Parties, Revolution and Democrazation*

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Preliminary and Incomplete

June 20, 2007

Abstract

In this study we investigate the relationship between the party and the likelihood and patterns of revolution. Revolution to democracy is modelled as asymmetric global games with public goods, then the coordiation problem between a large party and a continum of citizens (masses) under incomplete information are highlighted. By separating the payoff to revolution participants into heterogeneous insititutional return (the payoff from democratic regime) and subsidy (private return from revolution), we show that the presence of party unambiguously reduces the subsidy necessarily to spur revolution, thus favors democrazation. Moreover, we outline the interrelation between political resources and incentives on stimulating revolution, characterize different types of revolution and the corresponding equilibrium strategies, namely one-side action initiated by the party and party-led masses revolution, by the magnitude of revolutionary cost relative to payoffs and party's size. Finally, we discuss the policy implication, connect the theory with real world, and suggest the efficient ways to promote democrazation under different circumstances.

1 Introduction

*I would like to thank Antoni Calvo-Armengol for his inspiring suggestions and his patient and insightful discussion with me. The valuable comments from Liguo Lin, Joel Sobel, and Lan Yao, and the generous help from Amil Dasgupta are highly appreciated. The financial support from Generalitat Catalunya, Spain is also acknowledged.

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An important feature of democratic politics is the central role of party in political competition, and existing literatures on political science either only address the formation of party in democracy, or emphasize the potential of party in revolution (see Acemoglu and Robinson, 2005). However, few take these two lines of research together to analyze the effects of democratic party system in individual decisions to participate revolution. To fill this gap, this paper formulates the expectation about personal status in future democratic parties-politics, investigates the appropriate incentives for citizens to take part in revolution, and characterize different types of revolution.

In this study we focus on the coordination problem between a large party and a continum of ordinary citizens under incomplete information concerning the strength of autocracy. To concentrate on the issues of interest, we implicitly assumes that revolution always leads to democracy. Motivated by Cabrales et al (2007), the underlying assumption regarding payoffs is that a revolutionary party, since it enjoys some advantages in first democratic election, is able to reward its supporters more than other citizens within the constitutional limits. Therefore, whether to participate revolt actually involves the choice to become the supporter of leading party in democratic regime. Formulating revolution against autocratic regime as asymmetric global game, we study the ways to stimulate citizens to undertake the transition to democracy. Furthermore, the conditions for the emergence of different types of revolution, ranging from masses revolution to one-side action, are identified. We show that the existence of an opposition party, regardless its action, increases the likelihood of revolution, thus benefits democratisation.

Our model extends the asymmetric global game of Carsetti et al (2004) to the problem of provision of public goods. In our environment there is a nation constituted of countryside and urban, and ruled by an autocratic regime. The citizens lived in urban (resp. country) are denoted as workers (resp. peasants). A party could form among workers to play against the ruler, while the peasants could not be organized due to the lack of efficient communication means. Revolution is equal costly and risky activities for all citizens. And revolution succeeds only once the mass to participate revolution reaches a critical level, the strength of autocratic regime. Therefore, the coordination problem naturally arises. Generally, multiple Nash equilibrium arise, one is all citizens will coordinate to fight against the autocracy, and another is coordination failure. Once revolution succeeds, all citizens enjoy the *institutional returns* brought by democratic regime, which may be heterogeneous among citizens, conditional on their own actions and the party system. Moreover, the participants receive some additional direct private return, which is defined as *subsidy* here. If there is no revolution, everyone receive the same *status quo* return which is normalized to zero.

But, citizens only receive noisy signal concerning this critical level. And due to the lack of freedom of press, the citizens cannot communicate freely with each other and reach consensus unless they are organized together. Hence, the absence of common knowledge among players arises and inspires us to apply the methodology of global games (Carlsson and van Damme 1993, Morris and Shin, 2003) to select the unique equilibrium.

In this context, we want to examine two scenarios about coordination regime switch. In one scenario, there is no organized group against the autocracy. In this circumstance, due to the fact that they have trivial chance to influence the consequence of revolution, the only incentive for the citizens to take part in the uprising is the direct subsidy targeted to every participant. In another scenario the urban workers are organized into a unique organization (for example, trades unions). In this environment, this party brings forward heterogeneous return to citizens in future democracy. We study the equilibrium threshold strategies in both scenarios, compare in which context it's more likely to have successful revolution according to the relative size of subsidy required to induce revolution. We show that the presence of party and heterogeneous institutional returns reduce the subsidy, thus promote the revolution. Particularly, we find that the party and peasants have quite different incentives to join revolution due to their different strength to affect the consequence. If the size of party is large, their information concerning the strength of autocracy is accurate, then revolution is likely to happen even without the involvement of any peasants. Hence the prospect of democracy itself encourages some people to engage in revolution.

1.1 Motivation, methodological discussion and literatures review

The motivations of this research are the unsatisfactory account about the individual incentives to actively participate revolution in traditional rational choice methodology, and the lack of characerization about the patterns of revolution.

By and large, the revolution and its consequences are public goods. For example, the basic services to citizens in democratic regime, such as protection of property rights, just court, franchise. And in a large society the individual influence on the consequence of revolution is negligible. Furthermore, revolution is high risky activities. Therefore, standard rational choice theory predicts widespread free-ride among ordinary citizens in revolution participation. Hence, it could only appeal to *ad hoc* ideology or excludable

pecuniary benefits to fix the collective action problem. Thus they cannot "offer clear predictions about when we see democracy" (Glaeser, 2007).

Moreover, revolutions with quite different patterns, namely the masses revolution, party-led masses-participation revolution, and one-side revolution with silent masses, coexist in the world history. For example, the instances of masses revolution without involvement of any parties range from the beginning of French Revolution (though quickly parties formed afterward) to the recent nation-wide demonstrations which led to the collapse of old regime in Kyrgyzstan, 2005. The typical party-led transitions to democracy include African National Congress who led the transition to New South Africa, as well as the *Orange Revolution* in Ukraine. Paris Commune is the most well-known on the list of one-side revolution. However, to the best of our knowledge, economic theory hasn't provided any accounts about the various patterns of revolution yet.

There are two reasons to adopt the methodology of global games. First, theoretically, revolution typically is a coordination game, which famously give rise to multiple equilibria. As Carlsson and van Damme (1993) noted, relaxing the common knowledge among players would remove the multiplicity of equilibria. Hence modelling revolution as global games sheds lights on selecting the unique equilibrium. Second, beside the pure theoretical interest, an important pattern in autocracy is the strict control of press, so citizens lack both the precise information regarding the strength of rulers, and the efficient means to communicate with remote to achieve the coordination against the autocracy.

The concentration on the size of subsidy also has two sources. The appropriate magnitude of subsidy is a concept relative to the size of cost, thus to study subsidy indeed is to understand the return/cost level to participate revolution, which is in line of most literatures on collective action. And in the final section we focus on the interrelation between the cost level and the patterns of revolution. Moreover, a recent pattern of sudden democrazation is the more and more active role of external power, either the government-backed CIA, VOA, or the NGOs such as Soros Foundation. Consequently to some extent the subsidy becomes a policy instrument to promote revolution and democrazation. Hence, studying the subsidy indeed helps us to point out the appropriate policy and crucial element to initiate revolution. Actually, our model is more plausible to analyze the sudden successful revolution to democracy ranging from the revolution wave in Germany and Imperial Austro-Hungary after WWI, to the *Color Revolutions* among former Soviet countries around 2005.

This piece of work is an extension of Corsett et al (2004). In their work the size effects and informational effects of large trader (Soros) on small traders

in attacking monetary regime is concerned. Here as a complementary we highlight the influence of the party on the incentives of peasants to join revolution. Hence, the party not only may induce the individual citizens more aggressive by its information advantages or size effects, but also alter the incentives faced by the individual citizens.

In a seminal study Aumann and Myerson (1988) discuss the role of imperfect information in the formation of minimal winning coalition. Chamley (1999) studies the dynamic expectation evolution in social changes and revolution, but his account is not in the language of common knowledge and his model is quite special. Inspired by the original ideas of Schelling (1978) and Granovetter (1978), Chwe (1999) stresses the role of social structure in triggering revolt. Myatt (2007) applies global games to analyze strategic voting. Atkeson (2000) and Edmund (2003) adopt global games to study riot and political transition, respectively. However, They all share the premise that *status quo* generates the exactly same payoff as staying out, thus ignore the crucial fact that a revolution is public good that when it occurs it changes the whole of society. On the theoretical side, in a model of production coordination, Herrendorf et al (2000) emphasize that the heterogeneity of payoff to agents sometimes leads to uniqueness and stability of equilibrium. Karp et al (2004) indicate the non-monotonic equilibria in the presence of congestion effects. Morris and Shin (2002) highlight the provision of public good under incomplete information regarding the cost in contributing, and show that sometimes the threshold equilibrium may not exist.

This paper is organized as the follows: Section 2 present the structure of this revolutionary games, specify the payoff to different types of agents, and address the benchmark case that there is no party. Section 3 is devoted to characterizing the equlibrium threshold strategies, and indicates that the presence of revolutionary party and heterogeneous institutional return reduces the size of private return to motivate individuals. The characterization of different types of revolution is demonstrated in section 3.3. Section 4 investigates two illuminating special circumstances, one is there are no institutional returns, and the other is the noise obeys uniform distribution. Using the previous analytical framework, Section 5 explores the interrelation of incentives and political resources in promoting revolution, and connects them with real-world evidences. Section 6 concludes and suggests some directions for future studies. Some proofs of propositions are contained in Section 7 as appendix.

2 The Model Setting

2.1 Players

2.1.1 Urban workers

There is a party organized among workers denoted by P, which has members accountinf for $\lambda < 1$ of population. We assume that the coordination problem within party is solved and all party members take the same action[1].

2.1.2 Country peasants

The share of peasants in the population is a continum with mass $1-\lambda$, peasants are not organized, thus each peasant has no influence on overall outcome. A typical peasants is denoted as i, $\int di = 1 - \lambda$.

2.1.3 Autocratic regime

It has strength θ to repress the revolution. θ is a random variable choosen by the Nature. If the mass to undertake revolution exceeds θ, then the old regime is overthrown, otherwise it is retained.

2.2 Payoff structure:

To fix the free-rider problem in revolution, we introduce a couple of assumptions about the payoffs to players.

The first one is the heterogeneous institutional returns among citizens, depends on their action in revolution. It comes from the fact that though democracies are situations of relative political equality, there still exist some excludable return to the supporters of winning party of election, such as redistribution and targeted transfers. We assume that if the party joins the revolution, it's more likely to become the winner of the first election under new democracy[2], thus the revolution participants enjoy "revolutionary premium". However, if only peasants join the revolution, afterward new

[1] In terms of Cabrales et al (2007), the repression from autocracy targets to every member of the revolutionary party, rather than conditional on the action of a particular member. Hence, once the underground party approves the revolution, the dominant strategy for every clandestine member is to participate revolution.

[2] For example,it will be praised by the citizens, it receives more media exposure and is more influential among voters.

party system forms and this premium disappears, all parties have the equal likelihood to win the election.

The second one is that citizens could get some private return from successful revolution, in addition to the institutional return from democracy. This assumption sounds plausible. Consider the real-world example, the riot usually comes with the undisciplined masses revolution. For instance, in Kyrgyzstan, 2005, with the nation-wide demonstration, serious loots toward foreign merchants happened. These loots constitute private return to the participants. On the other hand, even in a well-organized revolution, to obtain wider supports from citizens, the revolutionary party will give them some excludable private return, such as the land and wealth redistribution toward supporters. Furthermore, another relatively new source of private return to individual participants comes from the outside sponsors, for example, Soros Fundation and CIA funded the participants of demonstration against the government in Orange Revolution in Ukraine. Finally, there may exists perceived "social" benefit of participating in a successful revolution in addtion to the material economic benefit of joining revolution (Persson and Tabellini, 2006). These private returns in our paper are generally defined as *subsidy*.

We assume that the cost to engaging in revolution is c equally for Party and peasants, and they are common knowledge among players. The space of action a_j ($j \in \{P, i\}$) is $\{0,\ 1\}$, 0 corresponds to inactive, while 1 represents participating revolution. The value to successful revolution to each type of citizen is $V_j(a_P, a_i)$. And the mass of citizens who participate revolution is denoted by ℓ. Therefore the payoff to citizens is:

$$U_j = \begin{cases} V_j(a_P, a_i) - ca_j & \text{if } \ell \geq \theta \\ -ca_j & \text{if } \ell < \theta \end{cases} \qquad (2.1)$$

The special payoff structure below is due to Cabrales et al (2007), who take the post-revolution negotiation into account to derive the payoff to revolutionarists. We suggest readers to refer to their work for the underlying intuitions. Briefly speaking, under democratic regime the fundamental expected value to every citizen is v. Besides, due to the discretion by the party in power, there is additional value to the supporters of the winner party in the first election after revolution, which is denoted by k. These payoffs are *institutional returns* to citizens. Beside, there is *subsidy* to the citizens who participate revolution, which is represented by q. Therefore, the expected discounted stream of payoffs for the first-election winner (resp. loser) in the new democratic regime is $v + k + q$ (resp. $v + q$).

If the party participates revolution, then in the new democracy the participating workers and peasants automatically become the supporters of this

revolutionary party, and the party has probability $p > 0.5$ to win the first election. Thus the present value for revolution participants is $v_h \equiv v + pk$, plus private return q. Other inactive peasants get the equal payoff $v_l \equiv v + (1-p)k$.

Second, if only unorganized peasants are involved in revolution, then the urban party has no advantages in new democracy, thus all citizens have equal likelihood to become a member of the winning party in the first election. Besides, the uprising peasants enjoy additional private return q. Therefore, the payoff to every inactive citizen is the same $v_m \equiv v + \frac{1}{2}k$, while for the uprising peasants are $v_m + q$.

2.3 Timing and infromation structure of this games

The information structure is that players receive a private signal concerning the strength of autocracy, and they have to decide whether to participate uprising simultaneously. Similar to Morris and Shin (2002), as a working hypothesis here, each player assumes that all other player using the switch strategies around some common-known cut-off levels regarding the strength of autocracy. These threshold levels may be different among different types of players, namely, the party members or unorganized peasants. To simplify analysis we ignore the collective action problem within a party. This assumption induces us to address the coordination games between organized urban workers and peasants in asymmetric global games.

There are four stages in this revolution game.

Stage 1. The Nature chooses the state of world (the strengh of autocracy) θ.

Stage 2. Both the party and peasants observe an informative private signal concerning the realization of θ.
For the party, the private signal is $y = \theta + \tau\eta$. η is a random variable with mean zero and smooth symmetric density $g(.)$[3]. For a typical peasant, his signal is $x_i = \theta + \sigma\epsilon_i$, ϵ_i distributed according to a smooth symmetric density function $f(.)$ with mean zero. $\epsilon_i \sim i.i.d.$ η and ϵ_i are indenpendent.

[3]Here we ignore the information aggregation problem within the party. It's quite plausible that each member in a party receives different private signal about the realization of θ. However, the existence of party provides a platform for the members to communicate and reach consensus about the state of nature. Therefore, in reality the constant τ and random variable η reflect the role of party in information aggregation.

Stage 3. Parties and peasants simultaneously decide whether to participate revolution. If $\ell > \theta$, then the old regime is overturned and revolution succeeds, otherwise the game ends.

Stage 4 and afterward. The citizens[4] negotiate on new constitutions, then turn to the election, and democracy consolidates. For details see Cabrales et al (2007).

A charcteristic here and already familiar from the literatures of global games is that regardless how small σ and τ is, the realization of θ is not common knowledge among the players. Upon receiving his signal, the typical peasant i can form the estimation regarding the value of θ, and the distribution of signals being received by the other citizens in this country, as well as of their estimate of θ. However, he cannot, believe in that the other citizens know what he knows—and agree with his guesses, due to the lack of communication within peasants and between peasants and workers. Therefore, the peasants and the party will have to rest exclusively on their own information to form their beliefs. This departure from the assumption of common knowledge of the fundamentals, no matter how small, is key to the results to follow. The ratio of the constants σ and τ represents the relative precision of the information of the two types of citizens. A player's strategy is a rule of action which projects his signal to one of two actions—to participate revolution, or to refrain. We will search for Bayes–Nash equilibria of the game in which, conditional on each player's signal, the action prescribed by this player's strategy maximizes his expected payoff, conditional upon that all other players also follow their equilibrium strategies

2.4 Benchmark Case: No Party

Before touch our main task to solving the games outlined above, we present a brief discussion about the coordination revolution problem under a special case $\lambda = 0$ to set up our benchmark case, and later compare the outcome of asymmetric games with the benchmark case to study the impact of presence of parties.

The case that $\lambda = 0$ leads to the symmetric game case. Using similar version as Corsetti et al (2004) and McBride (2006), we will conduct the discussion in terms of switching strategies in which citizens participate revolution if the signal falls below a critical value x^*. In accord with the payoff

[4]Regardless whether the parties join the revolution, they still could participate the constitution negotiation process. This condition reflect the fact that democratic regime is pure public good, it could not exclude some citizens from the design of new constitution.

structure explained before, if old regime collapses, each participated citizen obtain $v_m + q - c$, while inactive citizen get v_m. The unique equilibrium can be characterized by a critical value of the nature θ^* such that the old regime will always falls if its strength is lower than it, and a critical value of the individual signal x^* such that individuals receiving a signal below this value will always participate revolution. To derive these two critical values, note first that, if the true state is θ^* and citizens participate only if they observed a signal below x^*, the probability that any particular citizen receives a signal below this level is

$$\Pr(x_i < x^* \,|\theta\,) = F(\tfrac{x^*-\theta}{\sigma}) \qquad (2.2)$$

Since the noise terms $\{\epsilon_i\}$ are i.i.d, the mass to participate revolution ℓ, as well as the probability to have a successful revolution, is equal to the R.H.S in (2.2). We know that a revolution will succeed only if $\ell \geq \theta$. The critical value θ^* , if exists, is where this holds with equality. Therefore, the first equilibrium condition - a "critical mass condition"- is

$$F(\tfrac{x^*-\theta^*}{\sigma}) = \theta^* \qquad (2.3)$$

Then, consider the optimal threshold strategy for a citizen receiving a informative signal x_i, given the common knowledge about θ^*. The citizen has the conditional probability of a successful uprising of

$$\Pr(\theta < \theta^* \,|x_i\,) = F(\tfrac{\theta^*-x_i}{\sigma}) \quad (2.4)$$

and hence joins revolution if and only if his expected gross payoff from participating is at least as high as the payoff from refraining. Since any individual citizen has negligible impact on successful probability, he treat the probability of success as parametric, and only private return q is concerned. Therefore, the expected payoff to participate revolution, given the informative signal x_i, is

$$F(\tfrac{\theta^*-x_i}{\sigma})(v_m + q) - c \quad (2.5)$$

while the expected payoff from not participating is

$$F(\tfrac{\theta^*-x_i}{\sigma})v_m \qquad (2.6)$$

A typical citizen will joins revolution if and only if

$$F(\tfrac{\theta^*-x_i}{\sigma})(v_m + q) - c \geq F(\tfrac{\theta^*-x_i}{\sigma})v_m$$

namely,

$$F(\frac{\theta^*-x_i}{\sigma})q \geq c \qquad (2.7)$$

Then we could derive the first proposition regarding the existence and characterizations of the cut-off strategy x^*.

Proposition 1 *If $\lambda = 0$, the trigger strategy x^* for a citizen constitutes a equilibrium, and could be characterized as the following conditions:*

- *If $q < c$, then x^* doesn't exist.*
- *If $q \geq c$, then $x^* = 1 - \frac{c}{q} - \sigma F^{-1}(\frac{c}{q})$, $\theta^* = 1 - \frac{c}{q}$*

Proof. *First we show the existence of equlibrium, then we characterze it.*

- *Because $F(\cdot) \leq 1$, if $q < c$, then $F(\frac{\theta^*-x_i}{\sigma})q < c$. thus no revolution occurs. Otherwise, for $q \geq c$, we always could find some $x_i \in R$ such that $F(\frac{\theta^*-x_i}{\sigma})q \geq c$.*
  Define x^* as the solution to $F(\frac{\theta^*-x^*}{\sigma})q = c$. Because $F(\frac{\theta^*-x_i}{\sigma})$ is monotone decreasing in x_i, we have for any private signal received by a citizen $x_i \leq x^*$, $F(\frac{\theta^*-x_i}{\sigma})q \geq F(\frac{\theta^*-x^*}{\sigma})q = c$, so this citizen joins revolution;and for $x_i > x^*, F(\frac{\theta^*-x_i}{\sigma})q < F(\frac{\theta^*-x^*}{\sigma})q = c$, citizen won't take part in. Therefore, x^* is the equilibrium strategy.
- *Solving the equations $F(\frac{\theta^*-x^*}{\sigma})q = c$ and $F(\frac{x^*-\theta^*}{\sigma}) = \theta^*$, we obtain $\theta^* = F(-F^{-1}(\frac{c}{q})) = 1 - F(F^{-1}(\frac{c}{q})) = 1 - \frac{c}{q}$,and $x^* = \theta^* - \sigma F^{-1}(\frac{c}{q}) = 1 - \frac{c}{q} - \sigma F^{-1}(\frac{c}{q})$.*

■

We immediately find out that to guarantee the existence of the above cutoff conditions, we need to specify the relative magnitude of the subsidy from revolution q and the cost c. If $q < c$, there won't be any revolution and the old regime maintains, regardless of the strength of autocracy. Thus in the current context the lower bound of private return q in favor of revolution is c. The probability to have a successful revolution, given the value of $\theta < 1$, therefore is $F\left(\frac{1}{\sigma}\left(1 - \frac{c}{q} - \theta\right) - F^{-1}\left(\frac{c}{q}\right)\right)$. Hence, given $q \geq c$, the probability for democrasation is follows:

$$\begin{cases} 1 & \text{if } \theta < 0 \\ F\left(\frac{1}{\sigma}\left(1 - \frac{c}{q} - \theta\right) - F^{-1}\left(\frac{c}{q}\right)\right) & \text{if } 0 \leq \theta < 1 \\ 0 & \text{if } \theta \geq 1 \end{cases}$$

3 Games with one party and masses

Here we briefly outline the equlibrium of this games. In line with research in games with incomplete information (Milgrom and Weber, 1982, Athey, 2001, Morris and Shin, 2003), in the current asymmetric games we focus on the cutoff strategies equilibrium. Namely, there exists pairs $\{x^*, y^*\}$ such that if $y \leq y^*$, the Party participates revolution, otherwise not; and if $x_i < x^*$,peasant i joins revolution, otherwise not. In the later section we will show that this switching strategy constitutes equilibria, and iis the unique dominance solvable equilibrium. Moreover, we identify the conditions to guarantee the existence of the trigger equilibrium. Intuitively, the existence of threshold strategies depends on the magnitude of return to successful revolution, either institutional or private, and the cost to participate uprising. To clarify this point, given other things, we study the lower bound of subsidy to permit the existence of the trigger strategies.

Definition 2 $q^* = \inf\{q\}$ *such that* $\{x^*, y^*\}$ *exists.*

q^* could be understood as the minimal size of subsidy necessarily to encourage the players to undertake switching strategies. If at least one variable of the two-tuple exists, then there are at least some citizens participate the revolution and hence some likelihoods that the autocracy falls and democracy comes. Therefore, q^* indeed is the minimal requirement to make democrasation possible.

3.1 The switching strategies

We now consider the case that all urban residents are organized into one party, namely Party A, which has the strength $1 > \lambda > 0$. This case takes us into the methodology in Corsetti et al (2004) on asymmetric equlibrium strategies, where small traders and one large trader follow the equililibrium trigger strategies tuple (x^*, y^*).

In line with Corsetti et al (2004), we define

$$(1-\lambda)F(\tfrac{x^*-\underline{\theta}}{\sigma}) = \underline{\theta} \qquad (3.1)$$

whenever θ is below $\underline{\theta}$, the revolution succeeds irrespective of the action of the urban party; and

$$(1-\lambda)F(\tfrac{x^*-\overline{\theta}}{\sigma}) + \lambda = \overline{\theta} \qquad (3.2)$$

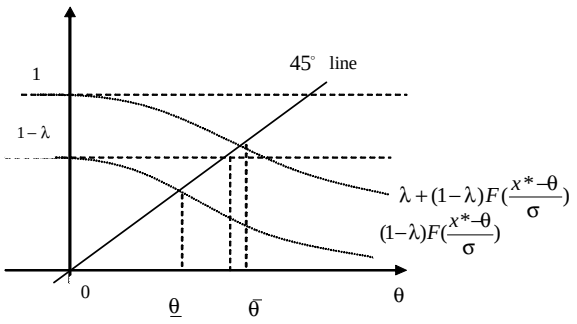

Figure 1: Occurrence of Revolution at θ with party and farmers

where $\overline{\theta}$ is defined as the critical value of the fundamentals at which the revolution is successful if and only if the unique revolutionary party (organized by all urban citizens) participates. Figure 1 depicts the derivation of these critical values. Clearly, $\overline{\theta} \geq \underline{\theta}$.

The party observing signal y assigns probability $G(\frac{\overline{\theta}-y}{\tau})$ to the event that $\theta \leq \overline{\theta}$. His expected payoff to participating revolution conditional on y is $G(\frac{\overline{\theta}-y}{\tau})(v_h+q)-c$, while his expected payoff to inactivity is $G(\frac{\underline{\theta}-y}{\tau})v_m$. We emphasize the threshold strategy y^*, namely the optimal strategy is to participate if and only if $y \leq y^*$. Obviously, y^* exists if and only if the expected payoff to participating is higher than that to standing out. Hence the condition $G(\frac{\overline{\theta}-y}{\tau})(v_h+q)-c \geq G(\frac{\underline{\theta}-y}{\tau})v_m$ should be satisfied. Consequently, y^* is defined by

$$G(\tfrac{\overline{\theta}-y^*}{\tau})(v_h+q)-G(\tfrac{\underline{\theta}-y^*}{\tau})v_m = c \qquad (3.3)$$

We need to give the characterization about the existence condition of y^*. Figure 2 intuitively illustrates the reasonings.

By change of variables, we use the notation that $s \equiv \frac{\overline{\theta}-y^*}{\tau}$, and $\Delta\theta = \overline{\theta}-\underline{\theta}$ and rewrite (3.3) as

$$G(s)(v_h+q) = c + G(s-\tfrac{\Delta\theta}{\tau})v_m \quad (3.4)$$

Graphically, the task is to ensure that there is a horizontal line passing through $c+G(s-\frac{\Delta\theta}{\tau})v_m$ and $G(s)(v_h+q)$ sequentially. And for adding any small $\varepsilon > 0$ to y^*, this line will be rotated to southeastern, which means

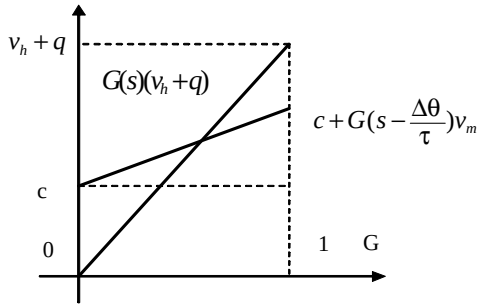

Figure 2: The existence condition of y^*

that participating revolution generates lower return than inactivity provided that the party receives signal $y > y^*$; and vice versus, this line wll become upward to northeastern by reducing any $\varepsilon > 0$ to y^*, which implies that for any signal $y < y^*$, undertaking revolution brings forward higher payoffs.

Lemma 3 *$q_y = \min\{0, c - v_h\}$ represents the minimal subsidy to spur the party to adopt threshold strategy.*
Proof. *It's obvious that $G(s), G(s - \frac{\Delta\theta}{\tau}) \in [0,1]$, $G(s) \geq G(s - \frac{\Delta\theta}{\tau})$. The L.H.S, the payoff to revolution, is bounded above from v_h+q, while the R.H.S, the opportunity cost of participation, has lower-bound c. From now on we treat $G(s)$ and $G(s - \frac{\Delta\theta}{\tau})$ as independent variables.*
First, $c \leq v_h - v_m + q$, thus $G(s)(v_h + q)$ and $c + G(s - \frac{\Delta\theta}{\tau})v_m$ intersect on $G(s) = \frac{c}{v_h+q-v_m}$. Since $G(s) \geq G(s - \frac{\Delta\theta}{\tau})$, we have that equilibrium threshold strategy, if exists, makes the probability to join revolution smaller than $\frac{c}{v_h+q-v_m}$, thus $s \leq G^{-1}(\frac{c}{v_h-v_m+q})$, $y^* \geq \overline{\theta} - \tau G^{-1}\left(\frac{c}{v_h-v_m+q}\right)$.
If $v_h - v_m + q < c < v_h + q$, which means that these two lines have no intersection in the range $[0,1]$, but we still could find s such that (3.4) holds. Since the R.H.S of (3.4) is strictly larger than c, we have $G(s) > \frac{c}{v_h+q}$, thus $s \geq G^{-1}(\frac{c}{v_h+q})$, $y^* \leq \overline{\theta} - \tau G^{-1}\left(\frac{c}{v_h+q}\right)$
Otherwise, if $c > v_h + q$, (3.4) never holds.

Moreover, since $q \geq 0$, we have that to ensure the existence of y^*, $q \geq \min\{0, c - v_h\}$. ■

Lemma 3 imposes the minimal general restriction on the magnitude of subsidy to ensure the existence of y^*, but the specification of q_y relies on the

specification of political environment, such as information structure, and the power of party. We leave it to later analysis on special examples. However, Lemma 3 unambiguously demonstrates that with heterogeneous institutional return due to party system, revolution is likely to happen even without any subsidy. This fact is in strong contrast with the rigious condition $q \geq c$ in the circumstance without party.

Hence the threshold level for the party is implicitly defined by the following equation:

$$y^* = \overline{\theta} - \tau G^{-1}\left(\frac{c-\left(G(\frac{\overline{\theta}-y^*}{\tau})-G(\frac{\underline{\theta}-y*}{\tau})\right)v_m}{v_h-v_m+q}\right)$$

Thus y^* is a function with respect to $\overline{\theta}$ and $\underline{\theta}$, consequently x^*. By differentiating the L.H.S of (3.3) we have:

$$\frac{d}{dy}\left(G(\frac{\overline{\theta}-y}{\tau})(v_h+q)-G(\frac{\underline{\theta}-y}{\tau})v_m\right)\Big|_{y=y^*} = -\frac{1}{\tau}\left[g(\frac{\overline{\theta}-y^*}{\tau})(v_h+q)-g(\frac{\underline{\theta}-y^*}{\tau})v_m\right]$$

So y^* is an equilibrium if

$$\frac{g(\frac{\overline{\theta}-y^*}{\tau})}{g(\frac{\underline{\theta}-y^*}{\tau})} > \frac{v_m}{v_h+q} \quad (3.5)$$

which implies that for signal $y \in (y^*, y^*+\varepsilon), \varepsilon > 0$, the return difference between action and no action is strictly smaller than the cost to participate revolution, and vice versus for $y \in y \in (y^*-\varepsilon, y^*)$. So in this interval y^* is the optimal strategy. Moreover, if $\frac{g(\frac{\overline{\theta}-y}{\tau})}{g(\frac{\underline{\theta}-y}{\tau})} > \frac{v_m}{v_h+q}$ holds for all y, which is called "(3.5) holds *globally*", then y^* is the unique equilibrium.

Conditional on signal x, the posterior density over θ for a peasant is given by $\frac{1}{\sigma}f(\frac{\theta-x}{\sigma})$. The probability that the party will participate at θ, given his cutoff strategy around y^*, is given by $G(\frac{y^*-\theta}{\tau})$. Thus the expected payoff for a typical peasant to join revolution is

$$\frac{1}{\sigma}[\int_{-\infty}^{\underline{\theta}} f(\frac{\theta-x}{\sigma})\left(G(\frac{y^*-\theta}{\tau})(v_h+q)+\left(1-G(\frac{y^*-\theta}{\tau})\right)(v_m+q)\right)d\theta] + \frac{1}{\sigma}[\int_{\underline{\theta}}^{\overline{\theta}} f(\frac{\theta-x}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta](v_h+q)$$

while the payoff to inactivity is

$$\frac{1}{\sigma}[\int_{-\infty}^{\underline{\theta}} f(\frac{\theta-x}{\sigma})\left(G(\frac{y^*-\theta}{\tau})v_l+\left(1-G(\frac{y^*-\theta}{\tau})\right)v_m\right)d\theta] + \frac{1}{\sigma}[\int_{\underline{\theta}}^{\overline{\theta}} f(\frac{\theta-x}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta]v_l$$

We should note that the action of party affects not only *ex ante* but *ex post* payoff to peasants. When $\theta < \underline{\theta}$, though the involvement of the party have no contribution to the success of revolution, it changes peasant's future status in democratic politics. If the party join revolution, the peasants who undertake revolution automatically become the supporter of this party and enjoy the benefits from the revolutionary premium of the party. Otherwise, they get equal institutional return as other silent peasants. This political mechanism works in opposite direction for those peasants who is neutral toward uprising.

Therefore, the trigger point x^* for the peasant is implicitly defined by the equation:

$$\frac{(v_h-v_l)}{\sigma}\int_{-\infty}^{\overline{\theta}} f(\frac{\theta-x^*}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta+\frac{q}{\sigma}\int_{-\infty}^{\underline{\theta}} f(\frac{\theta-x^*}{\sigma})d\theta+\frac{q}{\sigma}\int_{\underline{\theta}}^{\overline{\theta}} f(\frac{\theta-x^*}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta=c \tag{3.6}$$

The first term is the portion of expected institutional return difference between action and no-action attributable to the action of party. The second term presents the share of expected private return that is attributable to the interval $(-\infty,\underline{\theta}]$. The third term captures the portion of expected subsidy that is attributable to the interval $(\underline{\theta},\overline{\theta}]$. Here the peasant must take into consideration the fact that the revolution is successful if and only if the party also joins.

Notice if (3.5) holds, then by differentiating (3.1)-(3.3) we have $\frac{dy^*}{dx^*}=\frac{d\overline{\theta}}{dx^*}=\frac{d\underline{\theta}}{dx^*}$. Taking differentiate of (3.6) with respect to x^*, we have

$$\frac{d}{dx}\left(L.H.S.of\ \ (3.6)\right)<0$$

It implies that for any signal received $x > x^*$, engaging to revolution brings the peasants strictly fewer benefits than refraining, and vice versus for $x < x^*$. Therefore, the x^* satisfies (3.6) consists an equilibrium.

It's similarly to show that to permit that the peasant's trigger strategy x^* is well defined, we need additional condition on the size of subsidy.

Define $z\equiv\frac{\theta-x^*}{\sigma}$, $\underline{\delta}\equiv\frac{\underline{\theta}-x^*}{\sigma}$, $\overline{\delta}\equiv\frac{\overline{\theta}-x^*}{\sigma}$, and denote $T\equiv\frac{c-\left(G(\frac{\overline{\theta}-y^*}{\tau})-G(\frac{\underline{\theta}-y^*}{\tau})\right)v_m}{v_h-v_m+q}$, we have the definition of q_x.

Definition 4 *q_x measures the minimal subsidy necessarily to attract representative peasants to devote to uprising, which is defined by:*
$\int_{-\infty}^{\underline{\delta}} f(z)\left[G\left(\frac{\sigma}{\tau}(\overline{\delta}-z)-G^{-1}(T)\right)(v_h-v_l)+q_x\right]dz+(v_h-v_l+q_x)\int_{\underline{\delta}}^{\overline{\delta}} f(z)G(\frac{\sigma}{\tau}(\overline{\delta}-z)-G^{-1}(T))dz-c=0$ *(3.7)*
where $z\in(-\infty,+\infty)$.

So far we could characterize q^*, the existence condition of these two threshold strategies, namely $q^* = \min\{q_x, q_y\}$.

Lemma 5 *If $1 > \lambda > 0$, then $q_x \geq q_y$, and $q^* < c$, namely the presence of party reduce the critical level of q to attract the peasants to participate revolution.*

Remark 6 ***Proof.*** *see the appendix.* ■

Lemma 5 clearly shows the incentive effects of party, party system itself change the incentives of citizens, and make the revolution easier.

Finally we reach the formal definition and proposition of the threshold strategies equilibrium.

Proposition 7 *A trigger strategies equilibrium for all citizens, if exists due to $q \geq q^*$, is given by the tuple of switching strategies $\{x^*, y^*\}$ and the tuple of critical levels $\{\underline{\theta}, \overline{\theta}\} \in [0,1]^2$, such that:*
(i) $\{\underline{\theta}, \overline{\theta}\}$ solves:
$(1-\lambda)F(\frac{x^*-\underline{\theta}}{\sigma}) = \underline{\theta}$ *(3.1)*
$(1-\lambda)F(\frac{x^*-\overline{\theta}}{\sigma}) + \lambda = \overline{\theta}$ *(3.2)*
(ii) Given $\{\underline{\theta}, \overline{\theta}\}$, y^* is the optimal reaction of the party:
$G(\frac{\overline{\theta}-y^*}{\tau})(v_h + q) - G(\frac{\underline{\theta}-y^*}{\tau})v_m = c$ *(3.3)*
and $\frac{g(\frac{\overline{\theta}-y^*}{\tau})}{g(\frac{\underline{\theta}-y^*}{\tau})} > \frac{v_m}{v_h+q}$ *(3.5)*
(iii) Given y^*, x^* consists the best reaction of the peasants:
$\frac{v_h-v_l}{\sigma}\int_{-\infty}^{\overline{\theta}} f(\frac{\theta-x^*}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta + \frac{q}{\sigma}\int_{-\infty}^{\underline{\theta}} f(\frac{\theta-x^*}{\sigma})d\theta + \frac{q}{\sigma}\int_{\underline{\theta}}^{\overline{\theta}} f(\frac{\theta-x^*}{\sigma})G(\frac{y^*-\theta}{\tau})d\theta = c$
(3.6)

Furthermore, this equilibrium, if exists and (3.5) holds globally, is the unique, dominance solvable equilibrium.
Proof. *see the appendix.* ■

The argument of the assertation above can be understood easily by the conditions identified in the studies on supermodular games (Milgrom and Roberts, 1990, Vives, 1990, 1999)

3.2 Analysis of equilibrium: general distribution of noise

So far we construct the system of equations to characterize the trigger equilibrium, if it exists. In general, there is a formidable obstacle to provide

clear-cut results concerning the equilibrium strategies tuple $\{x^*, y^*\}$ and the critical level $\{\overline{\theta}, \underline{\theta}\}$. And it's even difficult to assert whether these trigger strategies consist the unique equilibrium of this game.

To ensure that y^* consists a equilibrium, (3.8) is required, but we have no idea about the general properties of $G(\cdot)$, hence it's not ensured that the trigger strategy y^* is an equilibrium for general distribution. Harsanyi and Selten (1988) suggest to adopt special distribution about the perturbation to select the equilibrium, thus in later section we will work out some examples to characterize the threshold strategies as the unique equilibrium. Here we just provide an analysis concerning the general results in the limiting case with very precise information regarding the strength of old regime.

Here we use the limiting case that both party and peasants have precise information regarding the strength of old regime to illustrate this intuition, namely, $\tau \to 0, \sigma \to 0$, and $\frac{\sigma}{\tau} \to r$.

Lemma 8 *If $\tau \to 0$, then if threshold strategy exists, then the unique rationalizable threshold strategy for the party is $y^* = \overline{\theta}$.*

Proof. *see the appendix.* ■

Lemma 7 characterizes that in the limiting case the optimal trigger strategy $y^* = \overline{\theta}$. Therefore, in the limit, the party always undertakes revolution at states to the left of $\overline{\theta}$, but stays out at states to the right of $\overline{\theta}$. In terms of Figure 1, the occurence of revolution will follow the top curve $(1-\lambda)F(\frac{x^*-\overline{\theta}}{\sigma})+\lambda$ till $\overline{\theta}$, and then jump down to the bottom curve thereafter. Similarly, if there always are sufficient subsidy for the peasants to join revolution, namely $q > q_x$ always holds, then when the peasants also have very precise information, their switching strategies must be such that they join revolution precisely when the true state is to the left of $\overline{\theta}$. Hence in the limit we have

$$x^* = y^* = \overline{\theta}$$

and the autocracy is overturnned if and only if $\theta < \overline{\theta}$.

From Figure 1 we can distinguish two cases regarding the critical state $\overline{\theta}$ in the limiting case. As σ becomes small, both curves becomes steeper, and converges to their step function around $\overline{\theta}$, respectively. However, we can still distinguish the case that $\overline{\theta} \leq 1-\lambda$ from the case that $\overline{\theta} > 1-\lambda$. In the former case, both step functions intersect the 45 degress line at $\overline{\theta}$, so that $\overline{\theta} = \underline{\theta}$. But, when $\overline{\theta} > 1-\lambda$, the lower step function intersects the 45 degree line at its horizontal portion, so that $\underline{\theta} < \overline{\theta}$. we summarize the general characterization of the equilibrium value of $\overline{\theta}$ in the following proposition:

Proposition 9 *If $\lambda > 0, q \geq q_x$, in the limit as $\sigma \to 0, \tau \to 0$, and$\frac{\sigma}{\tau} \to r$, then*
i) the optimal trigger strategy is $x^* = y^* = \overline{\theta}$, and the critical state $\overline{\theta}$ tends to $\lambda + (1-\lambda)(1 - F(\overline{\delta}))$,where $\overline{\delta}$ falls under two case. If $\overline{\theta} > 1 - \lambda$, then $\overline{\delta}$ is the solution to
$(v_h - v_l + q) \int_{-\infty}^{\overline{\delta}} f(z) G\left(r(\overline{\delta} - z) - G^{-1}(T)\right) dz = c \quad (3.9)$
If $\overline{\theta} \leq 1 - \lambda$, then $\overline{\delta}$ is the solution to
$\int_{-\infty}^{L} f(z) \left[G\left(r(\overline{\delta} - z) - G^{-1}(T)\right)(v_h - v_l) + q\right] dz + (v_h - v_l + q)$
$\int_{L}^{\overline{\delta}} f(z) G\left(r(\overline{\delta} - z) - G^{-1}(T)\right) dz = c \qquad (3.10)$
where $L = F^{-1}(F(\overline{\delta}) - \frac{\lambda}{1-\lambda})$

Proof. *See Corsetti et al (2004), it follows the proof of proposition 3 there closely.* ■

It's noteworthy that in the analysis about equilibrium above we impose the restriction that there always exists sufficient subsidy to stimulate peasants to join revolution. We leave the detailed discussion concerning the role of this assumption into the next subsection. However, here a brief comparison between the environment with party and that without is still useful. Recall in Proposition 1 we characterize the existence condition of trigger strategy, which depends on the relative magnitude of private return and cost. Compare these two cases, we notice that in the absence of organized citizens, the condition $q > c$ should be satisfied to maintain the possibility of revolution. However in the presence of a party, this condition is relaxed, since becoming the supporter of revolutionary party brings more institutional return than inactivity. Compared with the unorganized society, in the presence of one revolutionary party, revolution could succeed with lower private return. So the lower bound of subsidy q to achieve success in revolution reduces, and democrasation is easier to be achieved.

3.3 Size of subsidy and the prospects of revolution

Now we highlight the relationship between magnitude of subsidy and the incidence of revolution. To concentrate on it, now we assume that there is an equilibrium in the trigger strategies described above. If the size of subsidy is large enough to attract the party and some peasants to undertake threshold strategies, then the probability of successful uprising, given the strength of autocracy $\theta \in [\underline{\theta}, \overline{\theta})$, relies exclusively on the action of the party. In this context this probability is $G\left(\frac{y^* - \theta}{\tau}\right)$, the likelihood of the party to join revolution, provided that it receives signal θ. Otherwise, $\theta < \underline{\theta}$ ensures

a successful democrasation regardless the action of party, while $\theta \geq \overline{\theta}$ implies the impossibility of successful revolution. Thus the probability that the autocracy is overthrown at state θ is

$$\begin{cases} 1 & \text{if } \theta < \underline{\theta} \\ G\left(\frac{y^* - \theta}{\tau}\right) & \text{if } \underline{\theta} \leq \theta < \overline{\theta} \\ 0 & \text{if } \theta \geq \overline{\theta} \end{cases}$$

An interesting issue is to explore the possibility of one-side action by the party. It's easy to show that $c \geq q_x > q_y$. To see this assertation, we note that the L.H.S. of (3.6) is strictly increasing in q, and the L.H.S. of (3.6) is strictly negative if $q = q_y$, while positive for some z if $q = c$. Therefore, If the subsidy q locates within the interval $[q_y, q_x]$, then equation (3.3) no longer effects, since no individual citizen has the incentives to join revolution. However, the party still could take trigger strategy in equilibrium, which leads to one-side revolution. This possibility corresponds to the the events such as Paris Commune, 1871.

Following the reasoning in proceeding section, since all peasants stay out, the party observing signal y will assign probability $G(\frac{\lambda - y}{\tau})$ to the event that $\theta \leq \lambda$, which is the probability of successful one-side action. Now his expected payoff to carry out revolution, conditional on y, is $G(\frac{\lambda - y}{\tau})(v_h + q) - c$, while his expected payoff to inactivity is 0. To guarantee the possibility of one-side action, we need $q \geq c - v_h$. And by Lemma 3 the existence of one-side action is permitted.

His equilibrium strategy thus is to participate if and only if $y \leq y^{**}$,where y^{**} is defined by

$$G(\tfrac{\lambda - y^{**}}{\tau})(v_h + q) = c \qquad (3.11)$$

We could derive $y^{**} = \lambda - \tau G^{-1}(\frac{c}{v_h + q})$. Clearly the L.H.S. of (3.11) is decreasing in y^{**}, thus y^{**} is the unique solvable dominance equilibrium. So the probability that the party undertake one-side uprising at θ is given by $G\left(\frac{\lambda - \theta}{\tau} - G^{-1}(\frac{c}{v_h + q})\right)$. Now we complete the identification of one-side revolution.

Therefore, we reach the final proposition summarizing the patterns of revolution.

Proposition 10 *If $1 > \lambda > 0$, given the vector of institutional returns $\{v_h, v_m, v_l\}$, and critical subsidy level $\{q_y, q_x\}$ then:*

- *If $q < q_y$, then there is no revolution.*

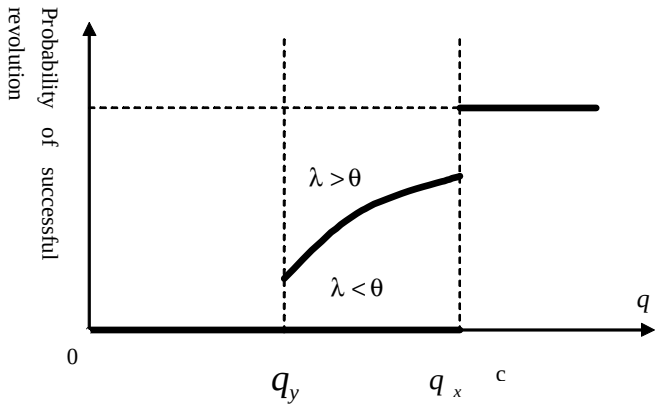

Figure 3: Probability to have successful democrazation as function of q, given $\theta < \underline{\theta}$

- *If $q_y \leq q < q_x$, there is one-side revolution initiated by urban party alone, and the probability that the autocracy will collapse at state θ is*

$$\begin{cases} G\left(\frac{\lambda-\theta}{\tau} - G^{-1}(\frac{c}{v_h+q})\right) & \text{if } \theta \leq \lambda \\ 0 & \text{otherwise} \end{cases}$$

- *If $q \geq q_x$, the urban party and some individual peasants undertake the uprising, and the probability that the revolution succeeds is*

$$\begin{cases} 1 & \text{if } \theta < \underline{\theta} \\ G\left(\frac{y^*-\theta}{\tau}\right) & \text{if } \underline{\theta} \leq \theta < \overline{\theta} \\ 0 & \text{if } \theta \geq \overline{\theta} \end{cases}$$

We illustrate the possible behavior of the probability of revolution in Figure 3.

4 Illustrative Examples

So far we have proposed switching strategies for the players to decide whether to undertake revolution, and we give some preliminary results about equilibrium in general case. Due to the difficulty to analyse the general situation, in this section we highlight two special cases. In the first example we concentrate on the context that there is no institutional return, so only subsidy motivates citizen to initiate the rebellion. In the second one the uniform distribution of noise is concerned.

4.1 Case I: only subsidy

First we study the equilibrium strategies in an extreme case that there is no institutional returns, which could be understood as no democracy comes after the uprising, then the revolution just changes the name of the dictator. Thus only private return stimulates citizens to join revolution. The paramters we set therefore are $\lambda > 0, q \geq c$ and $v_h = v_m = v_l = 0$. This case could be compared with the benchmark case that $\lambda = 0$ and $q \geq c$.

Therefore, Using the notation $\underline{\delta}$ and $\overline{\delta}$, in this context the equations characterizing the threshold equilibrium could be rewritten as the follows:

$$\begin{gathered}(1-\lambda)(1-F(\underline{\delta})) = \underline{\theta} \\ (1-\lambda)(1-F(\overline{\delta})) + \lambda = \overline{\theta} \\ G(\tfrac{\overline{\theta}-y^*}{\tau})q = c \\ q\int_{-\infty}^{\underline{\delta}} f(z)dz + q\int_{\underline{\delta}}^{\overline{\delta}} f(z)G\left(\tfrac{\sigma}{\tau}(\overline{\delta}-z) - G^{-1}(\tfrac{c}{q})\right)dz = c\end{gathered}$$

Follow the methodology in Corsetti et al (2004), the trigger equilibrium identified above is the only strategy that survive the iterated elimination of strictly interim dominated strategies. Hence the switching strategies around $\{x^*, y^*\}$ is a unique, dominance solvable equilibrium.

Then we confine to the properties of the equilibrium in the limiting case where $\sigma \to 0, \tau \to 0$, and$\frac{\sigma}{\tau} \to r$. In other words, both party and peasants have precise information.

Proposition 11 *If $\lambda > 0, q \geq c$ and $v_h = v_m = v_l = 0$, in the limit as $\sigma \to 0, \tau \to 0$, and$\frac{\sigma}{\tau} \to r$, then*
the optimal trigger strategy is $x^* = y^* = \overline{\theta}$, and the critical state $\overline{\theta}$ tends to $\lambda + (1-\lambda)(1-F(\overline{\delta}))$,where $\overline{\delta}$ falls under two case. If $\overline{\theta} > 1-\lambda$, then $\overline{\delta}$ is the unique solution to
$q\int_{-\infty}^{\overline{\delta}} f(z)G\left(r(\overline{\delta}-z) - G^{-1}(\frac{c}{q})\right)dz = c \quad (4.1)$
If $\overline{\theta} \leq 1-\lambda$, then $\overline{\delta}$ is the unique solution to
$q\int_{-\infty}^{L} f(z)dz + q\int_{L}^{\overline{\delta}} f(z)G\left(r(\overline{\delta}-z) - G^{-1}(\frac{c}{q})\right)dz = c \quad (4.2)$
where $L = F^{-1}(F(\overline{\delta}) - \frac{\lambda}{1-\lambda})$

Proof. *The proofs follow Corsetti et al (2004) Proposition 3, only the return changes from unit in their paper to q here, other arguments remain exactly the same.* ■

In this limiting case, the critical state $\overline{\theta}$ is no lower than the corresponding equilibrium strategy in the context of peasants only. Therefore, we conclude

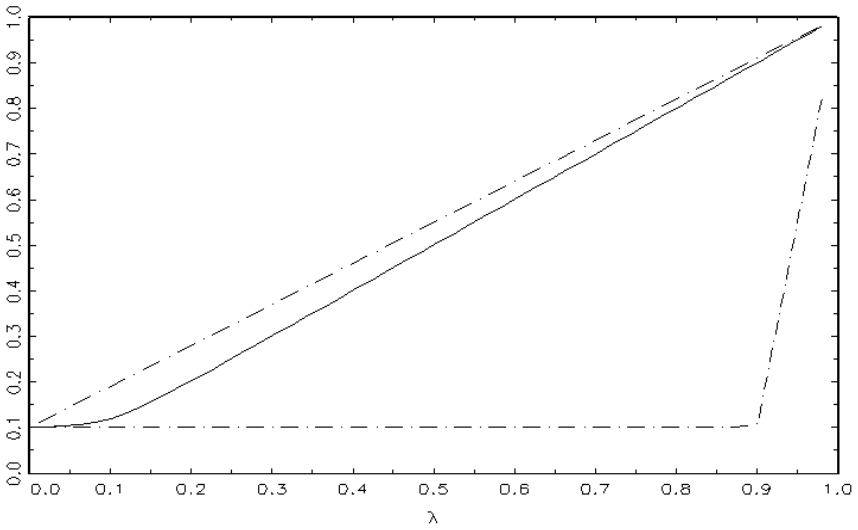

Figure 4: $\overline{\theta}$ at $r = 1$ as function of λ; $\frac{c}{q} = 0.9$, $\tau = \sigma = 0.01, v_h = v_m = v_l = 0$

that in the limiting case of precise information, under the same size of subsidy, the presence of party increases the likelihood of successful uprising. Hence, even if the current party could not impact the social fundamental, its existence also threats the autocracy. This explains why most autocratic countries are single-party regime, and only the masses organizations under the direct control of government are allowed.

Analogus to the results in Corsetti et al (2004), Figure 4 reports the simulation exercise where $\tau = \sigma = 0.01$, $\frac{c}{q} = 0.9, F$ and G are standard normal. The upper dotted line is the solutions for $\overline{\theta}$ in the special case $r \to \infty$, while the lower dotted line is $\overline{\theta}$ when $r \to 0$, and the solid line is the plot for $\tau = \sigma = 0.01$ as λ varies.

However, the general comparison concerning the relative size of $\overline{\theta}$ and $\underline{\theta}$ away from the limit don't have a definitive answer, and it seems that it depends on various factors, such as the relative size of q and c, and the specification about the distribution of noise.

4.2 Case II: uniform distributed noise

In our revolution game, free-rider problem naturally arises, thus general analysis of equilibrium is a formidable issue. However, it will largely simplify the analysis if we assume that the noise in private signal, η and ε_i are

independent random variable drawn uniformly from finite intervals, as the premise employed in Karp et al (2004). Morris and Shin (2002) also point out the particular significance of using uniform distribution to study strategic uncertainty. This methodology actually is in the spirit of Harsanyi and Selten (1988). In next section we demonstrate that this assumption is fruitful in the analysis of the critical cost conditions for various types of revolution. The uniform drawn noise assumption leads to the following claim concerning the difference between $\overline{\theta}$ and $\underline{\theta}$.

Claim 12 *If η and ε_i are drawn independently from uniform distribution, then $G(\frac{\overline{\theta}-y^*}{\tau}) - G(\frac{\underline{\theta}-y*}{\tau})$ is unique.*

Proof. *Suppose $\eta \sim U(-a,a)$, $\varepsilon_i \sim U(-b,b)$, $a,b \geq 0$, then $g(\cdot) = \frac{1}{2a}$, $f(\cdot) = \frac{1}{2b}$. Therefore $G(\frac{\overline{\theta}-y^*}{\tau}) - G(\frac{\underline{\theta}-y*}{\tau}) = \int_{\frac{\underline{\theta}-y*}{\tau}}^{\frac{\overline{\theta}-y^*}{\tau}} g(t)dt = \frac{1}{2a}\frac{\overline{\theta}-\underline{\theta}}{\tau}$*

By integrating (3.1) with (3.2), we have

$\overline{\theta} - \underline{\theta} = \lambda - \frac{1-\lambda}{2b}\frac{\overline{\theta}-\underline{\theta}}{\sigma}$

so $\overline{\theta} - \underline{\theta} = \frac{\lambda}{1+\frac{1-\lambda}{2b\sigma}}$ *(4.3)*

Hence we have $G(\frac{\overline{\theta}-y^*}{\tau}) - G(\frac{\underline{\theta}-y*}{\tau}) = \frac{1}{2a\tau} \cdot \frac{\lambda}{1+\frac{1-\lambda}{2b\sigma}}$, which only depends on the size of party λ, and the size of noises a, b, and the degree of information precision σ and τ. ■

Denote $K \equiv G(\frac{\overline{\theta}-y^*}{\tau}) - G(\frac{\underline{\theta}-y*}{\tau})$, so we have

$$K = \frac{\lambda}{2a\tau + \frac{a}{b}\frac{\tau}{\sigma}(1-\lambda)} = \frac{\lambda}{\frac{\tau}{g(y)} + \frac{a}{b}\frac{1}{r}(1-\lambda)}$$

Therefore, we have that since $G(\frac{\overline{\theta}-y^*}{\tau}) \in [0,1]$, by equation (3.3) q should satisfy that $0 \leq \frac{c-Kv_m}{v_h-v_m+q} \leq 1$, so

$$q_y = \min\{c - (v_h - v_m) - Kv_m, 0\}$$

and the additional restriction on parameters are

$$c - Kv_m \geq 0.$$

Using the notation $\underline{\delta}$, $\overline{\delta}$ and z again, we restate the key relationship that determine switching strategies as follows:

$$(1-\lambda)(1-F(\underline{\delta})) = \underline{\theta} \qquad (4.4)$$

$$(1-\lambda)(1-F(\overline{\delta})) + \lambda = \overline{\theta} \qquad (4.5)$$

$$G(\tfrac{\overline{\theta}-y^*}{\tau})(v_h - v_m + q) + Kv_m = c \qquad (4.6)$$

$$\int_{-\infty}^{\underline{\delta}} f(z)\left[G\left(\tfrac{\sigma}{\tau}(\overline{\delta}-z) - A\right)(v_h - v_l) + q\right]dz + (v_h - v_l + q)\int_{\underline{\delta}}^{\overline{\delta}} f(z)G\left(\tfrac{\sigma}{\tau}(\overline{\delta}-z) - A\right)dz = c \qquad (4.7)$$

where A is a constant independent with threshold levels $\{x^*, y^*\}$ and critical states $\left\{\overline{\theta}, \underline{\theta}\right\}$.

Since for all $\theta \in \left(\underline{\theta}, \overline{\theta}\right)$,

$$1 - \frac{c - Kv_m}{v_h - v_m + q} < G\left(\frac{\sigma}{\tau}(\overline{\delta} - z) - A\right) < 1$$

so the L.H.S. of (4.7) is strictly less than $F\left(\frac{\overline{\theta} - x^*}{\sigma}\right)(v_h - v_l + q)$, and

$$v_h - v_l + q > c$$

is required to ensure the existence of x^*.

Therefore we have under unifrom distribution of noise

$$q_x = \min\left\{c - (v_h - v_l), 0\right\}$$

If the 2-tuple $\{x^*, y^*\}$ that solves (4.6) and (4.7) exists, then it's an equilibrium. To see this assertation, first note that the payoff to the party is strictly decreasing with respect to y^*. Then by the definition of $\underline{\delta}$, $\overline{\delta}$, together with $\underline{\theta}$ and $\overline{\theta}$, we have

$$\frac{d\underline{\delta}}{dx^*} = -\frac{1}{\sigma + (1-\lambda) f(\frac{x^* - \underline{\theta}}{\sigma})} < 0$$
$$\frac{d\overline{\delta}}{dx^*} = -\frac{1}{\sigma + (1-\lambda) f(\frac{x^* - \overline{\theta}}{\sigma})} < 0$$

Straightforward calculus shows that under uniform distribution assumption the L.H.S of (4.7) is strictly increasing in both $\overline{\delta}$. Though it's ambiguous with respect to the change in $\underline{\delta}$, since under uniform distribution assumption $\frac{d\overline{\delta}}{dx^*} = \frac{d\underline{\delta}}{dx^*}$, the possible negative influence of x^* to the L.H.S though $\underline{\delta}$ is entirely offest by the change in $\overline{\delta}$, therefore $\frac{d(L.H.S)}{dx^*} < 0$. Hence, the solution to (4.7) satisfies the equilibrium condition, so threshold value $\{x^*, y^*\}$ consist an equilibrium. Once x^* is determined, the urban party's switching point y^* follows from (4.7). Therefore, the system of equations (4.4)-(4.7) jointly determine the trigger strategies equilibrium, namely the switching points x^* and y^*,and the critical state $\overline{\theta}$ and $\underline{\theta}$.[5]

[5] Another way to show that $\{x^*, y^*\}$ constitutes an equilibrium is to apply distributional strategies equilibrium. See Milgrom and Weber (1985) for the definition and conditions of distributional strategies, and Karp et al (2004) for the applications in global games. Briefly, since the action set is finite and given θ, the set of signal for every player is also finite, thus according to Theorem 1 in Milgrom & Weber (1985), there exists an equilibrium point in distributional strategies. Moreover, the cutoff strategies could be written as distributional strategies. Then with some trivial assumptions on variance of noise σ and τ, the threshold strategy could be shown as an equilibrium.

5 Applications: Promoting revolution–political resources or incentives?

Unsatisfied by the paramount highlights on the role of incentives in democ-

tazation process among economists, Glaeser (2007) suggests to pay more attentions to political resources. In this subsection, we extend previous framework to analyze the interrelation between political resources (λ) and incentives (q, v_h, v_m, v_l). In the following part we stick to the uniform distribution of noise, and concentrate on the critical size of c, since if q is fixed, critical level of c measures the critical magnitude of incentives to initiate revolution.

Now we turn to the charcterization of the actions of party and individual peasants. By the two conditions in previous section 4.2, we can separately discuss the different regions of cost to generate different form of revolutionary behaviors.

When $c \leq Kv_m$, namely cost locates in region I in Figure 5. Then the party always undertakes revolution regardless signal y, and $G\left(\frac{\sigma}{\tau}(\overline{\delta} - z) - A\right)$ degenerates to unit. Be sure about this fact, the individual citizens who adopt threshold strategy obtain $F\left(\frac{\overline{\theta}-x^*}{\sigma}\right)(v_h + q) - c$ if join revolution, and $F\left(\frac{\overline{\theta}-x^*}{\sigma}\right)v_l$ if refrain. Thus now the threshold strategy exists if and only if $c \leq v_h - v_l + q$, otherwise no peasant joins revolution. Thus if $c \leq \min\{Kv_m, v_h - v_l + q\}$, then the peasants who receive signal $x \leq x^*$ join, and the size of revolutionarist force is $\overline{\theta}$, $\overline{\theta}$ and x^* are defined as the follows:

$$\overline{\theta} = \lambda + (1-\lambda)\left(1 - \frac{c}{v_h - v_l + q}\right)$$
$$x^* = \overline{\theta} - \sigma F^{-1}\left(\frac{c}{v_h - v_l + q}\right)$$

and if $v_h - v_l + q < c \leq Kv_m$, there is one-side revolution by the party alone.

If cost locates in region II, $Kv_m \leq c \leq v_h - v_m + q + Kv_m$, the party adopts threshold strategy, and taking this strategic uncertainty into account, the peasants also take threshold strategy if the maximum of the L.H.S. of (4.7) is larger than the cost c. By the derivation of q_x in this context, $v_h - v_l + q > c$ is required to ensure the existence of x^*.

Hence if $Kv_m \leq c \leq \min\{v_h - v_m + q + Kv_m, v_h - v_l + q\}$, then both side undertake threshold strategies, which is the solution to equations (4.4) - (4.7).

But if $v_h - v_l + q \leq c \leq v_h - v_m + q + Kv_m$, as indicated in region III, then only the party take threshold strategy, the strategic complementaries between party and peasants disappears, and the size of revolutionarist force is only the size of party λ, as described in section 3.3.

If $c > v_h - v_m + q + Kv_m$, which is the cost is placed into region Iv in Figure 5. Then the party never participate revolution. Therefore, the only possible incentive for peasants to uprise is the private return q. However, since $c > q$ also holds in this context, the subsidy doesn't suffice attracting the peasants. Hence there is no revolution.

Hence we have the following conditions regarding the action of party and individual citizens, which is illustrated in Figure 5. For the party it's:

$$\begin{cases} c < Kv_m & \text{The party always initiates revolution} \\ Kv_m \leq c \leq v_h - v_m + q + Kv_m & \text{The party uprises if } y \leq y^* \\ c \geq v_h - v_m + q + Kv_m & \text{The party never participates revolution} \end{cases}$$

and for the peasants it's:

$$\begin{cases} c \leq v_h - v_l + q & \text{The peasants take part in revolution if } x \leq x^* \\ c > v_h - v_l + q & \text{The peasants never join revolution} \end{cases}$$

Hence again the different incentives for party and peasants are presented.

With the framework above, we could analyze the interrelation between the political resources, λ, and the the magnitude of incentives, c.

By the definition of K, we find that it's strictly increasing in λ. And whenever $\lambda = 0$, $K = 0$, and $\lambda = 1$, $K = \frac{1}{2a\tau}$. In Figure 5, it's clear that increasing in q will move the high line entirely upward.

Intuitively, the incentive for the party, due to its non-negligible impact on the consequence of revolution, is increasing in both the ex post return from revolution and the strength of the party. Hence for the party the "critical incentives" and political resources are interrelated. However, for the peasants the critical incentives is a horizontal line $c = v_h - v_l + q$, condition on $c \leq v_h - v_m + q + Kv_m$. Figure 5 illustrates the differences graphically. For example, If there are homogeneous institutional return, and the subsidy is zero, then no citizen will engage into revolution, although the party still may join revolution. We also note that in both region I and region III it's likely to have one-side revolution.

To ensure the existence of threshold strategy y^* for any parameters regarding λ, we need

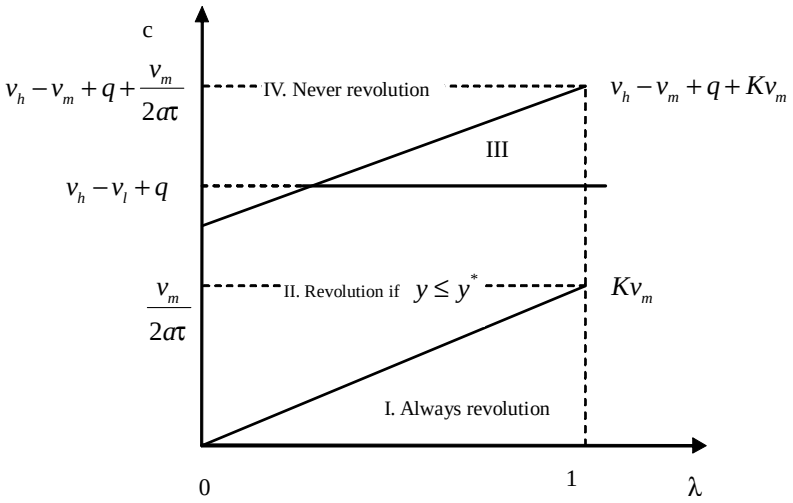

Figure 5: The decision of citizens and the scale of cost, as function of λ

$$Kv_m \le c \le v_h - v_m + q + Kv_m \qquad (5.1)$$

which impose the upper and lower bound conditions on c to ensure the existence of y^*.

Equation (5.1) implies that in different political and economic circumstances, there are different efficient ways to stimulating revolution, raising incentives only works in limited scope.

If the first inequality fails, namely the cost is low and locates in region I, then the sufficiently strong party will abandon threshold strategies, and take pure strategy to always initiate revolution. It implies that if the average institutional return v_m is high, the information is accurate (τ becomes small), and a large part of citizens are well-organized, then the old regime actually hardly sustains since democratic revolution always happens. Hence, for a high urbanization autocratic country with big underground political organization, the best ways to stir democratisation are the promise of aid to future democracy and the *VOA*. That's what happened in the transitions of many East-European countries such as Poland. In this environment conveying more precise information to the party is more efficient than subsidying its members.

On the other hand, if the second inequality doesn't hold, then for the party the threshold strategy also fails. Alternatively, the party choose to stay out of any revolution. Then, since everyone has negligible impact on

the consequences, the relative cost to participate revolution becomes too high for every individual. Thus it's impossible to have any revolution. As to policy implication, to make democratic revolution immediately possible in poor agrarian country, the only efficient way is to financing each participants directly.

The above analysis shows the different roles of the party size and subsidy in stimulating the party to adopt threshold strategies. Consider the observations of revolutionary party in real world. If we interprete the party who takes threshold strategy as "opportunist party", and the party always initiate revolution as "rigid opposition"[6], then given the cost to join uprising, the emergence of opportunistic party and rigid opposition depends on the size of party, the democratic value and the subsidy. Albeit the increases in subsidy and party size both raise the likelihood of revolution, the increasing subsidy only encourages the opportunistic behavior, while the development of party also motivates rigid opposition action. Hence, here large private incentive only buys opportunistic behavior, while high value of democracy as public good attracts those revolutionarists who are ready to devote to the risky revolution. Money may buy revolution, but not rigid revolutionarists.

We summarize our findings for promoting democratic revolution as follows.

1. The critical level of cost to prevent revolution is increasing in the political resource of party (λ) and the size of personal incentives (q). The larger the strength of party, the higher the subsidy targeted to revolution participants, the easier to have revolution.

2. Personal incentives and political resources have different effects on inspiring party to undertake revolution. Increasing personal incentives only encourage the opportunistic revolution behavior, and have no effects for the rigid opposition party. On the other hand, strong party is more likely to take rigid action than the weak one.

3. If democracy becomes more attractive to every citizen (v_m increases), and the party is larger, then revolution becomes easier, even in the absence of any heterogenous institutional returns ($v_h = v_m = v_l$). It has the same effects on rigid and opportunistic behavior.

4. However, as to stirring individual citizen to join revolution, incentives are crucial. Higher subsidy inspires more peasants to participate, while

[6]This notation could be illustrated clearly by setting $v_h = v_m = v_l$. Then in region I the rigid opposition fights for public good which values v_m, but in region II the opportunistic behavior is solely aiming to get private return.

homogeneous institutional returns, regardless the magnitude, reduce the incentives of peasants. The political resources in the hand of party has ambiguous effects on individual decision to participate revolution. When $K \leq \frac{v_m - v_l}{v_m}$, the increase in the size of party raises the critical cost level, thus ease the individual revolutionary action. But when $K > \frac{v_m - v_l}{v_m}$, the party's political resouces only affects the individual threshold level setting.

5. More accurate information has similar effects on revolution as political resources.

How to interprete our results in real world? In another word, does our model match the empirical results? Our model gives credit to both rising force of organized opposition and rising incentives as stimulates of democratization. However, the changes in the size of organized citizens has no effects on the incentives of other citizens, thus only the likelihood of one-side action changes. But increasing in private benefits to participants highers the incentives faced by citizens, thus stimulates revolution and reduces the possibility of one-side action simultaneously.

The effects of changes in institutional return on revolution is not clear-cut. Note that in our model the payoff under nondemocracy is normalized to zero, thus institutional return actually measures the attractiveness of democracy relative to status quo. By the definition of institutional return, the rising in it has two possible sources: rising fundamental values of democracy, or increasing premium to winning party. If the former case happens, then the incentives for individual citizens remain the same, while the party is more likely to take revolution. But if the latter happens, then the scope of opportunistic behavior increases, and the strategic complementaries between party and peasants are presented.

Our model thus could explain the somehow ambiguous relationship between income inequality and democratisation. Przeworski et al (2000) find that neither Gini coefficient nor the ratio of share of total income going to the richest 10% of population and the share going to the poorest 10% has any significant relationsip with democratization. However, they also record "dictatorships...are much more vulnerable when the functional distribution of income is more unequal", as shown in figure 5. It means that democratisation is more likely to happen in societies in which labor receives lower share of value added in manufacturing. Our interpretation of these contrasting empirical evidence is that in poor working-class society, democracy means the redistribution and tax schemes preferred by the majority poor, thus raises v_m and q for urban workers, and consequently, as our finding 2 states, promotes

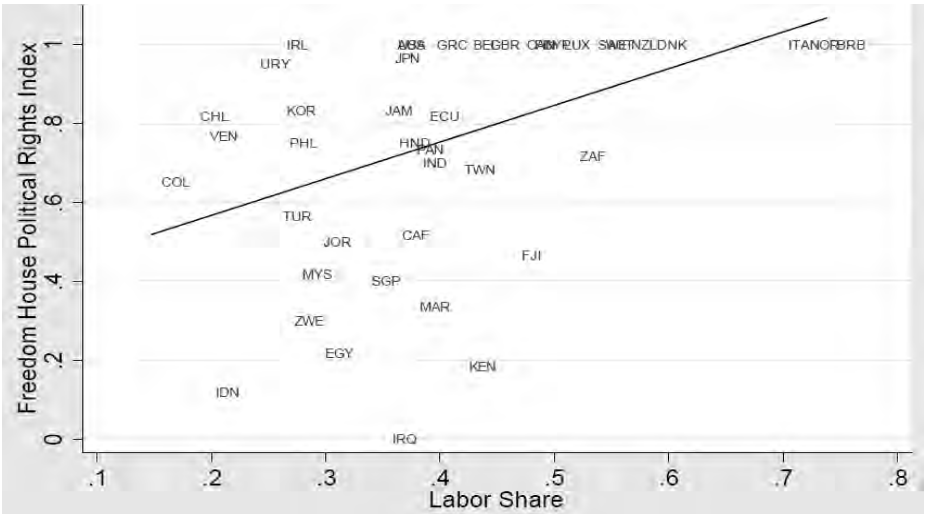

Figure 6: Democrazation and workers' income distribution, 1990s (Source: Acemoglu and Robinson, 2005)

revolution initiated by organized workers. While the other two measures fail to capture the interrelation between incentives and political resources, the within-industry inequality reflects the situation together with the real incentives for the working-class, the group which is easiest to be organized against the nondemocratic regime.

Another observation in real world is the frequent occurrence of students movements against the regime in nondemocratic countries. It's obviously that by the easier access to the rest of the world, similar education background, and social networks among peers, students are better informed about the value of democracy and easily to be organized[7]. However, in reality their demonstrations usually fail to start the transition to democracy, since many citizens keep silence. Traditionally, researchers usually consider the motivation of students as temporary impulse, and appeal to social networks structure to answer the question about how to organized students demonstration, and why it's alone in many instances. However, here we attempt to give an interpretation of these observations from the perspective of incentives.

In most countries, students consist a small but not negligible group, especially in countries with cluster huge universites. By our finding 3, we

[7]The suppress action from government also contribute to the resolve of collective action problem among students. As anecdote, in 1990 Chinese government reduced the enrollment of colleges to half of the level of 1989, as one reaction to the pro-democracy students movement in Tiananmen Square in previous year.

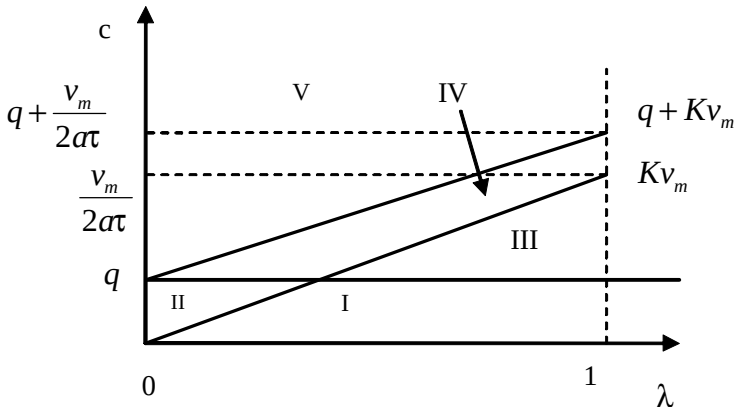

Figure 7: The incentives for students movements, as function with respect to λ

know that the action of this group could be motivated solely by the vision of democracy. Together with finding 5, our theory predicts that the enlighted students could be actively against the autocratic regime.

But, an important fact about students movement is that students could never form as or be represented by an unique party in any democratic society. Therefore, a supporter to students movement could not automatically become a citizen enjoying revolutionary premium in democracy, the uncertainty in the status in new regime is not yet resolved. Hence, the heterogeneous institutional returns disapprear. Figure 6 depicits the incentives structure of students movements. It's clear that organized students are more likely to engage in demonstration.

As finding 4 explains, other unorganized citizens are mostly motivated by the likelihood of heterogeneous institutional return and subsidy, rather than the abstract concept of democracy. Because students and masses have quite different incentives to join revolution, when students feel the strong incentives to initiate movements, the citizens may lack the necessary incentives. Consequently, though the masses also dislike the autocracy and are sympathy to students, they are reluctant to show active support to the movements.

Hence, when the critical cost level locates into region I and II in Figure 7, we could observe the lonely students movements. If the autocracy still hold sufficient power to suppress the students demonstration, the students movements alone fail to reach the critical level to overthrow the old regime.

In our account social networks work, since it help to resolve collective action problem to organize students into a force against the regime. However, the influence of social networks on the consequence of demonstration is

though the changing incentives for citizens. As Figure 7 indicates, in the presence of homogeneous institutional return, any change in the size of student movements could not change the incentives for other citizens. The precision of information also works, on one side it changes the particular equilibrium strategy, on the other hand it alters the incentives of students. Different incentives percived by group and individuals are the underlying force of lonely students movements.

6 Conclusion

In this paper, we extend asymmetric global games to the provision of public goods, and examine the influence of party on the likelihood and patterns of revolution. By the nature of democratic party system, the presence of party change the *ex post* payoff structure, brings the possibility of heterogeneous institutional returns. Consequently it reduces the subsidy necessarily to initiate a successful revolution, thus increase the probability of successful uprising. In a word, the presence of a party increases the likelihood of democratisation.

The emergence of different forms of revolution also depends on the relative magnitude of subsidy, which is represented by the critical level of cost to participate revolution. One-side action and party-led masses revolution are outlined as equilibrium strategies under different magnitude of cost. The emergence of rigid opposition party and opportunist party are also described as equilibrium in various environments characterized by the strength of party and the size of incentives.

Furthermore, we apply our results to provide policy suggestions about promoting revolution, and explain two real world facts: The unclear empirical relationship between income inequality and democrasation, and the frequent occurences of failed students movements against autocracy. It's shown that our asymmetric global games could explain wide range of facts of revolution and democrazation. The applications of this framework to explain other phenomina are waiting for further research.

It noteworthy that in our model there is only strategic complements among citizens. However, once there are more than one organized group against the autocracy, the strategic substitutes effects may be presented. Further studies should concern this important extension, and explore the interaction between various revolutionary groups.

7 Appendix

Proof of Lemma 5

First, we show $q_y \leq q_x$ by contradition. If $q_y > q_x$, then there exist some $q \in (q_x, q_y)$ such that while the party never join revolution, some peasants may participate revolution conditional on the signal $x \leq x^*$. Then we actually return to the situation in Proposition 1, namely $q \geq c$ is required. However, then $q_y > c$, contradict with Lemma 3. Hence $q_y \leq q_x$.

Then, we indicate that for some information structure there exist $q \in (q_x, c)$ such that (3.7) holds. To demonstrate this argument, we just need to show that for some information structure when $q = c$ the L.H.S. of (3.7) is strictly larger than the R.H.S.

Denote the L.H.S. by W as a function with respect to q. Because $G(\frac{\sigma}{\tau}(\overline{\delta} - z) - G^{-1}(T)) \leq 1$, then $W(c) \leq (v_h - v_l + c) \int_{-\infty}^{\overline{\delta}} f(z) = (v_h - v_l + c) F\left(\overline{\delta}\right)$. It's obvious that it's likely that $W(c) > c$. Besides, $W(q)$ is increasing in q. So we could find for some information structure $W(q_x) = c$ and $q_x < c$. This is in clear contrast with the assertation in Proposition 1 that $q \geq c$ is required to guarantee the existence of threshold strategy x^* for the peasants.

Proof of Proposition 6

Here we show that if the switching strategies exist, then the unique equilibrium in switching strategies can be obtained by the iterated deletion of strictly dominated strategies.

Consider the expected payoff to taking part in revolution for a peasant conditional on signal x when all other peasants follow the trigger strategy around $\widehat{x}$, and when the party plays his best response against this cutoff strategy (which is to switch at $y(\widehat{x})$, obtained from (3.3) and by the premise that (3.5) holds for every y) is also the Denote this expected payoff to the peasant as

$$U(x, \widehat{x}) = \frac{v_h - v_l}{\sigma} \int_{-\infty}^{\overline{\theta}(\widehat{x})} f(\tfrac{\theta - x}{\sigma}) G(\tfrac{y(\widehat{x}) - \theta}{\tau}) d\theta + \frac{q}{\sigma} \int_{-\infty}^{\underline{\theta}(\widehat{x})} f(\tfrac{\theta - x}{\sigma}) d\theta + \frac{q}{\sigma} \int_{\underline{\theta}(\widehat{x})}^{\overline{\theta}(\widehat{x})} f(\tfrac{\theta - x}{\sigma}) G(\tfrac{y(\widehat{x}) - \theta}{\tau}) d\theta - c$$

where $\overline{\theta}(\widehat{x}), \underline{\theta}(\widehat{x})$ indicates the value of $\overline{\theta}, \underline{\theta}$ that all other peasants follow the $\widehat{x}$-switching strategy, respectively. It's obviously that by equilibrium condition $U(x, \widehat{x})$ is decreasing in x while increasing in $\widehat{x}$.

If the incentives suffice, for sufficiently low values of x, revolution is a dominant action for a peasant, irrespective of the actions of the other citizens. Denote by $\underline{x_0}$ the threshold level of x below which it is a dominant action to initiate uprising for this peasant. All citizens realize this and rule out any strategy for the peasants which stand out of revolution below $\underline{x_0}$. But then

keeping silent on revolution cannot be rational for a peasant whenever one's signal is below $\underline{x_1}$ where $\underline{x_1}$ solves:

$$U\left(\underline{x_1}, \underline{x_0}\right) = 0$$

This is so since the trigger strategy around $\underline{x_1}$ is the best response to the threshold strategy around $\underline{x_0}$. Because the presence of strategic complementaries in this game, the payoff to joining revolution is increasing in the occurence of revolution by the other citizens, then any strategy which refrains from uprising for the private signal below $\underline{x_1}$ is dominated. Hence, after two rounds ofdeletion of dominated strategies, any strategy for a peasant that stays out of revolution for signal lower than $\underline{x_1}$ is eliminated. Proceeding in this way, we can generate the increasing sequence

$$\underline{x_0} < \underline{x_1} < \underline{x_2} < \underline{x_3} < \cdots < \underline{x_k} < \cdots$$

where any strategy that refrains from participating revolution for signal $x < \underline{x_k}$ doesn't survive k+1 rounds of deletion of dominated strategies. The minimal solution $\underline{\mathrm{x}}$ to $U(x, x) = 0$ is the least upper bound of this sequence, and hence its limit.

Conversely, we can apply the analogous iterated dominance argument to eliminate any strategy that peasant takes part in revolution for signals larger than x that solves $U(x, x) = 0$. This is precisely the strategy that remain after eliminating all iteratively dominated strategies.

Moreover, because (3.5) holds for every y, there is unique y^* that solves (3.3) and consists the equilibrium switching strategy for the party. Consequently, this also implies that the peasant's strategy survived iterated deletion of dominated strategies is the only equilibrium strategy.

Proof of Proposition 7

First, we note that by (3.1) and (3.2), $\underline{\theta} \leq \overline{\theta}$.

By lemma 3, we could divide the proof into two cases, $v_h - v_m + q \geq c$ and $v_h - v_m + q < c \leq v_h + q$. To ease analysis, we repeat equation (3.3)

$$G(\tfrac{\overline{\theta}-y^*}{\tau})(v_h + q) - G(\tfrac{\underline{\theta}-y^*}{\tau})v_m = c \quad (3.3)$$

i) $v_h+q = c+v_m$, then (3.3) sustains if only only if $G(\frac{\overline{\theta}-y^*}{\tau}) = G(\frac{\underline{\theta}-y^*}{\tau}) = 1$, or $G(\frac{\overline{\theta}-y^*}{\tau})$ is finite and $G(\frac{\underline{\theta}-y^*}{\tau}) = 0$, which means that both $\overline{\theta} - y^* > 0$ and $\underline{\theta} - y^* > 0$, or $y^* \to \overline{\theta}$ and $\underline{\theta} - y^* < 0$.Hence $y^* < \underline{\theta}$ and $y^* = \overline{\theta}$ consists candidates for trigger strategy equilibrium.

We also note that if $\tau \to 0$, then for any $y < \underline{\theta}$ (3.3) holds. Moreover, for any $y \in [\underline{\theta}, \overline{\theta})$, the L.H.S of (3.3) is strictly larger than the R.H.S, while for any $y \in (\overline{\theta}, \infty)$ the opposite maintains. Thus any $y^* < \underline{\theta}$ is weakly dominance strategy, thus applying the refinement we could rule them out. But only $y^* = \overline{\theta}$ is satisfying that for any signal received $y < y^*$, it's dominance to undertake revolution, and vice versus. Hence $y^* = \overline{\theta}$ is the unique equilibrium in this context.

ii) $v_h + q > c + v_m$, then (3.3) holds only if $G(\frac{\overline{\theta} - y^*}{\tau}) < 1$, which implies that $y^* \to \overline{\theta}$, or else the L.H.S of (3.3) is strictly larger than c. It's obvious that for any private signal $y > y^*$, the L.H.S becomes zero, thus it's dominated to join revolution, while for any $y < y^*$ the reverse holds. Thus $y^* = \overline{\theta}$ is the equilibrium in this case.

iii) $v_h + q \leq c + v_m$. It's easy to rule out the case $y^* < \underline{\theta}$ and $y^* > \overline{\theta}$ since (3.3) never holds.

If $y^* \in \left(\underline{\theta}, \overline{\theta}\right)$, then (3.3) holds iff $v_h + q = c$. However, it's not rationalizable since there are a continum of weakly dominance strategies in this interval.

If $y^* = \underline{\theta}$, though (3.3) may hold, we have contrast results regarding the small change in y^*, namely for any $y > y^*$, the L.H.S of (3.3) is strictly larger than the R.H.S, thus the party prefers to take action.

If $y^* = \overline{\theta}$, then $G(\frac{\overline{\theta} - y^*}{\tau})$ is a constant and $G(\frac{\underline{\theta} - y^*}{\tau}) = 0$. so (3.3) holds, and for any $y > y^*$, the L.H.S of (3.3) is strictly smaller than the R.H.S.

Now the $y^* = \overline{\theta}$ is demonstrated clearly, and we complete our proof.

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