Contract Law and Development

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Hold-up Problem $\Rightarrow$ Time-Inconsistency Problem

Solution requires *subsidization of trade* and a *Social Contract* which defines:

1. **Regulation**: Set of *contracts* which are *non-enforceable*
2. **Judge**: Institutional Agent/Bureaucrat

Social Contract requires a minimum level of resources $\Rightarrow$ Implications for Contract Law design and Development
Theo ry:

- Restricting the types of agreements that can be written as enforceable contracts can increase effort exertion and social welfare.

- Existing literature focuses on the role of regulation for moving along the Pareto frontier rather than moving to it. However, in this model, regulation is necessary for achieving Pareto efficiency.

Empirical:

Acemoglu and Johnson (2005): contract enforcement institutions do not matter for growth. However, the relationship between contract enforcement costs and growth may be non-monotonic so linear specifications are not appropriate for testing the relation.
Very few papers on contract law and development. Exceptions:

- Acemoglu and Johnson, 2005 (Empirical)
- Dhillon and Rigolini, WP, 2009 (Theoretical)

Other related areas:

- Property Rights: e.g. North (1984), Grossman and Hart (1986)
A Simple Example

- A farmer (F) and a baker (B) want to trade wheat for a price.
- Both of them have bargaining power and are risk-neutrals.
- Whether trade is valuable or not depends on the uncertain value of bread (High or Low).
- The probability that the value of bread is high depends on the effort levels of both of them for acquiring human capital (skills) for farming and baking respectively.
- Effort exertion, the state of nature and final utilities are non-verifiable.
- Assume that the net private marginal benefit from exerting high effort is negative but the net social marginal benefit is positive for both F and B.
- ⇒ Hold-up Problem: Agents exert sub-optimally low effort levels (low accumulation of skills)
Main Idea of the Solution

Assume that F and B have sufficient initial resources. Then:

- Inducing high effort levels requires that subsidies to be given to F and B when trade takes place.
  **But:** If the low-state arises, agents will write *side-contracts* to trade (even though it is unprofitable for one party) and redistribute the subsidies.

- ⇒ Side-contracts must be “forbidden” (Regulation)
  **But:** Any initial agreement by F and B not to allow side-contracts to take place is *time-inconsistent* (it is not Renegotiation-Proof).

- ⇒ A “Mayor” is needed, who enforces contracts, pays subsidies when trade takes place and receives taxes when trade does not occur.

- The “**Constitution**” (Social Contract) defines the Mayor’s authorities:
  1. Which contracts are enforceable and which are not.
  2. The amount of subsidies and taxes

We show that the Social Contract induces first-best effort levels and it is Renegotiation-Proof.
Design of Contract Law $\iff$ Development:

- Development process increases aggregate resources $\Rightarrow$ Mechanism becomes feasible at some point and Contract Law emerges.
- Contract Law increases marginal value of trade $\Rightarrow$ More investments in productivity and faster economic growth.

Other Examples:

- Researchers in R&D Department $\Rightarrow$ Patent Policy
- Venture Capitalist & Entrepreneurs $\Rightarrow$ Financial Regulation
Economic Environment: The Extended Model

- economy lasts for $T$ periods

- two groups of risk-neutral agents $\{i, j\}$ with measure one (continuum of agents) random matching per period

- two goods: an autarchic good (bread) and a specialized good (plough, multiple varieties)

- $A_t$: Productivity of the autarchic good, $\Gamma_t$: Productivity of the specialized good

- $Z_a, Z_g$: Capital stocks which increase productivity. $A$ and $\Gamma$ is a concave function of $Z_a$ and $Z_g$ respectively
In time zero agents propose and vote a Constitution. Then, the following timing of events repeats itself in every period.

1. **Effort exertion**

2. **Production costs are determined**

3. **Private contracts are signed**

4. **Trade takes place. Government executes taxation and investment plans in productivity growth**

5. **Enforcement of private contracts**

6. **Consumption takes place**
We define $\bar{p}$ to be the maximum permitted net transfer between two agents:

$$\bar{p} = \Gamma(Z_{gt-1}) \left( k_H + \beta_j (v - k_L) - \frac{\bar{e} - \bar{c}}{f(e_i; \bar{e}) - f(e_i; \bar{e})} \right)$$

Proposition 3:
Incentive compatible inducement of high effort for the production of good $g$ requires that any private contract $\pi(\hat{p}, g)$ or side contract $\pi(\hat{q}, p, g)$ is non-enforceable, where $\hat{p} > \bar{p}$ and $\hat{q} > \bar{p} - p$.

- The set of (non)-enforceable contracts depends endogenously on $\Gamma_t$ and the optimal effort levels to be induced $\{e_{igt}, e_{jgt}\}$. 
We consider social contracts which solve the following problem:

\[
\max_{\tau, z_a, z_g} \sum_{t=0}^{T} \delta_t \left( E(u_{i\theta t}) + E(u_{j\theta t}) \right)
\]

subject to:

- Agents' Best Response Functions
- Government Budget Constraint
  \[ z_{at} + z_{gt} \leq f(e_{igt}, e_{jgt})(\tau_{i1t} + \tau_{j1t}) + (1 - f(e_{igt}, e_{jgt})) (\tau_{i0t} + \tau_{j0t}) \]
- Feasibility Constraints
- Incentive Compatibility/Enforcement Constraint
Equilibrium Investment Paths

\[ \tilde{Z}_a < Z_a < \bar{Z}_a \]

- No trade
- No enforcement institutions
- No regulation

- Trade
- Enforcement institutions
- No regulation

- Trade
- Enforcement institutions
- Partial subsidies and regulation

- Trade
- Enforcement institutions
- Full subsidies and regulation

- Taxation and investment stop
- Regulation remains unchanged

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Equilibrium Regulation

\[ \tilde{Z}_a < \underline{Z}_a < \overline{Z}_a \]

\[ p \]

No trade
No enforcement institutions
No regulation

Trade
Enforcement institutions
No regulation

Trade
Enforcement institutions
Partial subsidies and regulation

Trade
Enforcement institutions
Full subsidies and regulation

Taxation and investment stop
Regulation remains unchanged
Conclusions and Extensions

This paper shows that:

- Contract Law and development are closely inter-related
- The relationship between regulation and growth may be non-monotonic

Testable Implications

- Contract enforcement costs are positively correlated to capital accumulation.
- Contract enforcement costs are negatively correlated to increases in Total Factor Productivity.

Future Work

- Empirical testing
- Theoretical Extensions:
  - Trade-off between Incentives and Economic Freedom
  - Regulation Cycles
Additional Material: Extra Slides
Economic Environment

- T-period economy, [0, 1] continuum of agents, 2 goods
- two types: i and j, equal proportion in population
- i: potential consumer/buyer, j: potential producer/seller of specialized good g
- good a: autarchic good, all agents can produce it
- production: \( y_{\xi at} = A_t e_{\xi at}, e_{\xi at} \in [0, \infty) \)
- cost of effort: \( c_{\xi at}(e_{\xi at}), c' > 0, c'' > 0 \)
good g is a specialized good with multiple varieties

if the good is produced and traded, then $i$ receives utility $\Gamma_t v$

uncertain cost: $\Gamma_t k_\theta$, $\theta \in \{H, L\}$

$k_H > v > k_L > 0$

$\text{prob}(\theta = L | t) = f(e_{igt}, e_{jgt}), e_{\xi gt} \in \{e, \bar{e}\}$

$f(\bar{e}, \bar{e}) > f(e, \bar{e}) = f(\bar{e}, e) > f(e, e)$

cost of effort: $\Gamma_t c_{gt}(e_{gt})$, $c_{gt}(\bar{e}) = \bar{c} > c_{gt}(e) = c$

effort levels, state of nature and final utilities are observable by the two parties but not verifiable in a court and unobservable by anyone else
Utility Functions

- \( u_{i\theta t} = A_t e_{iat} + (\Gamma_t v - p_{\theta})l_T - (\Gamma_t c_{igt} + c_{iat}) \)

- \( u_{j\theta t} = A_t e_{jat} + (p_{\theta} - \Gamma_t c_{\theta})l_T - (\Gamma_t c_{jgt} + c_{jat}) \)

\( l_T = 1 \) if trade takes place and zero otherwise

- expected utility: \( E(u_{\xi\theta t}) = \sum_{\theta} f_{\theta} u_{\xi\theta t} \)

- intertemporal utility: \( U_{\xi} = \sum_{t=0}^{T} \delta_t E(u_{\xi\theta t}) \)
bargaining power $\beta_\xi$ determines price $p$ when $g$ is traded:

$$\beta_i > 0 \ , \ \beta_j > 0 \ , \ \sum_\xi \beta_\xi = 1$$

$$p = \Gamma_t[(1 - \beta_i)v + \beta_i c_L]$$

$$(f(\bar{e}, e_\zeta) - f(e, e_\zeta)) \beta_\xi (v - k_L) - (\bar{c} - c) < 0 \ , \ \forall e_\zeta \in \{\bar{e}, e\}$$

$$(f(\bar{e}, e_\zeta) - f(e, e_\zeta)) (v - k_L) - (\bar{c} - c) > 0 \ , \ \forall e_\zeta \in \{\bar{e}, e\}$$
Productivity Growth

- Productivity parameters $A_t$ and $\Gamma_t$ depend on aggregate capital stocks $Z_{at}$ and $Z_{gt}$:

  $$A(Z_{at}) \quad \Gamma(Z_{gt})$$

  concave functions

  $$Z_{a0} = Z_{g0} = 0, \quad A'(0) = \Gamma'(0) = \infty$$

- Investment levels in period $t$: $z_{at}$, $z_{gt}$

  $$Z_{at} = Z_{at-1} + z_{at} \quad Z_{gt} = Z_{gt-1} + z_{gt}$$

- Productivity parameters are effectively public goods

- Private investments are zero
• Social Contract: $S(\Phi(Q), \tau, z_a, z_g)$
  
  $\Phi(Q)$: set of enforceable private agreements
  $\tau$: taxation plan, elements: $\tau_{\xi \theta t}$
  $z_a$: investment plan for productivity of good a, elements: $z_{at}$
  $z_g$: investment plan for productivity of good g, elements: $z_{gt}$

• Private Contracts: $\pi(p, I_T)$ or $\pi(q, p, I_T)$
  
  $p$: price of good in terms of the numeraire commodity
  $I_T$: indicator function of trade of good $g$
  $q$: net transfer of resources
treat $i$ and $j$ as representative agents of their type

we examine the equilibrium of the game which corresponds to the utilitarian welfare function

implications of risk-neutrality for solution
Agents’ Best-Response Functions

- Given a social contract $S_t$, an agent $\xi$ chooses $e_{\xi at}$ and $e_{\xi gt}$ in order to maximize:

$$
E(u_{\xi t}) = A(Z_{at-1})e_{\xi at} + f(e_{igt}, e_{jgt}) (\Gamma(Z_{gt-1}) \beta_\xi (v - k_L) - \tau_{\xi 1t}) + (1 - f(e_{igt}, e_{jgt})) (-\tau_{\xi 0t}) - \Gamma(Z_{gt-1}) c_{\xi gt} - c_{\xi at}
$$

Agent’s Best Response Function:

- $e_{\xi at} : A(Z_{at-1}) = \frac{\partial c_{at}}{\partial e_{\xi at}}$

- $e_{\xi gt} = \bar{e}$ if $\tau_{\xi 0t} - \tau_{\xi 1t} \geq -\frac{\Gamma(Z_{gt-1})[(f(\bar{e}, e_\xi) - f(e, e_\xi)) \beta_\xi (v - k_L) - (\bar{c} - c)]}{f(\bar{e}, e_\xi) - f(e, e_\xi)}$

- $e_{\xi gt} = e$ otherwise
Inducing high effort in the production of the specialized good requires indirect subsidies through differential taxation conditional on trade (since state is non-verifiable).

This generates the incentive for agents to trade in high cost state and receive the benefits of lower taxation through overpricing the good or through side-contracting.

Incentive Compatibility requires that the producer can not be compensated for production costs in the high cost state:

\[
p + q \leq \Gamma(Z_{gt-1})[(1 - \beta_i)v + \beta_i c_L] + \Gamma(Z_{gt-1})\left(k_H - k_L - \frac{\bar{c} - c}{f(\bar{e},e_i) - f(e,e_i)}\right)
\]
Let \( \bar{p} = \Gamma(Z_{gt-1})[(1 - \beta_i) v + \beta_i c_L] + \Gamma(Z_{gt-1}) \left( k_H - k_L - \frac{\bar{c} - c}{f(e, e_i) - f(e, e_i)} \right) \)

**Lemma 1:**
Incentive compatible inducement of high effort for the production of good \( g \) requires that any private contract \( \pi(\hat{p}, g) \) or side contract \( \pi(\hat{q}, p, g) \) is non-enforceable, where \( \hat{p} > \bar{p} \) and \( \hat{q} > \bar{p} - p \).

- The set of (non)-enforceable contracts depends endogenously on \( \Gamma_t \) and the optimal effort levels to be induced \( \{e_{igt}, e_{jgt}\} \).
We consider social contracts which solve the following problem:

$$\max_{\tau, z_a, z_g} \sum_{t=0}^{T} \delta_t (E(u_{i\theta t}) + E(u_{j\theta t}))$$

subject to:

- **Agents’ Best Response Functions**
  $$z_{at} + z_{gt} \leq f(e_{igt}, e_{jgt}) (\tau_{i1t} + \tau_{j1t}) + (1 - f(e_{igt}, e_{jgt})) (\tau_{i0t} + \tau_{j0t})$$

- **Government Budget Constraint**

- **Feasibility Constraints**

- **Incentive Compatibility/Enforcement Constraint**
Feasibility Constraints

- Taxation Constraint:
  \[ f(e_{igt}, e_{jgt})(\tau_{i1t} + \tau_{j1t}) + (1 - f(e_{igt}, e_{jgt})) \leq A(Z_{at-1})(e_{iat} + e_{jat}) - f(e_{igt}, e_{jgt})k_L \]

- Feasibility of Trade: \( A(Z_{at})e_{iat} \geq \Gamma(Z_{gt})k_L \)

- Feasibility of inducing high effort for one agent:
  \( A(Z_{at-1})(e_{iat} + e_{jat}) \geq K(Z_{gt}) \)

- Feasibility of inducing high effort for both agents:
  \( A(Z_{at-1})(e_{iat} + e_{jat}) \geq \overline{K}(Z_{gt}) \)
Depending on the parameter values, the interaction between the feasibility constraints and the optimality conditions may generate multiple equilibrium paths. Regarding economic consequences, the following are the most important cases:

- Economy without trade
- Economy with trade but with no regulation
- Economy with trade and regulation
In this case, there exists $t^*$ such that:

- Agents’ production of good $a$ is taxed away (up to the inducement of high effort condition) in periods $[0, t^*]$ with $t^* > \tilde{t}$. Taxation falls for the remaining periods $[t^* + 1, T]$.

- Investment in productivity of good $a$ up to $t^*$ and in productivity of good $g$ between $[\tilde{t}, t^*]$.

- Tax breaks for only one type of agent during $[\tilde{t} + 1, \bar{t}]$.
  Tax breaks for both types during $[\bar{t} + 1, T]$.

- Restrictions on enforceable agreements follow Lemma 1.
Unconstrained Optimality Conditions

- Optimality Condition for good $a$

  $z_a$ such that: \[
  \sum_{t=1}^{T} \delta^t \frac{\partial A(Z_a)}{\partial Z_a} (e_i^*(Z_a) + e_i^*(Z_a)) = 1
  \]
  where $Z_a = z_a$

- Optimality Condition for good $g$

  $z_g$ such that: \[
  \sum_{t=1}^{T} \delta^t \frac{\partial r(Z_g)}{\partial Z_g} (f(\bar{e},\bar{e})(v - k_L) - 2\bar{c}) = 1
  \]
  where $Z_g = z_g$
Feasibility Constraints

- **Taxation Constraint:**
  \[ f(e_{igt}, e_{jgt})(\tau_{i1t} + \tau_{j1t}) + (1 - f(e_{igt}, e_{jgt}))(\tau_{i0t} + \tau_{j0t}) \leq A(Z_{at-1})(e_{iat} + e_{jat}) - f(e_{igt}, e_{jgt})k_L \]

- **Feasibility of Trade:**
  \[ A(Z_{at-1})e_{iat} \geq \Gamma(Z_{gt-1})k_L \]

- **Feasibility of inducing high effort for one agent:**
  \[ A(Z_{at-1})(e_{iat} + e_{jat}) \geq K(Z_{gt-1}) \]

- **Feasibility of inducing high effort for both agents:**
  \[ A(Z_{at-1})(e_{iat} + e_{jat}) \geq \overline{K}(Z_{gt-1}) \]
Each one of the feasibility constraints generates a critical value for the capital stock of good \( a \). Define the following values:

- \( \widetilde{Z}_a : A(\widetilde{Z}_a) \left( e_{ia}(\widetilde{Z}_a) + e_{ja}(\widetilde{Z}_a) \right) = \Gamma(0)k_L \)
- \( \underline{Z}_a : A(\underline{Z}_a) \left( e_{ia}(\underline{Z}_a) + e_{ja}(\underline{Z}_a) \right) = K(0) \)
- \( \bar{Z}_a : A(\bar{Z}_a) \left( e_{ia}(\bar{Z}_a) + e_{ja}(\bar{Z}_a) \right) = \bar{K}(0) \)
- \( \overline{Z}_a > \underline{Z}_a \)
The ranking of the critical values determines the order in which feasibility constraints are relaxed.

Define $\tilde{t}$, $t$, $\bar{t}$ as the time periods at which the respective feasibility constraint stops being binding.

Investment in productivity of good $a$ continues until the equalization of marginal benefits and costs or until one of critical values of capital stock is reached.

Investment in productivity of good $g$ continues until the equalization of marginal benefits and costs.

Tax breaks are provided if the benefit of increased volume of trade outweighs the delayed investment in productivity of good $a$ or $g$ (or both).
Consider the case where $\tilde{Z}_a < Z_a < \bar{Z}_a$. Assume that:

\[
\frac{\partial A(\tilde{Z}_a)}{\partial Z_a} [e_{ia}^*(\tilde{Z}_a) + e_{ja}^*(\tilde{Z}_a)] \left( \sum_{t=\tilde{t}}^{T} \delta^{t-\tilde{t}} \right) > 1
\]

\[
\frac{\partial A(Z_a)}{\partial Z_a} \left[ e_{ia}^*(Z_a) + e_{ja}^*(Z_a) \right] \left( \sum_{s=\tilde{t}}^{T} \delta^{s-\tilde{t}} \right) > 1
\]

\[
\frac{\partial A(\bar{Z}_a)}{\partial Z_a} \left[ e_{ia}^*(\bar{Z}_a) + e_{ja}^*(\bar{Z}_a) \right] \left( \sum_{s=\tilde{t}}^{T} \delta^{s-\tilde{t}} \right) > 1
\]

\[
\sum_{t=\tilde{t}}^{T} \delta^{t} \left[ A(Z_{at}) \left( e_{ia}^*(Z_{at}) + e_{ja}^*(Z_{at}) \right) + \Gamma(Z_{gt}) (f(\bar{e}, e) \nu - \bar{c} - c) \right] >
\]

\[
\sum_{t=\tilde{t}}^{T} \delta^{t} \left[ A(\hat{Z}_{at}) \left( \hat{e}_{ia}^*(\hat{Z}_{at}) + \hat{e}_{ja}^*(\hat{Z}_{at}) \right) + \Gamma(\hat{Z}_{gt}) (f(\bar{e}, e) \nu - 2\bar{c}) \right]
\]

\[
\sum_{t=\tilde{t}}^{T} \delta^{t} \left[ A(\check{Z}_{at}) \left( e_{ia}^*(\check{Z}_{at}) + e_{ja}^*(\check{Z}_{at}) \right) + \Gamma(\check{Z}_{gt}) (f(\bar{e}, \bar{e}) \nu - \check{c} - c) \right] >
\]

\[
\sum_{t=\tilde{t}}^{T} \delta^{t} \left[ A(Z_{at}) \left( e_{ia}^*(Z_{at}) + e_{ja}^*(Z_{at}) \right) + \Gamma(Z_{gt}) (f(\bar{e}, e) \nu - \bar{c} - c) \right]
\]