Corruption and Paradoxes in Alliances

Corrupción y Paradojas en Alianzas (Eco. Gov. 2018)

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Motivation

Corruption is associated with low productivity (Salinas-Jimenez et al. 2008).

Midlarsky (1988) finds association between pop. growth, land concentration (thus, lower MPL) and conflict in agrarian societies. State backing (Homer and Dixon 1994).

Would the enforcer exclude a productive worker? No!

Intuition: 1 Piece of land, a non productive enforcer has to allocate in an egalitarian way among two identical workers. What happens if MPL=0?

Objective

Study corruption when a person can adjudicate over property rights (land). As there is conflict, as in political conflict, we hope for understanding related social situations: Ex. Endogenous Institutions (The institution is the prize), Inequality and social conflict.

Model Overview

Extension of the Tullock context model over land embedded in a coalition structure. Non productive enforcer and identical workers. Property rights are well defined for output but not for the resource. For the most, MPL=0

Egalitarian allocation in the grand coalition: no corruption

Enforcer colludes with a subset of workers and fights against other groups and gets a transfer: corruption

Anarchy or enforcer isolated: deposition of the enforcer

Binding agreements to fight as a group and abide by sharing rule.

Effort is supplied non cooperatively. We focus on the effect of a coalition structure in the intergroup conflict.

Main Results Overview

If MPL=0, if total effort level is fixed, adding an effective enough enforcer increases the sum of payoffs of this bigger coalition. This is even true when total effort goes up (GE effect) when effectiveness goes up: If total effort goes up MB of war $\downarrow$ MC of war $\uparrow \rightarrow$Probability of winning $\downarrow$, then, payoffs decrease. Sum of payoffs larger than outside option. Negative externalities on other coalitions.

Workers free ride on the more effective enforcer, fighting is less costly for the group and the more efficient fighter fights more; the enforcer's zero outside option makes such a coalition more attractive.

Rivalry$\rightarrow$Enforcer colludes with small coalition of workers (perfect enforcement).

Contribution to Literature, Conflict

Conflict: There is no collective action problem (Olson) for corrupt coalitions. Explain divide and Rule that contradicts Olson as excluded would fight more.
Solve alliance formation paradox in fixed effort model (Konrad 2009).
First model w/heterogeneity in literature where Tullock models have been embedded in coalition formation games.

Contribution to Literature, Inequality and Conflict

Inequality Polarization and Social conflict: Esteban and Ray (2008, 2011), not class conflicts but heterogeneous ethnic groups. Rich Muslim finance poor soldiers as poor have a higher opportunity cost of resources than the rich. Our model has heterogeneity in effectiveness and a non productive enforcer. Enforcer makes up an ethnic group to divide and rule.

Contribution to Literature, Corruption

Corruption: government/regulator/firm three-tier hierarchy principal agent model. Laffont found problems in developing countries due to institutional limitations, including limited regulatory capacity, *limited accountability*, limited commitment, and limited fiscal efficiency (see Estache and Wren-Lewis 2009 and Dixit 2003).

Nieva (2003) proposed an example in a coalition formation game with networks and bargaining. Grand coalition was the no corruption outcome.

We focus on accountability and what a coalition can achieve in a coalition structure when there are externalities. We conjecture on coalition formation.

Contribution to Literature, Endogenous Institutions

Endogenous Institutions: The institution is the prize and as for lack of commitment, the state, in charge of implementing it, may fail. The grand coalition does not form, in our terms.

Acemoglu and Robinson (2004), kleptocrat and two producers with endogenous labor supply who can be taxed or subsidized in a dynamic non-cooperative framework. Natural resources owned by the kleptocrat and foreign aid supply him with extra income. Kleptocrat divides and rules off the equilibrium path if a producer wants to propose that the kleptocrat be deposed because of weak institutions. In our static setup, where land is at stake, the enforcer divides and rules along the equilibrium path if he is sufficiently effective and the marginal productivity of labor is low enough.

Acemoglu (2008, 2012, 2015), dynamic set up, winning coalitions can choose institutions and future winning coalitions in a model without commitment. We may explain commitment via MPL (temporary agreements).

Contribution to Literature, Endogenous Institutions

Acemoglu (2017), dynamic game of conflict state-society endogenizes state capacity.
19th century Prussia (military colludes with landowners), despotic state
Swiss state inclusive. Montenegro never had centralized states. Small differences in initial conditions matter. They emphasize social norms in the Swiss state and Montenegro cases.
Evenly matched competitors→inclusive state
small heterogeneity→weak or despotic states
We emphasize existence of our enforcer in contexts of low MPL. No role for social norms.

The Paradox of Alliance Formation in the Fixed Effort Model

<u>No alliance</u>

Three agents $i = 1, 2, 3$ with a fixed, exogenous endowments r_i

Probability of winning a prize worth 1: $p_i = \frac{r_i}{\sum_j r_j}$.

Individual expected payoffs: $u_i = \frac{r_i}{\sum_j r_j}$.

<u>Alliance 23 forms</u>

The expected payoff for the coalition is $\frac{r_2 + r_3}{\sum_j r_j}$

The lack of incentive: the paradox of alliance formation, Konrad (2009).

Exogenous Effort with an Enforcer

Three player contest is over a piece of land that produces 1 regardless of the number of workers.

An unproductive enforcer, agent 3, has a better endowment $r_3 > r_1, r_2 > 0$.

No Alliance

A trivial Nash equilibrium where the enforcer does not participate as he is indifferent.

Worker i's expected payoff: $u_i = \frac{r_i}{r_1 + r_2}$.

Alliance 23

Sum of payoffs: $\frac{r_2 + r_3}{\sum_j r_j}$.

Exogenous Effort, no Extortion

Theorem

If the enforcer does not participate in the contest without alliances, the difference between the sum of payoffs in coalition 23 and $\frac{r_2}{r_1+r_2}$ is positive if and only if $r_3 r_1 > 0$. It is increasing in r_3, decreasing in r_2 and increasing in r_1 if $r_2 \geq r_1$.

$$\begin{array}{cccccc} \frac{r_2}{r_1+r_2+r_3} & + & \frac{r_3}{r_1+r_2+r_3} & \text{vs} & \frac{r_2+r_3}{r_1+r_2+r_3}, & \text{zero difference.} \\ \uparrow & & \downarrow & & \text{constant} & \\ \frac{r_2}{r_1+r_2} & + & 0 & \text{vs} & \frac{r_2+r_3}{r_1+r_2+r_3}. & \end{array}$$

If $r_1 = 0$, it is clear that the two allies get the same total regardless of whether they form an alliance or not. If $r_3 = 0$, difference is zero. If $r_1 > 0$, little strength of the enforcer is enough to make the alliance more profitable, (standard result in contests). Key: Enforcer's zero outside option dominates higher probability of worker 2 winning the no alliance contest.

Exogenous Effort, Extortion

Corollary

If the enforcer does participate in the contest without alliances, the difference between the sum of payoffs in coalition 23 and $\frac{r_2}{r_1+r_2}$ *is positive for all parameter values.*

Extortion is possible in this set up and it eliminates the higher probability of worker 2 winning in anarchy (no alliance contest)!

A General Model of Enforcement and Corruption

m groups, $N-1$ identical workers, N_k, $k=1$ enforcer group, r effort
Land produces 1, $MPL = 0$.
Worker utility in group $k \neq 1$:

$$u_{ik} = \frac{R_k}{R}\frac{1}{N_k} - v\left(r_{ik}\right) \tag{1}$$

R total effort, $v\left(r\right)$ cost of the effort, increasing, smooth, strictly convex, $v'\left(0\right) = 0$.

$$\text{F.O.C. } \frac{1}{R}\left(1-\pi_k\right)\frac{1}{N_k} - v'\left(r_{ik}\right) = 0 \tag{2}$$

$\pi_k = \frac{R_k}{R}$, probability of group k winning

A General Model of Enforcement and Corruption

The expected utility for the enforcer, player 1, in group 1

$$u_{11} = \frac{R_1}{R}\lambda - v\left(r_{11}\right) \tag{3}$$

λ share of the prize $R_1 = zr_{11} + \sum_{i \neq 1} r_{i1}$, z effectiveness parameter.

$$\text{F.O.C } \frac{z}{R}\left(1 - \pi_1\right)\lambda - v'\left(r_{11}\right) = 0 \tag{4}$$

The expected utility for the worker i in group 1,

$$u_{i1} = \frac{R_1}{R}\frac{1 - \lambda}{N_1 - 1} - v\left(r_{i1}\right) \tag{5}$$

each worker receives the same.

$$\text{F.O.C. } \frac{1}{R}\left(1 - \pi_1\right)\frac{1 - \lambda}{N_1 - 1} - v'\left(r_{i1}\right) = 0 \tag{6}$$

An equilibrium is a vector of individual effort levels such that corresponding F.O.C.s are satisfied for each agent

As all workers in a group provide same effort,
from group 1's F.O.Cs, (4) and (6),

$$v'(r_{11}) = \frac{z\lambda(N_1 - 1)}{1 - \lambda} v'(r_{i1}) \tag{7}$$

NOTE: if z and λ go up, enforcer works more (free riding). Implicit function $r_{11}(z, \lambda, N_1, r_{i1})$. Also group 1's prob. winning

$$\pi_1 = \frac{r_{i1}(N_1 - 1) + z r_{11}}{R} \tag{8}$$

implicit function $r_{i1}(\pi_1, z, \lambda, N_1, R)$ after using (7).
We can eliminate the enforcer's F.O.C. and keep only

$$\text{F.O.C. } \frac{1}{R}(1 - \pi_1)\frac{1 - \lambda}{N_1 - 1} - v'(r_{i1}) = 0.$$

Equilibrium and Existence

An equilibrium is now a vector of success probabilities that add up to 1

$$\sum_{i=1}^{m} \pi_i - 1 = F^{m+1}(\pi_1, ..., \pi_m) \tag{9}$$

and a positive number R such that for group k π_k satisfies

$$\frac{1}{R}(1-\pi_k)\frac{1}{N_k} - v'(r_{ik}) = F^k(\pi_k, N_k, R) \tag{10}$$

, for $k \neq 1$. Recall $\pi_k = \frac{R_k}{R}$. And for the enforcer group 1, π_1 satisfies

$$\frac{1}{R}(1-\pi_1)\frac{1-\lambda}{N_1-1} - v'(r_{i1}) = F^1(\pi_1, z, \lambda, N_1, R) \tag{11}$$

Marginal benefit is decreasing in π_1 and marginal cost is increasing in π_1, $\pi_1 \uparrow F^1 \downarrow$. Thus, implicit function $\pi_1(z, \lambda, N_1, R)$,
Strictly decreasing in R as marginal benefit decreases and marginal cost increases. Same for any group, thus (9) has a unique solution.

Comparative Statics when Enforcer is more Effective

Next, we compare the sum of expected payoffs in a group that contains an enforcer and another given group with one member less, which does not contain an enforcer. We make this comparison when the equilibrium is fixed (R is given) by increasing N_1 and z pretending that the former is continuous. We also carry out the comparison when the equilibrium changes.

In the first scenario, we find that the derivative of the sum of the expected payoffs with respect to z in group 1, evaluated at $\lambda = \frac{1}{N_1}$ and $z = 1$, is positive.

This result implies that the total differential evaluated at $\lambda = \frac{1}{N_1}$ and $z = 1$ of the sum of payoffs in group 1 when both dz, $dN_1 > 0$ is always positive if dz is high enough.[1]

[1] It is known that if the size of a group N_i increases in a cross-section, individual payoffs in the group and hence, the sum among the original members goes down whenever the prize is private; see Esteban and Ray (2001), Proposition 3.

Enforcer more Effective when Total Effort is Constant

Lemma

Given an equilibrium (that is, given R), the derivative of the probability of winning in group 1 with respect to the effectiveness of the enforcer is

$$\frac{d\pi_1}{dz} = -\frac{F_z^1}{F_{\pi_1}^1} > 0 \tag{12}$$

$$\frac{1}{R}\left(1-\pi_1\right)\frac{1-\lambda}{N_1-1} - v'\left(r_{i1}\right) = F^1\left(\pi_1, z, \lambda, N_1, R\right)$$

$v'\left(r_{i1}\right)$ is the MC of increasing π_1. As π_1 goes up, r_{i1} and r_{11} go up; $v'\left(r_{i1}\right)$ goes up in turn. If z goes up, for fixed π_1, the MC curve shifts down as r_{i1} and thus, r_{11} goes down. Note r_{i1} goes down more as for free riding. A higher π_1 is required. Final effect on r_{i1} is undetermined. We show it goes down. *If z goes up, the identical workers provide less effort and hence all the increase in π_1 is due to the increase in the enforcer's effort level.* We prove their payoffs go up. Sum with enforcer too.

Enforcer more Effective when Total Effort Changes

Lemma

Suppose that there are m groups, one of which includes the enforcer. Then, the total derivative of R with respect to z (that is, when the equilibrium changes), is equal to

$$\frac{dR}{dz} = \frac{-F_z^1 \left(-1\right)^{1+m+1} \prod_{t=2}^{m} -F_{\pi_t}^t}{B + F_R^1 \left(-1\right)^{1+m+1} \prod_{t=2}^{m} -F_{\pi_t}^t} > 0 \tag{13}$$

If the enforcer gets stronger, the probability of winning of his group π_1 goes up given a level of total effort R. Hence, for sum of probabilities equation to still be valid, R has to go up. Note that π_k for $k \neq 1$ goes down. Thus, "war is more likely when conquest is easy". For empirical support, see Van Evera (1998).[2]

[2] A similar effect is generated by an increase in the number of members in group i, N_i in Esteban and Ray (2001) but with identical members when marginal costs are strictly increasing enough. However, we are able to obtain the associated analytical derivative.

Enforcer more Effective when Total Effort Changes

We have shown, if $z \uparrow$, $R \uparrow$. If an adequately effective enforcer is added to a coalition of identical workers, the individual payoffs of the workers still increase[3]. Further, the sum of payoffs in the new coalition is higher than the sum of their members' payoffs in the original coalition structure as the enforcer's outside option is zero. Finally, this merging generates negative spillovers on the other coalitions[4].

[3] This occurs even though a higher aggregate effort diminishes payoffs of workers. We show that the marginal benefit of war goes down and its marginal cost goes up. This implies lower probability of winning and lower payoffs.

[4] Consistent with the important association found between corruption and income inequality. See Gupta et al (2002) and Rose-Ackerman and Palifka (2016).

Coalition Formation Conjectures

Using the rejector-proposes protocol, we show that only the coalition of the enforcer and one of the workers form in the model with fixed effort and perfect enforcement. If MPL is high enough there is no corruption even with temporary agreements.