Contracting for Control

G. Baker
R. Gibbons
K. J. Murphy

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
December 2003

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
  $i \in \{A, B\}$

• state
  $s \in S$

• alienable dec. right
  $d \in D$

• inalienable payoffs
  $\pi_A(d, s), \pi_B(d, s)$

• $d^{FB}(s)$ solves
  $\max_{d \in D} \pi_A(d, s) + \pi_B(d, s)$

• $V^{FB}(s) \equiv \pi_A(d^{FB}(s), s) + \pi_B(d^{FB}(s), s)$
• 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 $d = (d_1, \ldots, d_J) \in D$
• inalienable DRs $\delta_i \in \Delta_i$, $\delta = (\delta_A, \delta_B)$
• inalienable payoffs $\pi_i(d, \delta, s)$
• Nash equilibrium $d^{NE}(s), \delta^{NE}(s)$
IC. Assets (& Payoff Rights)

• Asset (D, \( \pi \)) (where \( \pi \) 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 \( \pi \)?
  
  \(- \) pure PR vs. hidden DR?

ID. Simple Governance Structures

• 2 alienable decision rights \( D_1, D_2 \)

• 2 alienable payoff rights \( \pi_1, \pi_2 \)

• 4 governance structures:
  
  A: \( D_1, \pi_1 \) \hspace{1cm} B: \( D_2, \pi_2 \) \hspace{1cm} non-integration?
  
  A: \( D_1, \pi_1, D_2, \pi_2 \) \hspace{1cm} B: --- \hspace{1cm} integration?
  
  A: \( D_1, \pi_1, D_2 \) \hspace{1cm} B: \( \pi_2 \) \hspace{1cm} licensing?
  
  A: \( D_1, \pi_1, \pi_2 \) \hspace{1cm} B: \( D_2 \) \hspace{1cm} equity?

• cf. GHM: \( U_i(a_1, a_2, s, d_1, d_2) \)
IE. General Model

• I parties \( i \in I \) \( \Delta_i, \pi_i \)
• state \( s \in S \) \( \sim f(s) \)
• J assets \( j \in J \) \( D_j, \pi_j \)
• K decision rights \( k \in K \) \( D_k \)
• M payoff rights \( m \in M \) \( \pi_m \)

• Governance structure \( g \equiv \) allocation of assets, DRs, and PRs to parties \( \rightarrow D_{ig}, \pi_{ig} \)

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
  – 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: \( d_{ig} \rightarrow d^{RC}() \rightarrow V^{RC} \)
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 \( t_{ig} \)?

\[
[1+(1/r)] \left[ t_{ig} + E_s\{\pi_{ig}(d^{RC}(s), s) + \tau_{ig}(s) + T_{ig}(d^{RC}(s), s))\} \right] \\
\geq 0 + E_s\{\pi_{ig}(d^{NE}_g(s), s) + p_{ig}/(1+r) + (1/r)V_i^{SP} \} 
\]
IID. Constraint Reduction
(building on MM 89 & Levin 03)

\[ d_{ig}(s) = (d_{ig}^{BR}(s), d_{ig}^{RC}(s)) \]

\[ R_{ig}(s) \equiv \pi_{ig}(d_{ig}^{DEV}(s), s) - \pi_{ig}(d_{ig}^{RC}(s), s) \]

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

\[ \max_{s \in S} \sum_{i \in I} R_{ig}(s) < \left( \frac{1}{t} \right)[V^{RC} - V^{SP}] \]

---

**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

$$\pi_i(d_i, s) = \sigma_i s + \rho_i \quad i \in \{A, B\}$$
$$\pi_i(d_{-i}, s) = 0 \quad i \in \{\alpha, \beta\}$$
• generalizations:
  – \( s \sim f(s) \)
  – \( \pi_i \) monotone
  – \( \prod_i = \pi_i(d, s) + k_i(s) \)

• example parameters:
  – \( \sigma_A < 0, \sigma_B > 0 \)
  – \( \text{SP} \neq \text{FB} \)
Presented March 26, 2004

SPOT CONTROL BY A

SPOT CONTROL BY B
II. Spot Control

- i has control:
  \[ d_i^*(s) = d_i \text{ for all } s \]
  \[ V_i = \sigma_iE(s) + \rho_i \]

- efficient (spot) contract design:
  \[ V^{SP} \equiv \max\{V_A, V_B\} \]
  \[ \rho_i = \text{benefit of unconditional control} \]
III. FB Relational Control

• i has control:
  \[ R_i(s) = \pi_i(d_i, s) - \pi_i(d_{FB}^*(s), s) \]
  \[ \max_s R_i(s) = \pi_i(d_i, s^*) \equiv R_{FB} \]

• COROLLARY: FB feasible iff
  \[ R_{FB} < (1/r)[V_{FB} - V_{SP}] \]

IV. SB Relational Control

• A has control:
  \[ d_{RC}(s \mid s^{'}) = d_{\alpha} \text{ if } s < s' \]
  \[ = d_{\beta} \text{ if } s > s' \]
  \[ \rightarrow V(s'), \quad R_A(s') = \pi_A(d_{\alpha}', s') \]

• 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 $d^{RC}(\cdot | s')$ 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
Presented March 26, 2004

FIRST-BEST RELATIONAL CONTROL

SECOND-BEST RELATIONAL CONTROL
Presented March 26, 2004

SPOT CONTROL BY A

SB BY A vs. SB BY B
EFFICIENT CONTRACT DESIGN

COMPARATIVE STATICS

Presented March 26, 2004