How to determine it?
- $\rightarrow$ Roughly speaking,
  - if there is a decision which is bad for the deviator but good for the other players, to choose such decision repeatedly is still stable $\rightarrow$ Exclusion
  - if not, choose the terrible decision for the deviator and after that reward every one by another decision $\rightarrow$ Sanction

Example

Decision	l	c	r
$v^1(a)$	$-D$	0	G
$v^2(a)$	G	0	$-D$
$v^0(a)$	$-C$	0	$-C$

- Assume that $C > 0$ and $G - C - D \leq 0$
- When P2 would be punished,
  - to choose r is required, but
  - r is also costly for the agent
- if $\delta \geq C/(2D + C)$, the punishment on P2 would be; $r \rightarrow$ (P2 pays something) $\rightarrow c \rightarrow c \cdots$: Sanction
- higher δ is required to implement $r \rightarrow r \rightarrow r \cdots$ (specifically $\delta \geq C/(G - D)$ provided $G > D$)

Example Modified

Decision	l	c	r
$v^1(a)$	$-D$	0	G
$v^2(a)$	G	0	$-D$
$v^0(a)$	0	$-C$	0

- r is costly for P2, beneficial for the others
- Exclusion ($r \to r \to r \cdots$) can be always the punishment on P2
- even assumed that c is socially efficient, (i.e. $G - D < -C$), positive $\delta \geq C/2D$ is required to implement the sanction type punishment ($r \to c \to c \cdots$)

Remarks

- For the later analysis, keep in mind that
  1. The punishment could be more severe when $\delta \uparrow$
     - Constraint (2) is relaxed when $\delta \uparrow$
  2. $u^j(\sigma(j)) = v^j(a_0(j)) \geq \underline{v}^j$ for any $\delta \in [0,1)$
- In what follows, denote it by $a_0(j;\delta)$

Stationary SPE

- Now consider SPE $\hat{\sigma}$ where the agent chooses $\hat{a} \in \mathcal{A}$ repeatedly on the equilibrium path
- WLOG, the payment can also be stationary
- The payment is stationary if

$$\hat{\sigma}^j(\hat{h}_t, \hat{a}_t) = \hat{\beta}^j(\hat{a}_t)$$

  for $j \in \mathcal{N}$ and the on-path history $(\hat{h}_t, \hat{a}_t)$.
- If the payment is stationary, the payment schedule only depends on the current action

Stationary Payment

- (Proposition 1): Suppose that $\hat{\sigma}$ is a decision stationary SPE of $\hat{a} \rightarrow {}^{\exists}$ strategy profile which satisfies the following;
  - payment stationarity and action stationarity of $\hat{a}$
  - same payoff vector as $\hat{\sigma}$
  - SPE
- $\rightarrow$ We will focus on the strategy with stationary payment
- It can reduce the equilibrium conditions to be checked because
  - $\hat{\sigma}_1 = \hat{\sigma}$
  - $\rightarrow$ enough to check IC at period 0
- Let $\hat{\beta}^j(a)$ be the stationary payment and $\hat{\mathrm{B}}(a) := \sum_{j=1}^{N} \hat{\beta}^j(a)$

Incentive Compatibility

- Incentive compatibility of the agent at period 0:

$$(1-\delta)\left[v^0(\hat{a})+\hat{\mathrm{B}}(\hat{a})\right]+\delta u^0(\hat{\sigma}) \geq (1-\delta)\overline{v}^0+\delta\overline{v}^0,$$

$$\iff \quad \hat{\mathrm{B}}(\hat{a}) \geq \frac{1}{1-\delta}\overline{v}^0 - v^0(\hat{a}) - \frac{\delta}{1-\delta}u^0(\hat{\sigma}) \qquad (3)$$

- Incentive compatibility of principal j at period 0 (given $\hat{a} \in \mathcal{A}$):

$$(1-\delta)[v^j(\hat{a})-\hat{\beta}^j(\hat{a})]+\delta u^j(\hat{\sigma}) \geq (1-\delta)v^j(\hat{a})+\delta v^j(a_0(j;\delta))$$

$$\iff \hat{\beta}^j(\hat{a}) \leq \frac{\delta}{1-\delta}\left[u^j(\hat{\sigma})-v^j(a_0(j;\delta))\right] \qquad (4)$$

Equilibrium Conditions

- Notice that
  - $v^0(\hat{a}) + \hat{B}(\hat{a}) = u^0(\hat{\sigma})$
  - $v^j(\hat{a}) - \hat{\beta}^j(\hat{a}) = u^j(\hat{\sigma})$
- $\rightarrow$ By eliminating $\hat{B}$ and $\hat{\beta}^j$, equation (3) and (4) would be

$$\begin{aligned}(3) &\iff u^0(\hat{\sigma}) \geq \overline{v}^0 \\ (4) &\iff u^j(\hat{\sigma}) \geq (1-\delta)v^j(\hat{a}) + \delta v^j(a_0(j;\delta))\end{aligned}$$

- Finally, notice that
  - $u^j(\hat{\sigma}) \leq v^j(\hat{a})$ for $j \in \mathcal{N}$ and $u^0(\hat{\sigma}) \geq v^0(\hat{a})$ since $\hat{\beta}^j \geq 0$
  - $\sum_{j=0}^{N} u^j(\hat{\sigma}) = s(\hat{a})$ if $\hat{\sigma} \in \hat{\Sigma}^*(\hat{a})$
- The stationary net SPE payoff set when the agent chooses $\hat{a}$ is;

Stationary Equilibrium Payoff

Proposition (7)

$$\hat{U}(\hat{a};\delta) := \left\{ \begin{pmatrix} u^0 \\ u^1 \\ \vdots \\ u^N \end{pmatrix}' \;\middle|\; \begin{array}{l} \sum_{j=0}^{N} u^j = s(\hat{a}), \\ u^0 \geq \overline{v}^0, \\ v^j(\hat{a}) \geq u^j \geq (1-\delta)v^j(\hat{a}) + \delta v^j(a_0(j;\delta)), \forall j \in \mathcal{N} \end{array} \right\}$$

Stationary Equilibrium Payoff

- For $u \in \hat{U}(\hat{a};\delta)$, there exists a vector $(\hat{b}^1, \ldots, \hat{b}^N) \in \mathbb{R}^N_+$ such that on a stationary equilibrium of $\hat{a}$,
  - the agent chooses $\hat{a}$
  - principal j pays $\hat{b}^j$ to the agent
  - the net payoff vector is $u = (v^0(\hat{a}) + \hat{B}, v^1(\hat{a}) - \hat{b}^1, \ldots, v^N(\hat{a}) - \hat{b}^N)$ where $\hat{B} = \sum_{k=1}^N \hat{b}^k$
- We will compare it with the one-shot common agency game by BW to investigate the validity of menu auction for political contribution

Comparison to the Static Model

- Let us call our equilibrium "Relational Political Contribution (RPC)" equilibrium
- Basic question: When can equilibria in the static common agency be replicated by RPC-equilibria?
- Consider one-shot game where action a is verifiable (as BW)
  - Stage 1: The principals offers the compensation plan contingent on a $w^j : \mathcal{A} \to \mathbb{R}_+$ for $j \in \mathcal{N}$
  - Stage 2: the agent chooses $a \in \mathcal{A}$
  - (Stage 3: The compensation is enforced.)

SMA Equilibrium

- Outcome: $(a, \{w^1(a)\}_{a\in\mathcal{A}}, \dots, \{w^N(a)\}_{a\in\mathcal{A}})$
  - We call it the "Static Menu Auction (SMA)" equilibrium
- (Lemma 2 in BW) $(\hat{a}, \hat{w}^1(\cdot), \dots, \hat{w}^N(\cdot))$ is a SMA-Eq. $\iff$
  1. $\hat{w}^j(a) \geq 0$ for all $a \in \mathcal{A}$ and $j = 1, \dots, N$
  2. $\hat{a} \in \arg\max_{a\in\mathcal{A}}[v^0(a) + \hat{W}(a)]$
  3. $\hat{a} \in \arg\max_{a\in\mathcal{A}}([v^j(\hat{a}) - \hat{w}^j(\hat{a})] + [v^0(\hat{a}) + \hat{W}(\hat{a})])$ for $j = 1, \dots, N$
  4. For $j = 1, \dots, N$, there exists $a_j \in \arg\max_a[v^0(a) + \hat{W}(a)]$ such that $\hat{w}^j(a_j) = 0$

  where $\hat{W}(\cdot) := \sum_{j=1}^N \hat{w}^j(\cdot)$

When Is the Static Eq. Supported?

- Let a SMA-equilibrium payoff vector $\hat{y} := (v^0(\hat{a}) + \hat{W}(\hat{a}), v^1(\hat{a}) - \hat{w}^1(\hat{a}), \ldots, v^N(\hat{a}) - \hat{w}^N(\hat{a}))$
- Question 1; When $\hat{y} \in \hat{U}(\hat{a}; \delta)$?

Proposition (8)

$\hat{y} \notin \hat{U}(\hat{a}; \delta) \iff$ *for some* $j \in \mathcal{N}$,

$$\hat{w}^j(\hat{a}) > \delta[v^j(\hat{a}) - v^j(a_0(j; \delta))].$$

When Is the Static Eq. Supported?

- Proof (Sketch);
  - In RPC, IC for principal j is

$$(1-\delta)(v^i(\hat{a}) - \hat{b}^j) + \delta(v^i(\hat{a}) - \hat{b}^j) \geq (1-\delta)v^i(\hat{a}) + \delta v^j(a_0(j;\delta))$$
$$\iff \hat{b}^j \leq \delta \left[v^j(\hat{a}) - v^j(a_0(j;\delta)) \right]$$

  - RHS; upper bound of payment to be credible
  - If the payment in SMA-eq. exceeds this upper bound, it cannot credibly paid in the relational case.
- Recall that $v^j(a_0(j;\delta)) \downarrow$ as $\delta \uparrow$
- $\rightarrow$ If δ is higher, the static eq is more likely to be supported by relational eq

If Patient

- Question 2: Is it always on a RPC-equilibrium as long as δ is high enough? $\rightarrow$ No

Proposition (9)

For any $\delta \in [0,1)$, $\hat{y} \notin \hat{U}(\hat{a};\delta) \iff {}^{\exists}j \in \mathcal{N}$ *s.t.*

1. $\hat{w}^j(\hat{a}) = v^j(\hat{a}) - \underline{v}^j$ *and*
2. $\underline{v}^j < v^j(\hat{a})$

- Proof (sketch): Again, the upper bound of the credible payment $\delta\left[v^j(\hat{a}) - v^j(a_0(j;\delta))\right]$ is (strictly) less than $v^j(\hat{a}) - \underline{v}^j$ for any $\delta \in [0,1)$

Could It BE the Case?

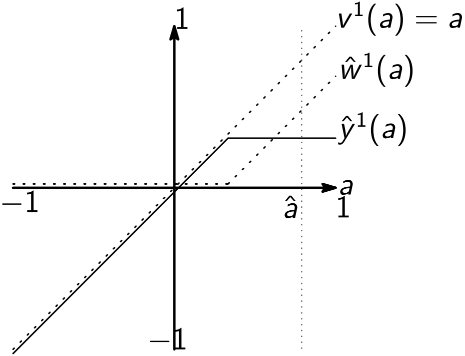
- Question 3: When are the conditions in Proposition 9 established ?
- Now focus on the SMA truthful (SMAT) equilibria where

$$\hat{w}^j(a) = \max\{v^j(a) - \hat{y}^j, 0\}$$

for all $j \in \mathcal{N}$

Example of Truthful Payment

- Suppose that $v^1(a) = a$ for $a \in [-1, 1]$
- If $\hat{w}^1(\cdot)$ consists a truthful equilibria, it is parallel to $v^1(a)$ whenever $\hat{w}^1(a) > 0$



SMAT and RPC Equilibrium

- Property of SMAT equilibrium (BW Theorem 2);
    - SMAT is efficient
    - Equilibrium payoff is no more than marginal contribution;

$$v^j(\hat{a}) - \hat{w}^j(\hat{a}) \leq \max_{a \in \mathcal{A}} s(a) - \max_{a \in \mathcal{A}} [s(a) - v^j(a)]$$

- If $\underline{A}^j \cap A^* \notin \emptyset$,
    - RHS is $\underline{v}^j \rightarrow v^j(\hat{a}) - \hat{w}^j(\hat{a}) \leq \underline{v}^j$
    - (Note that $v^j(\hat{a}) - \hat{w}^j(\hat{a}) \geq \underline{v}^j$ ($\underline{v}^j$ is j's minimax value))
- $\rightarrow$ Condition 1 in Proposition 9 holds

SMAT and RPC Equilibrium

- Suppose that $^{\exists}$ two principals j and k s.t. $\underline{A}^j \cap A^* \notin \emptyset$ and $\underline{A}^k \cap A^* \notin \emptyset$
- Furthermore if $\underline{A}^j \cap \underline{A}^k = \emptyset$,
  - $\rightarrow A^* \cap \underline{A}^j \cap \underline{A}^k = \emptyset$
  - $\rightarrow$ for any $a^* \in A^*$, either $a^* \notin \underline{A}^j$ or $a^* \notin \underline{A}^k$ (or both).
  - Since $\hat{a} \in A^*$, either $v^j(\hat{a}) > \underline{v}^j$ or $v^k(\hat{a}) > \underline{v}^k$
  - Condition 2 also holds

Proposition (10)

$\hat{y} \notin \hat{U}(\hat{a};\delta)$ for any $\delta \in [0,1)$ if $^{\exists} j,k \in \mathcal{N}$ such that

$$\underline{A}^j \cap A^* \notin \emptyset, \underline{A}^k \cap A^* \notin \emptyset, \text{ and } \underline{A}^j \cap \underline{A}^k = \emptyset.$$

Example

Decision	l	c	r
$v^1(a)$	$-D$	0	G
$v^2(a)$	G	0	$-D$
$v^0(a)$	$-C$	0	$-C$

- Assume that $G - C - D = 0$.
- In this case $A^* = \{l, c, r\}$, $\underline{A}^1 = \{l\}$ and $\underline{A}^2 = \{r\}$
- $\rightarrow$ the conditions in Proposition 10 hold.

Equilibria in Ex.1

- (Unique) SMAT equilibrium:
  - $(\hat{w}^1(l), \hat{w}^1(c), \hat{w}^1(r)) = (0, D, G + D)$ (symmetrical to P2)
  - A chooses 0 and is paid D from Ps
  - Net payoff: $(\hat{y}^0, \hat{y}^1, \hat{y}^2) = (2D, -D, -D)$
- Notice that $\hat{w}^1(c) = v^1(c) - \underline{v}^1(= D)$ and $v^1(c) > -D$
- What happens in RPC eq.?
  - From IC conditions for the principal the upper bound of the credible payment is

$$\delta \left[v^j(c) - v^j(a_0(j; \delta)) \right]$$

    which is less than $-\delta \underline{v}^j = \delta D$
  - Ps cannot credibly pay D

Intuition

- A decision $\underline{a}^1 \in \underline{A}^1 \cap A^*$ is
  - the worst for Principal 1 but
  - the best for P2 and the agent
- In SMA,
  - since binding contract is possible, P2 and the agent would be willing to agree the contract to choose $\underline{a}^1$
  - $\rightarrow$ the agent can use $\underline{a}^1$ as a credible threat to exploit P1
- If, further, $\underline{A}^2 \cap A^* \notin \emptyset$, then the agent can exploit both of the principals

Intuition

- But, if $\underline{A}^1 \cap \underline{A}^2 = \emptyset$,
  - $\nexists$ decision beneficial only for the agent
  - $\rightarrow$ either of the principals must be exploited *via* much (positive) payment which leads her net payoff equal to her minimax value
- In RPC,
  - the punishment is always delayed
  - if such a large amount of the transfer is required, principal is willing to renege

Conclusion

- Analyze infinitely repeated common agency without verifiability in political process
- Main Result
  - Characterization of the punishment;
    - either "Exclusion" or "One-shot Sanction" would be the punishment strategy
    - "Micro foundation" of the binding-contract model
  - Compare the payoff of relational stationary equilibrium with that of the static equilibrium
    - dependence on the discount factor
    - not always replicated even patient enough
- Future research
  - Introducing election process

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