Multifaceted Transactions, Incentives, and Organizational Form

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1. Motivation and basic insight

Low-powered incentives are both ubiquitous and (perhaps surprisingly) effective (Bohren and Josefsen, 2013; Hansmann and Thomsen, 2012).

When not every facet of a transaction can be contracted upon, low-powered incentives for those facets of the transaction that can be contracted upon may be necessary to avoid too large a distortion in those facets that cannot be contracted upon (Barzel, 1982, 1997; Hansmann, 1996; Holmstrom and Milgrom, 1991).

Consider a trader who trades off risk and return in her choice of trades.

It is not optimal to provide the trader with very strong incentives when the bulk of the losses that would be incurred in case a trade goes wrong would be borne by the trader's employer rather than by the trader herself.

2. Selected results

Distinguishing between different types of capital (financial, physical, intangible), different forms of incentives (performance pay, organizational form, ownership), and different transacting pairs (manager/shareholder, supplier/buyer, customer/firm), **we provide an explanation for legal partnerships, mutual ownership, government and customer ownership, worker cooperatives, farm marketing, processing, and supply cooperatives, and vertical integration.**

Distinguishing between resource allocation and resource creation, **we show that whereas resource creation calls for high-powered incentives, resource allocation calls for low-powered incentives**.

Allowing for the partial contractibility of inputs, **we account for the demise of purchase and patronage and their replacement by merit for the purpose of staffing military, law enforcement, and tax collection positions** (Allen's (2012) 'Institutional Revolution').

3. Literature review

The various organizational forms we analyze have for the most part received prior explanations (Allen, 2012; Barzel, 2013; Gibbons and Roberts, 2012; Hansmann, 1997).

Our paper provides a unified explanation where other explanations have been perhaps more disparate (Gibbons and Roberts, 2012).

It develops a formal model where other explanations have been perhaps less formal developed (Allen, 2012; Barzel, 2013; Hansmann, 1997).

Our paper further derives a number of new insights.

4. The (simplified) model (Falkinger, 2013) and the basic result

A firm has total resources B.

The firm can allocate resources L to some generalized investment that pays off aL with certainty; it allocates the remainder $B-L$ to some specialized investment that pays off $A(B-L)$ with probability p_r, $p_r A > a$. Total investment has expected payoff

$$E[K] = p_r A(B - L) + aL$$

It has variance

$$var[K] = A^2(B - L)^2 p_r p_u$$

We assume specialized investment must be evaluated at cost $\kappa(B-L)^2$ and, being risky, that it requires (equity, financial) capital $\Psi sd[K] = \Psi A(B-L)\sqrt{p_r p_u}$.

Throughout, we make the important assumption that the manager is risk-neutral.

We assume for the time being that the firm's shareholders provide the entirety of capital.

The manager's expected payoff is $\beta_1 E[K] + \beta_0$. He solves

$$\underset{L}{\text{Max}}\ \beta_1\left[p_r A(B-L) + aL\right] - \kappa(B-L)^2$$

$$\Rightarrow B-L = \frac{\beta_1}{2\kappa}\left[p_r A - a\right]$$

Shareholders solve

$$\underset{\beta_1}{\text{Max}} \; E[K] - \beta_1 E[K] - \beta_0 - \Psi sd[K]$$

$$\Leftrightarrow \underset{\beta_1}{\text{Max}} \; p_r A(B-L) + aL - \kappa(B-L)^2 - \Psi A(B-L)\sqrt{p_r p_u}$$

$$\Rightarrow B - L = \frac{1}{2\kappa}\left[p_r A - a - \Psi A\sqrt{p_r p_u}\right]$$

Shareholders therefore set

$$\beta_1 = 1 - \frac{\Psi A\sqrt{p_r p_u}}{p_r A - a} < 1$$

Shareholders provide the manager with low-powered incentives in order to have the manager (indirectly) account for costly capital in his choice of specialized investment.

Note that shareholders can induce the manager to make the first-best investment through their choice of pay-for-performance parameter.

FB is not essential to our results and will be abandoned in later sections.

5. Manager capital provision

Suppose the cost of capital to the manager is Φ and that he is asked to provide a fraction m of capital.

We have

$$\beta_1^m = 1 - \frac{(1-m)\Psi A \sqrt{p_r p_u}}{p_r A - a} < 1$$

Manager capital provision makes possible an increase in the power of incentives.

Shareholders' payoff is

$$aB + \frac{\left[p_r A - a - [m\Phi + (1-m)\Psi]A\sqrt{p_r p_u}\right]^2}{4\kappa}$$

It decreases in m for $\Phi > \Psi$.

The higher-powered incentives made possible by manager capital provision do not necessarily increase shareholders' payoff when the manager's cost of capital is higher than shareholders'.

6. Beyond capital and shareholders/manager

Capital can take many forms and agency relations involve more than just shareholders and managers.

In the early 1990s, America's Sears suffered a blow to its reputation when it was reported that its car mechanics performed numerous unnecessary repairs. The reason was that mechanics received a bonus proportional to the repairs they would bill.

Capital in such case is Sears' reputation, generalized investment is uncontroversial repairs, specialized investment those of more dubious necessity, the probability that specialized investment pays off is the probability that the questionable repair is not in fact questioned by the car owner.

Sears discontinued its policy of offering billing-linked bonuses to its car mechanics.

A firm has many patrons (customers, suppliers, workers, shareholders, …).

Ownership – and the power to set managerial incentives it confers – should belong to those patrons whose transactions with the firm include facets that are both important and non-(fully-)contractible.

Organizational form	Non-contractible facet
Legal partnerships	Engaging senior lawyer reputation
Mutual banks and insurance companies	Investing deposits and premiums
Government and customer ownership	Maintaining infrastructure
Worker cooperatives	Recognizing the incidental effects of expanded employment
Farm marketing, processing, and supply cooperatives	Recognizing the incidental effects of expanded production
Vertical integration	Assuring quality

6. Endogenous total investment

Assume that the manager brings forth total resources B, at a cost cB^2.

He solves

$$\underset{B,L}{\text{Max}}\ \beta_1[p_r A(B-L)+aL]-\kappa(B-L)^2-cB^2$$

$$\Rightarrow B=\frac{\beta_1 a}{2c},\ L=B-\frac{\beta_1}{2\kappa}[p_r A-a]=\beta_1\left[\frac{a}{2c}-\frac{p_r A-a}{2\kappa}\right]$$

Shareholders solve

$$\text{Max}_{\beta_1} \; p_r A (B - L) + aL - \kappa (B - L)^2 - \Psi A (B - L) \sqrt{p_r p_u} - cB^2$$

$$\Rightarrow \beta_1 = 1 - \frac{\Psi A \sqrt{p_r p_u} (p_r A - a) c}{(p_r A - a)^2 c + a^2 \kappa} = W \beta_{1,B-L} + (1 - W) \beta_{1,B}$$

where $\beta_{1,B} = 1$ is the pay-for-performance parameter that equates the manager's choice of total investment to the shareholder's first-best (resource creation) and $\beta_{1,B-L} = 1 - \left[\left(\Psi A \sqrt{p_r p_u} \right) / (p_r A - a) \right] < 1$ does likewise for the manager's choice of specialized investment (resource allocation).

First-best is no longer attained. There a trade-off between resource creation and resource allocation.

The weight W increases in c: a greater cost of bringing forth total investment decreases the importance attached to resource creation; it correspondingly increases the importance attached to resource allocation. W decreases in κ.

Resource allocation (low κ/c) calls for lower-powered incentives than does resource creation (low c/κ).

They steal and steal and steal. They are stealing absolutely everything and it is impossible to stop them. But let them steal and take their property. They will then become owners and decent administrators of this property. Anatoly Chubais, architect of Russian privatizations, quoted in *The Sale of the Century*, 2000, by Chrystia Freeland.

The higher-powered incentives made possible by manager capital provision increase shareholders' payoff despite the manager's higher cost of capital.

$$\beta_1 = 1 - \frac{(1-m)\Psi A\sqrt{p_r p_u}(p_r A - a)c}{(p_r A - a)^2 c + a^2 \kappa}$$

$$m = \frac{(\Phi - \Psi)\big[(p_r A - a)^2 c(p_r A - a - \Psi A\sqrt{p_r p_u}) + a^2 \kappa(p_r A - a)\big] - \Phi\Psi A\sqrt{p_r p_u}a^2\kappa}{(\Phi - \Psi)\big[(p_r A - a)^2 c(\Phi - \Psi)A\sqrt{p_r p_u} + a^2\kappa\Phi A\sqrt{p_r p_u}\big] - \Phi\Psi A\sqrt{p_r p_u}a^2\kappa}$$

When

- $2\Psi A\sqrt{p_r p_u} > \Phi A\sqrt{p_r p_u} > \Psi_0 A\sqrt{p_r p_u}$, shareholders provide the entirety of capital: $m = 0$
- $\Psi_0 A\sqrt{p_r p_u} > \Phi A\sqrt{p_r p_u} > p_r A - a$, the manager provides part of the capital: $0 < m < 1$
- $\Phi A\sqrt{p_r p_u} < p_r A - a$: the manager provides the entirety of capital: $m = 1$

7. Partial contractibility and the power of incentives

Suppose it is possible partially to contract on a hitherto non-contractible facet a transaction (e.g., a supplier's choice of quality $\Theta(B-L)$, a manager's use of shareholders capital $\Psi A(B-L)\sqrt{p_r p_u}$).

Let q denote the index of contractibility, $0 \le q \le 1$, with $q = 1$ denoting full contractibility, e.g., the case where quality can be fully contracted upon.

The power of incentives increases in the index of contractibility: $\partial \beta_1 / \partial q > 0$.

Now suppose it is possible to contract on some minimum level of total and/or general investment: $B \geq B^i, L \geq L^i$.

The power of incentives decreases in the contractibility of investment: $\partial\beta_1/\partial B^i \leq 0, \partial\beta_1/\partial L^i \leq 0$.

Whereas a greater ability to contract on hitherto non-contractile facets of a transaction (quality, capital) increases the power of incentives, a greater ability to contract on inputs decreases that power.

That both (i) the late-twentieth, early-twenty-first century increase in outsourcing and (ii) the nineteenth to mid-twentieth century development of large bureaucracies and corporate organizations have been attributed to increases in contractibility need no longer be contradictory.

8. Empirical evidence

Anderson (1985) and Anderson and Schmittlein (1984):

Direct sales force (firm employees, low β_1) chosen over indirect (independent sales representative, high β_1) when non-selling activities are important (high Θ).

Azoulay (2004):

Decision to subcontract clinical trials to Contract Research Organizations (high-powered incentives, high β_1) or to conduct these trials 'in-house' (flat incentives, low β_1).

'Knowledge-intensive projects' are more likely to be assigned to internal teams.

Knowledge-intensive projects are those with a high likelihood of delivering "unexpected and anomalous results [that] pose new questions for basic biomedical research and enrich its ultimate payoff" (high Θ, low q).

Allen (2012):

Where British Army or Royal Navy officers had once purchased their commissions (army) or owed them to patronage (navy) and had been compensated by a rank-dependent share of loot or prize money (high β_1), officer positions have come to be held by salaried personnel (low β_1) selected and promoted on merit.

Allen (2005) attributes the change to the greater measurability of officer input made possible by modern technology:

i. "changes in weapons allowed for training in ordinance and shooting[; t]his training allowed the army to select soldiers on observable inputs" (army, $B \geq B^i$)
ii. "the technical innovation of steam power in conjunction with the screw propeller [removed] wind as a critical element in battle[;] captains, and admirals [therefore] could no longer easily excuse their failure to engage [the enemy]" (navy, $L \geq L^i$)

Allen (2005, 2012) notes that the high-powered incentives prevailing under purchase and patronage (high β_1) regularly distorted military personnel's choices away from fighting and towards looting (lower L, higher $B - L$), at the expense of wider military aims (high Θ).

For example, a ship captain may attack an enemy merchant rather than military ship, despite the latter's much higher military value, because of the easier and richer picking constituted by the former.

9. Conclusion

The present paper has provided a (partial) explanation for both the ubiquity and the effectiveness of low-powered incentives.

This explanation combines the multifaceted nature of most transactions with the non-contractibility of at least some facets.

It delivers a number of new insights, not least regarding the need to discriminate between the different dimensions of investment and contractibility for the purpose of understanding the relation between these and the power of incentives.