USC FBE/CLEO APPLIED ECONOMICS WORKSHOP
presented by Bob Gibbons
FRIDAY, March 26, 2004
1:30 pm - 3:00 pm, **Room: HOH-601K**

Contracting for Control

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December 2003

- Post-GHM theory of the firm
  - Ownership for control (not bargaining or specific investments)
- Application to contract economics
  - Moving control rights across firm boundaries
- Testable implications?!
  - Benefit of adaptation → allocation of control
- Rich, tractable theoretical framework
  - Alliances, JVs, and other hybrid governance structures

Analyses of Contract Terms (in Incomplete Contracts)

- Crocker, Goldberg, Klein, Masten, …

- Lerner-Merges *JIE* 98
- Klein *REI* 00
- Arrunada-Garicano-Vázquez *JLEO* 01
- Kaplan-Stromberg *RES* 03
- Elfenbein-Lerner *RAND* 03
- Lerner-Shane-Tsai *JFE* 03

Klein *REI* 00

- "Extend the simple model of self-enforcement to take account of the role of contract terms in facilitating self-enforcement."
- "Court-enforcement and self-enforcement are complements in supply: the two mechanisms work better together than either of them does separately."

Technical Appendix

Decision Rights, Payoff Rights, and Relationships in Firms, Contracts, and Other Governance Structures

G. Baker, R. Gibbons, & K. J. Murphy
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I. Spot Control

A. Elemental Model

B. Alienable & Inalienable Decision Rights

C. Assets (and Payoff Rights)

D. Simple Governance Structures

E. General Model

F. Applications

IA. Elemental Model

- Simon '51:
  - d_0 vs. $d_B(s) \rightarrow$ d contractible $\rightarrow$ renegotiation
- Updated approach:
  - *Decision right* contractible ex ante
  - *Decision* not contractible ex post
    - $\neq$ GHM
    - motivated by practitioners (BGM 03b "Alliances")
    - other static models: BT 01, ADR 03, HH 03

- 2 parties $\quad i \in \{A, B\}$
- state $\quad s \in S$
- alienable dec. right $\quad d \in D$
- inalienable payoffs $\quad \pi_A(d, s), \pi_B(d, s)$

- $d^{FB}(s)$ solves $\quad \max_{d \in D} \pi_A(d, s) + \pi_B(d, s)$
- $V^{FB}(s) \equiv \pi_A(d^{FB}(s), s) + \pi_B(d^{FB}(s), s)$

- Control by $i \in \{A, B\}$:
  - $d_i^*(s)$ solves $\max_{d \in D} \pi_i(d, s)$
  - $V_i(s) \equiv \pi_A(d_i^*(s), s) + \pi_B(d_i^*(s), s) \leq V^{FB}(s)$
- Efficient contract design:
  - $E[V_A(s)]$ vs $E[V_B(s)]$

IB. Alienable & Inalienable Decision Rights

- alienable DRs $\mathbf{d} = (d_1, \ldots, d_J) \in \mathbf{D}$
- inalienable DRs $\delta_i \in \Delta_i$, $\boldsymbol{\delta} = (\delta_A, \delta_B)$
- inalienable payoffs $\pi_i(\mathbf{d}, \boldsymbol{\delta}, s)$
- Nash equilibrium $\mathbf{d}^{NE}(s)$, $\boldsymbol{\delta}^{NE}(s)$

IC. Assets (& Payoff Rights)

- *Asset* (D, π) (where π not contractible)
  - $d_i^*(s)$ solves $\max_{d\in D} \pi_i(d, s) + \pi(d, s)$
  - $V_i(s) \equiv \pi_A(d_i^*(s), s) + \pi_B(d_i^*(s), s) + \pi(d_i^*(s), s)$
- D *separable* from π?
  - pure PR vs. hidden DR?

ID. Simple Governance Structures

- 2 alienable decision rights D_1, D_2
- 2 alienable payoff rights π_1, π_2
- 4 governance structures:
  - A: D_1, π_1 B: D_2, π_2 non-integration?
  - A: D_1, π_1, D_2, π_2 B: --- integration?
  - A: D_1, π_1, D_2 B: π_2 licensing?
  - A: D_1, π_1, π_2 B: D_2 equity?
- *cf.* GHM: $U_i(a_1, a_2, s, d_1, d_2)$

IE. General Model

• I parties	$i \in I$	Δ_i, π_i
• state	$s \in S$	$\sim f(s)$
• J assets	$j \in J$	D_j, π_j
• K decision rights	$k \in K$	D_k
• M payoff rights	$m \in M$	π_m

- *Governance structure* $g \equiv$ allocation of assets, DRs, and PRs to parties $\rightarrow \mathbf{D}_{ig}$, π_{ig}

IF. Applications

- Ownership
- Contracts
- "Hybrids"

II. Relational Control

A. Relational Contracts

B. Timing

C. Equilibrium

D. Constraint Reduction

IIA. Relational Contracts

- Evidence: within & between firms
  - Macaulay ‘63, Macneil ‘78, Dore ‘83, Powell ‘90, …
  - Barnard ‘38, Simon ‘47, Selznick ‘49, Gouldner ‘54 …
- Theory, I: relational incentive contracts
  - Klein-Leffler ‘81, Telser ‘81, Bull ‘87
  - MacLeod-Malcomson ‘89, Levin ‘03
- Theory, II: formal and informal co-exist *and interact*
  - BGM ‘94, ‘99, ‘01, ‘02
  - Garvey ‘95, Halonen ‘02, Bragelien ‘03, Rayo ‘03

IIB. Timing

1. Ex ante payment: t_{ig}
2. State: s
3. Post-state payment: $\tau_{ig}(s)$
4. Decision: $\mathbf{d}_{ig} \rightarrow \mathbf{d}^{RC}(\cdot) \rightarrow V^{RC}$
5. Post-decision payment: $T_{ig}(d, s)$

IIC. Equilibrium

- Trigger strategies
  - side-payment $p_{ig} \rightarrow$ efficient spot governance after reneging
- *Many* reneging constraints:
  - example: will i pay t_{ig}?

$$[1+(1/r)]\,[t_{ig} + E_s\{\pi_{ig}(\mathbf{d}^{RC}(s), s) + \tau_{ig}(s) + T_{ig}(\mathbf{d}^{RC}(s), s)\}]$$

$$\geq 0 + E_s\{\pi_{ig}(\mathbf{d}^{NE}{}_g(s), s) + p_{ig}/(1+r) + (1/r)V_i^{SP}\}$$

IID. Constraint Reduction

(building on MM 89 & Levin 03)

$d^{DEV}_{ig}(s) = (d^{BR}_{ig}(s), d^{RC}_{-ig}(s))$

$R_{ig}(s) \equiv \pi_{ig}(d^{DEV}_{ig}(s), s) - \pi_{ig}(d^{RC}(s), s)$

PROPOSITION: $\mathbf{d}^{RC}(\cdot)$ feasible under g iff

$$\max_{s \in S} \sum_{i \in I} R_{ig}(s) < (1/r)[V^{RC} - V^{SP}]$$

PAPER: Contracting for Control

I. Environment

II. Spot Control

III. First-best Relational Control

IV. Second-best Relational Control

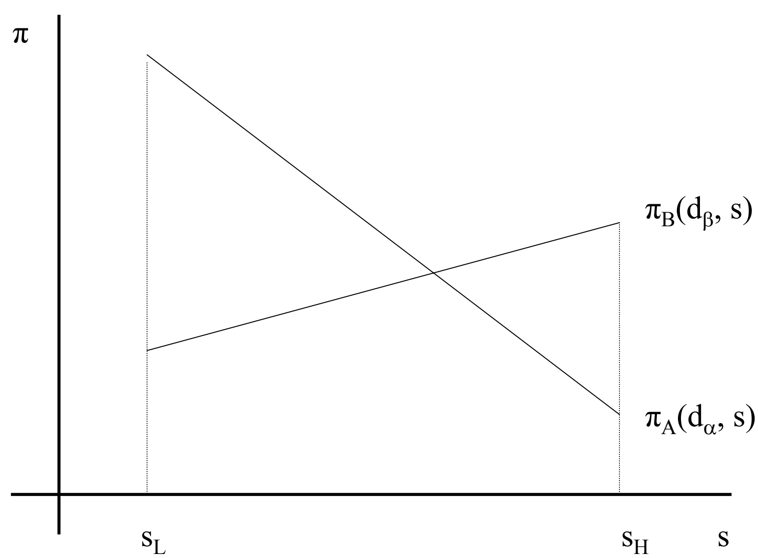
V. Efficient Contract Design

I. Environment

- 2 parties $i \in \{A, B\}$
- state $s \sim U[s_L, s_H]$
- alienable DR $d \in \{d_\alpha, d_\beta\}$
- inalienable payoffs

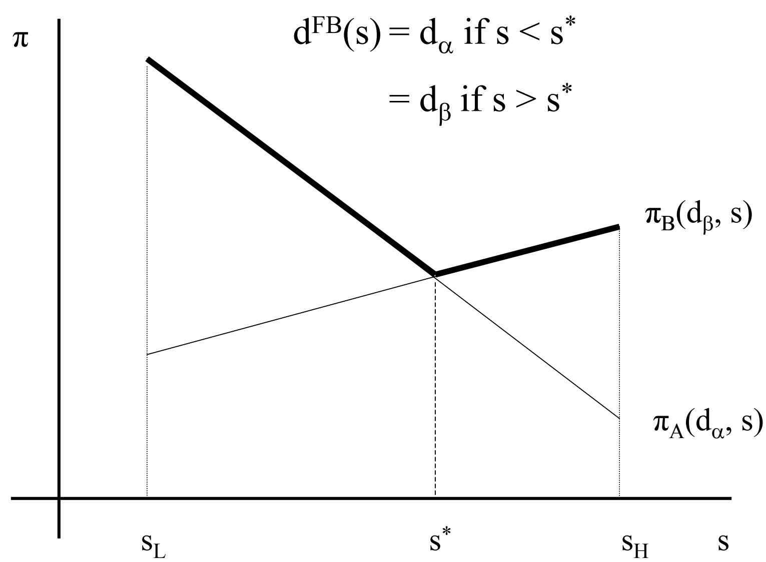
$$\pi_i(d_\iota, s) = \sigma_i s + \rho_i \qquad i \in \{A, B\}$$

$$\pi_i(d_{-\iota}, s) = 0 \qquad \iota \in \{\alpha, \beta\}$$

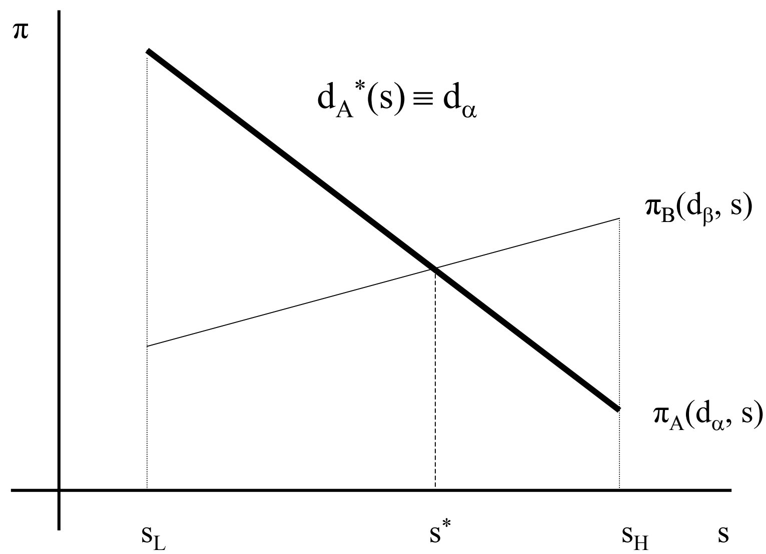


EXAMPLE

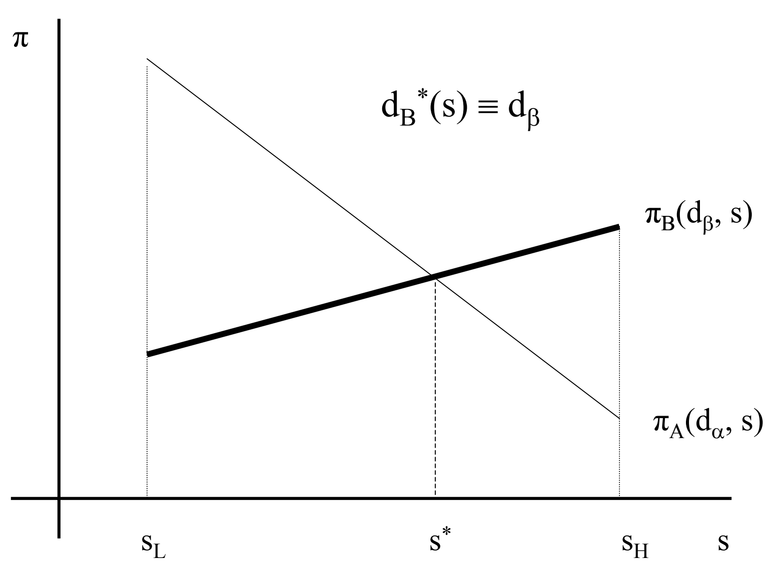
- generalizations:
  - $s \sim f(s)$
  - π_i monotone
  - $\prod_i = \pi_i(d, s) + k_i(s)$
- example parameters:
  - $\sigma_A < 0, \sigma_B > 0$
  - SP $\neq$ FB



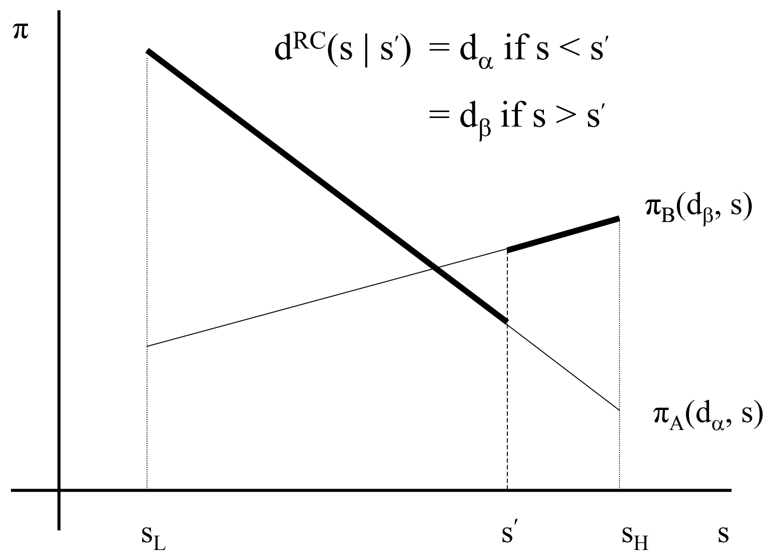
FIRST-BEST



SPOT CONTROL BY A



SPOT CONTROL BY B



RELATIONAL CONTROL?

II. Spot Control

- i has control:

  $d_i^*(s) = d_\iota$ for all s

  $V_i = \sigma_i E(s) + \rho_i$

- efficient (spot) contract design:

  $V^{SP} \equiv \max\{V_A, V_B\}$

  ρ_i = benefit of unconditional control

III. FB Relational Control

- i has control:

$$R_i(s) = \pi_i(d_\iota, s) - \pi_i(d^{FB}(s), s)$$

$$\max_s R_i(s) = \pi_i(d_\iota, s^*) \equiv R^{FB}$$

- COROLLARY: FB feasible iff

$$R^{FB} < (1/r)[V^{FB} - V^{SP}]$$

IV. SB Relational Control

- A has control:

$$d^{RC}(s \mid s') = d_\alpha \text{ if } s < s'$$
$$= d_\beta \text{ if } s > s'$$

$$\rightarrow \quad V(s'), \quad R_A(s') = \pi_A(d_\alpha, s')$$

- COROLLARY: $d^{RC}(\cdot \mid s')$ feasible by A iff

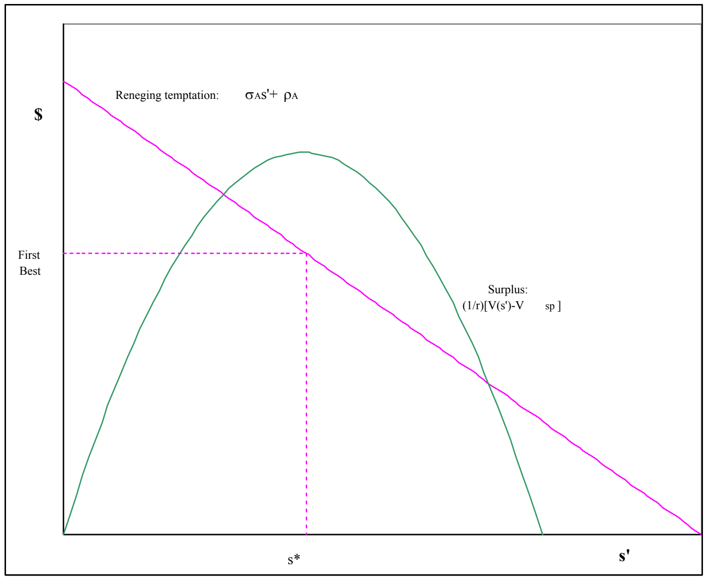
$$R_A(s') < (1/r)[V(s') - V^{SP}]$$

SB Relational Control (cont.)

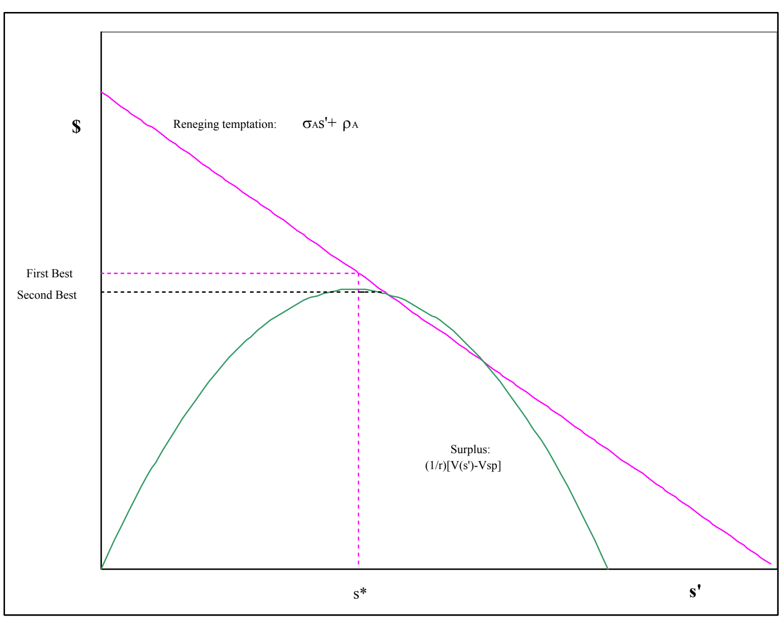
- If A has control:
  - Is $d^{RC}(\cdot \mid s')$ optimal?
  - If so, what is the optimal s' ?
  - Iterated construction of SB_A
- Should B have control?
  - (SB, SP) or (SP, SB) or (SB, SB)?

V. Efficient Contract Design

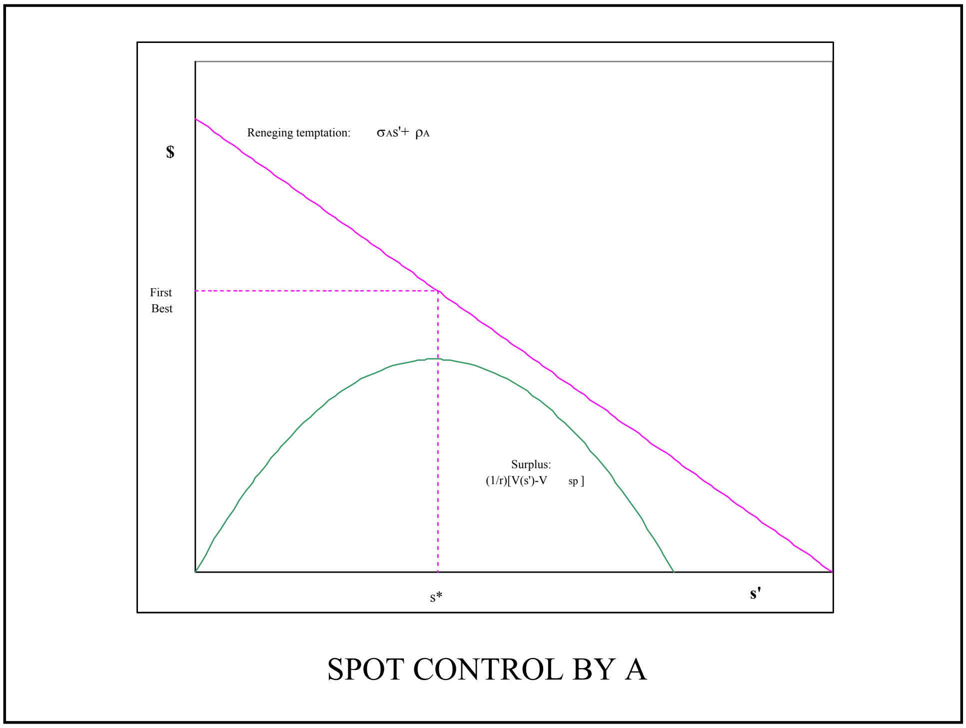
- PROPOSITION:
  - Second-best relational control goes to $\max \{|\sigma_A|, |\sigma_B|\}$
- Comparative statics
  - Macaulay, Coase ‘60, Klein I, Klein II

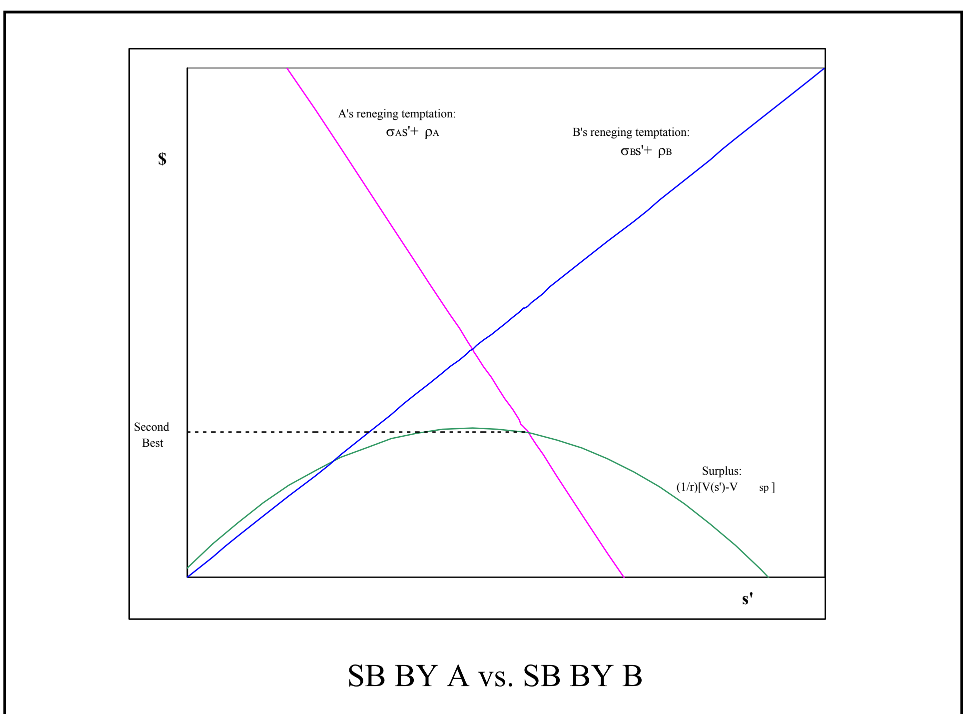


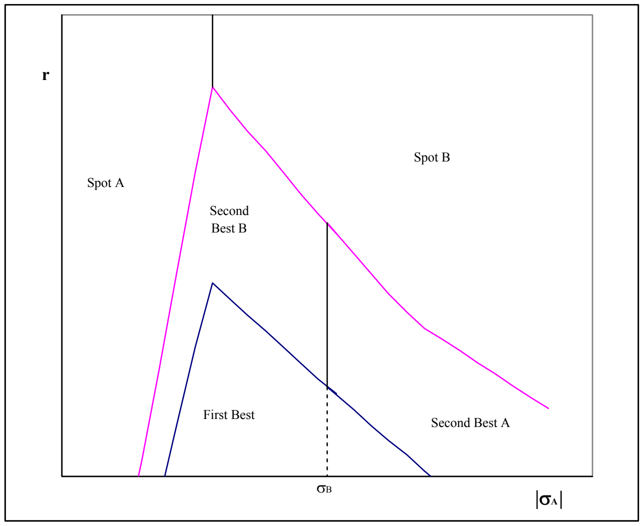
FIRST-BEST RELATIONAL CONTROL



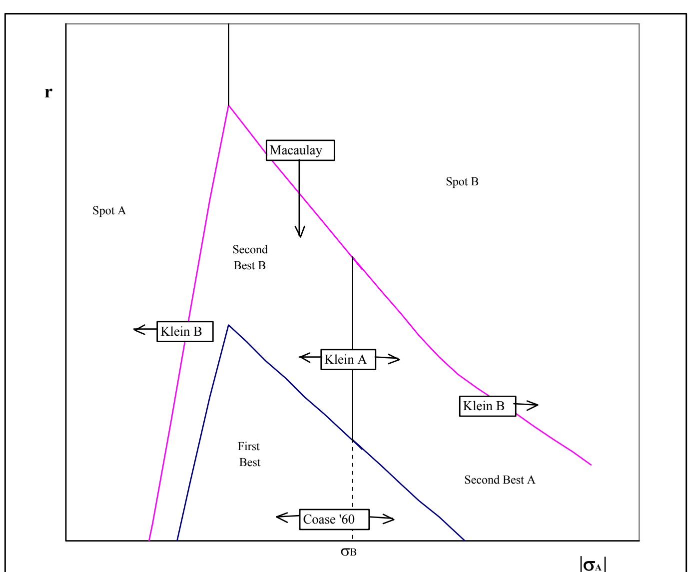
SECOND-BEST RELATIONAL CONTROL


Reneging temptation: σAS'+ ρA
$
First
Best
Surplus:
(1/r)[V(s')-V sp]
s*
s'
SPOT CONTROL BY A


A's reneging temptation:
σAS'+ ρA
B's reneging temptation:
σBS'+ ρB
$
Second
Best
Surplus:
(1/r)[V(s')-V sp]
s'
SB BY A vs. SB BY B



EFFICIENT CONTRACT DESIGN



COMPARATIVE STATICS