PARTY AND REVOLUTION: A Global Game Approach*

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September 10, 2007

Abstract

This paper attempts to bridge the gap between revolution studies and democracy studies, and investigates the roles of party politics in individual revolutionary decision. In this study, the revolution to democracy is formulated as an asymmetric global game, and the coordination problem between a single democratic organization (party) and a continuum of ordinary citizens (masses) under incomplete information concerning the strength of autocracy is highlighted. Within appropriate fundamental parameters regarding the relative magnitude of revolutionary cost/return, as well as the size of this organization, the threshold strategies tuple consist the unique rationalizable equilibrium. The existence of a democratic organization, regardless of its action, is shown to increase the incentives for some citizens to join

*I would like to thank Antoni Calvo-Armengol for his inspiring suggestions and his patient and thoughtful discussion with me. The valuable comments from Miguell Ballester, Jordi Brandts, Juan Carlos Cornesa, Jinbo Li, Liguo Lin, Joel Sobel, and Lan Yao, the generous provision of computation codes from Amil Dasgupta, and the attendance of the Conference on Economic Development, 2007, CCER, Peking University, are especially appreciated. The financial support from Generalitat Catalunya is gratefully acknowledged.

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revolution, thus facilitate revolution. Moreover, as the incentives and the political resources in the hand of party change, the various forms of the revolution, ranging from masses revolution to one-side action, emerge. Finally, the policy implication is discussed, the connection with the real world example (students movement) gets special focus, and the efficient ways for democratisation promotion are proposed.

1 Introduction

By and large, democracy is public goods, and revolution is risky and costly, hence rational choice methodology predicts that no large-scale sudden revolution ever occurs. Therefore, previous researchers resort to excludable private return such as land redistribution as the only incentives for ordinary citizens to actively support revolutionary party. In terms of model, democratic revolution differs from riots just by the arbitrary interpretation of the private return. This oversimplification facilitates some analysis at the cost of ignoring many other important issues, such as the timing of revolution, the role of democratic future in initiating revolution, and moreover, why different types of revolution we observed emerge. In a word, to understand democratic revolution, we have to take the public good property of democracy seriously.

It's widely acknowledged that a modern democracy can hardly be said to exist without party system and electoral procedures, thus party politics is a crucial feature of democratic institutions. However, existing literature of political science either only stresses the role of party in democracy (for example, see the huge and excellent companion by Katz and Crotty, 2006), or focuses on the optimal policy of revolutionary party, mostly communists party, in the war to autocracy (see the celebrated work by Acemoglu and Robinson, 2005), but on the issue of great political transition, to the best of our knowledge, no one brings these two strands together to model the effects of party politics in individual revolutionary decisions. This paper attempts to bridge this gap. We formulate the expectation about payoff in future democratic party politics, argue that the existing democratic organization, legal

or underground, facilitates revolution by changing the incentives for citizens to join revolution, and identify the emergence of a variety of revolution.

In this study, we develop an asymmetric global games model with public good that serves as a basis for understanding the coordination to revolution problem between a single large democratic organization (party) and a continuum of ordinary citizens under incomplete information concerning the strength of the autocracy. Additional to the information effect and size effect brought by a large player identified in previous study in asymmetric global games (Corsetti et al, 2004), we demonstrate the incentive effect by the presence of a large player. Intuitively speaking, by the nature of party politics, the large player (party) increases the incentive of other small players (citizens) to provide public good (democracy), and there are some contexts in which the large player takes action alone.

To concentrate on the issues of interest, throughout this paper we assume that revolution always leads to liberal democracy with two-party system.

Our model of revolution is described as follows. There is a nation which is constituted of countryside and cities, and ruled by an autocratic regime. The citizens lived in urban area (resp. countryside) are denoted as workers (resp. peasants). The workers form a democratic organization (party), while the peasants could not be unified due to the lack of efficient communication means. Revolution is equally costly for all citizens, and revolution succeeds only when sufficiently many people participates revolution, which exceeds the strength of autocratic regime. Once revolution succeeds, the workers organization, if having joined the uprising, has more chance to win the election and become the ruling party. All citizens enjoy the *positive institutional returns* brought by democratic regime, which may vary among citizens, conditional on their own actions (for peasants) and the action of party (for workers). Moreover, the participants receive additional direct private return, which is defined as *subsidy*. 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 citizen cannot build preplay communication and reach the consensus, except the workers who are organized

together. In terms of political science, players lack the agreement about the precise size of "minimal winning coalition". Therefore, the coordination problem naturally arises. The lack of common knowledge among players convinces us to apply the methodology of global games (Carlsson and van Damme 1993, Morris and Shin, 2003) to select the unique equilibrium.

Inspired by Cabrales et al (2007), the intuition underlies our assumption regarding payoffs is that a revolutionary party, since he is more likely to win the first democratic election, is able to reward his supporters within the constitutional limits. Hence his supporters get more institutional returns than other inactive citizens. The decision to participate revolution actually represents the choice to become the supporter of the party in power in democratic regime.

We attempt to compare two scenarios about coordination regime switch. In the benchmark scenario there is no organized group against the autocracy. Therefore, due to the fact that every citizen has the trivial chance to influence the consequence of revolution, the only incentive for taking part in the uprising is the subsidy which is targeted to every participant. In another scenario which attracts our concerns, the urban workers are organized into a single organization (for example, trades unions). We characterize the existence condition of equilibrium strategies in both scenarios, compare in which context it's more likely to have successful revolution, according to the relative size of subsidy necessarily to induce revolution. We show that the presence of a single democratic party reduces the necessary magnitude of subsidy, thus facilitates the revolution. Particularly, we find that the party and peasants have quite different incentives to join revolution due to their different abilities to affect the consequence. If the size of party is large, his information concerning the strength of autocracy is accurate, then revolution is likely to happen even without any subsidy, which also implies that no peasant is willing to join revolution. Hence the prospect of liberal democracy itself encourages organized people to engage in revolution.

Finally, we identify the conditions for the emergence of the different types of revolution we observed, and connect our theoretical results with real-world examples, especially Color Revolutions and students movement as world-wide

phenomena. We also suggest some general ideas to promote revolution to democracy in autocratic countries.

1.1 Motivation and related literature

To a large extent, the revolution and its consequences are public goods. For example, in democracy the citizens enjoy the equal basic services, such as protection of property rights, fair trial, and *one person, one vote*. Meanwhile, in a large society the individual influence on the consequence of revolution is negligible. Further, revolution is costly and risky. Therefore, standard rational choice methodology predicts widespread free-rider among ordinary citizens in participating revolution. Hence, it could only appeal to *ad hoc* ideology or excludable pecuniary benefits to explain the revolution to democracy, thus cannot "(o)ffer clear predictions about when we see democracy" (Glaeser, 2007).

Moreover, revolutions with a variety of patterns, namely the masses revolution, party-led masses revolution, and one-side revolution with the silent masses, coexist in the history. The instances of masses revolution without involvement of any party range from the initial period of French Revolution (though party formed soon thereafter) to the recent *Tulip Revolution* in Kyrgyzstan, 2005. The typically party-led transitions to democracy include *Rose Revolution* in Georgia, as well as the *Orange Revolution* in Ukraine. The Paris Commune, 1871, is on the top of the list of one-side revolution. There is still much to be learned about how the pattern of revolution differs across countries and circumstances, and in particular how this relates to the interpaly between incentives and political resources.

There are two merits to adopt the methodology of global games. First, theoretically, revolution typically is a coordination game, which notoriously gives rise to multiple equilibria. As Carlsson and van Damme (1993) noted, relaxing the common knowledge among players would remove the multiplicity of equilibria. Hence, modeling revolution as global games sheds light on selecting the unique equilibrium. Second, beyond the pure theoretical interest,

an important pattern in autocracy is the strict control of press, so citizens normally lack both the precise information regarding the strength of rulers, and the efficient means to communicate with the remoteness. This fact also inspires us to resort to global games.

We combine the assumption of excludable benefits (subsidy) with the premise of pivotal decision-maker (single large party) to overcome the collective action problem in an infinite population. These assumptions are inspired by the consideration of real-world, rather than theoretical interest. Two reasons may justify our concentration on the size of subsidy. On the one hand, The appropriate magnitude of subsidy is a concept associated with the size of cost, thus to study subsidy indeed is to understand the cost/benefit calculation of the agent who make decision on joining revolution, which is in line with most literature on collective action. On the other hand, a relatively new pattern of sudden transition to democracy is the indisputable more and more active involvement of external power, either *U.S. State Department*, *National Democratic Institute*, or the international NGOs such as *Freedom House* and *Open Society Institute*[1]. Consequently, to some extent the subsidy becomes a policy instrument to initiate revolution[2]. Hence, studying the subsidy indeed assists us to figure out the appropriate policy and crucial elements to promote democracy. Our account is more suitable to understand the unexpected, suddenly successful transition to democracy ranging from the revolution wave in Germany and Imperial Austro-Hungary after WWI, to the recent non-violent *Color Revolutions* among former Soviet bloc countries.

On the camp of global games, this piece of work is an extension of Corsetti et al (2004) to the provision of public goods. In their work the size effects and information effects of large trader (Soros) on small traders in attacking monetary regime is concerned, while here we figure out another source of influence from a single party to individual, the shift in incentives. Karp et

[1]See "US campaign behind the turmoil in Kiev", *The Guardian*, November 26, 2004, and "U.S. Money has Helped Opposition in Ukraine", Associated Press, December 11, 2004.

[2]Debs (2007) provides policy implications for foreign powers to improve the welfare of the population in dictatorship regime by investigating political strength and economic efficiency under dictatorship. It's in line with our motivation to investigate the subsidy.

al (2007) clarify 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. Among the literature of political science, Cabrales et al (2007) take the heterogeneous values under democracy into account, and focus on the resolvent of collective action problem within a party. As complementary, using similar payoff structure, ours concentrates on the coordination problem between the democratic party and 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) restricts attentions to 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) studies the role of social structure in triggering revolt. 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, hence ignore the cold fact that a revolution is public good in the sense that when it occurs it changes the whole of society. Simply assuming that the voters have some other-regard preference and more or less in line with global games, Myatt (2007) applies global games to analyze strategic voting, and Callander (2007) investigates the communication and information aggregation in sequential voting.

The remainder of this paper is organized as follows. Section 2 presents the structure of our revolutionary games, specifies the payoff to different players, and addresses the benchmark case that there is no party. Section 3 is devoted to characterizing the equilibrium threshold strategies, and demonstrates that the presence of democratic party and heterogeneous institutional return reduces the size of private return necessarily to stir individuals. The characterization of a variety of revolution is built in Section 3.3, and Section 3.4 continues to presents a special case that there are no institutional returns. To isolate the variables of interest, in Section 4 we assume that

the distribution of noise in information received is uniform, and explore the interplay of incentives and political resources in promoting revolution. Using the previous analytical framework, we give an incentive-based account of the occurrence of students movement in autocratic regimes. Section 5 concludes and suggests some directions for further research. Some proofs of main propositions are contained in Section 6 as appendix.

2 The Model Setting

2.1 Players

2.1.1 Urban workers

We denote the party which is organized among workers by P. This party has members amount to $\lambda < 1$ of population. To simplify our analysis, we assume that the coordination problem within party is already solved[3] to restrict our attentions to coordination between party and peasants.

2.1.2 Countryside peasants

The share of peasants in the population is a continuum with mass $1-\lambda$. The 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

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

[3]Here we apply the intuition of Cabrales et al (2007). In their account, the repression from autocracy targets to every member of the revolutionary party, regardless of the action of a particular one. Therefore, once the underground party approves the revolution, the dominant strategy for every clandestine member is to participate revolution.

2.2 Payoff structure:

To overcome 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, conditional on their action in revolution. It comes from the fact that though democracies are situations of relative political equality, there still exist some excludable returns to the supporters of the party in power, due to some degree of discretion over the policy in the hand of winner of an election. We assume that if the party joins the revolution, he is more likely to become the winner of the first election under new democracy[4], and every revolution participant automatically becomes the supporter of the party in democracy. Thus, the revolution participants enjoy "revolutionary premium". However, if only the peasants take part in the revolution, in democracy the entirely new party system will form and this premium disappears, all parties have the equal likelihood to win the first election.

The second one is that citizens could get private return from successful revolution, in addition to the institutional returns from liberal democracy. This assumption sounds plausible. Consider the real-world example, the mob riot usually comes with the undisciplined masses revolution. For instance, in the process of Tulip Revolution in Kyrgyzstan, mass looting toward shops and ATMs occurred in capital and other major cities. These loots constitute an important part of private return to the masses participants. On the other hand, even in a well-organized revolution, to obtain wider supports among citizens, land and wealth redistribution or privatization of state-owned firms toward the supporters are common used methods by the revolutionary party. Furthermore, another relatively new source of private return to individual participants comes from the outside sponsors, for instance, in Orange Revolution the Open Society Institute provided free food and drink directly to the crowds in Independent Square[5]. Consider the non-violent feature of this

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

[5]"The price of People Power", *The Guardian*, December 7, 2004.

revolution, this provision is not trivial, and this source is of most interest in current policy analysis. In our paper the private return is generally defined as *subsidy*.

We assume that the cost to engaging in revolution is equally c for the party and peasants, which are common knowledge among players. The space of action a_j ($j \in \{P, i\}$) is $\{0,\ 1\}$, 0 corresponds to inaction, 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 bargaining about constitutions into account to derive the payoff to revolutionists. We suggest readers to refer to their work for the details. Briefly, under democratic regime the expected fundamental value to every citizen is v. Besides, due to the discretion over policy by the party in power, there is extra payoff to the supporters of the winning 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 and his supporters (resp. loser) in the new democratic regime is $v + k + q$ (resp. $v + q$).

If the party participates revolution, then in the new democracy his members and participating peasants automatically become the supporters of this revolutionary party, and due to "revolutionary premium", he 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 special advantages in new democracy, thus all citizens have equal chance to enjoy the extra institutional payoff. Besides, the uprising peasants obtain the 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 information structure

The information structure is that players receive a private signal concerning the strength of autocracy, and they have to decide whether to participate the uprising simultaneously.

There are four stages in this revolution game.

Stage 1. The Nature draws the strength of autocracy $\theta \in \mathbb{R}$.

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 $g(.)$[6]. For a typical peasant, the signal is $x_i = \theta + \sigma\epsilon_i$, where ϵ_i is distributed according to a smooth symmetric density function $f(.)$ with mean zero. $\epsilon_i \sim i.i.d.$ η and ϵ_i are independent.

Stage 3. The party 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 negotiate on new constitutions, turn to the election, and democracy consolidates[7]. Then the payoffs are generated to citizens, for detailed payoffs setup see Cabrales et al (2007).

[6]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 party provides a platform for the members to communicate and reach consensus about the state of nature.

[7]Regardless of whether the party joins the revolution, it still could participate the constitution negotiation process. This condition reflects the fact that democratic regime is pure public good since it could not exclude some citizens from the design of new constitution.

A characteristic here and already familiar from the literature of global games is that regardless of 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 among 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. In other words, player needs to use his own signal to estimate the real strength of autocracy, and infers the others' beliefs about his estimation, and so on. 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 thus is a rule of action which projects his signal onto 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 party.

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 structure outlined before, if old regime collapses, each participated citizen obtains $v_m + q - c$, while inactive citizen gets 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 this value, 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. of (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 an informative signal x_i, given the common knowledge about θ^*. The citizen has the conditional probability of a successful uprising as

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

and hence joins revolution if and only if his expected payoff from participating is at least as high as the payoff from refraining. Since any individual citizen has negligible impact on the probability of success, he treat this probability as parametric, and only private return q is concerned. Therefore, the expected payoff to participating 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 take part in 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,

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

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

Proposition 1 *Let $\lambda = 0$. If $q < c$, then there is no revolution at any size of q. If $q \geq c$, then the switching strategy equilibrium exists, and is characterized by the threshold level $x^* = 1 - \frac{c}{q} - \sigma F^{-1}(\frac{c}{q})$, and the critical mass level is given by $\theta^* = 1 - \frac{c}{q}$.*

Proof. *First we show the existence of equilibrium, then we characterize it.*

- *Because $F(\cdot) \leq 1$, if $q < c$, then $F(\frac{\theta^*-x_i}{\sigma})q < c$ always holds, 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 cut-off 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 $x^* = \theta^* - \sigma F^{-1}(\frac{c}{q}) = 1 - \frac{c}{q} - \sigma F^{-1}(\frac{c}{q})$.*

■

Proposition 1 unambiguously indicates that to have a revolution in the society without a party, it's absolutely necessary to provide citizens with sufficiently high subsidy. As q increases, both θ^* and x^* increase. The larger

the reward, the more likely that citizens join the revolution, and the strength of revolutionary force against the autocracy increases. Consequently, the likelihood of democratization raises.

The point here is that enough subsidy is the only incentive for the citizens in a shattered country without any civil organizations. To see this assertation, we immediately figure out that to guarantee the existence of the above cutoff conditions, we need to specify the relative magnitude of the subsidy from revolution q to the cost c. If $q < c$, there won't be any revolution and the autocracy 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 democratization 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 Game with a Single Party and Masses

Here we briefly outline the equilibrium of this game. 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 keeps inaction. In the later subsection we will show that this switching strategy constitutes equilibria, and is 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 returns to successful revolution, either institutional or private, relative to the cost to participate uprising. In other words, appropriate subsidy is necessary to promote revolution. We focus on the smallest value among those subsidies such

that the possibility of revolution, regardless of how small it is, is positive. This smallest value is denoted as q^*.

q^* could be understood as the minimal size of subsidy necessarily to encourage the players to undertake switching strategies. Therefore, q^* indeed is the minimal requirement to make democratization possible.

3.1 The switching strategies

We now consider the case that all workers are organized into one party, which has the strength $1 > \lambda > 0$. This case takes us into the methodology in Corsetti et al (2004) on asymmetric equilibrium strategies, where small traders and one large trader follow the equilibrium 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

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

where $\overline{\theta}$ is defined as the critical value of the fundamentals at which the revolution is successful if and only if the single democratic party (organized by all urban workers) 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 inaction 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 for some $y \in \mathbb{R}$. 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 at least for some y. Consequently, y^* is defined by

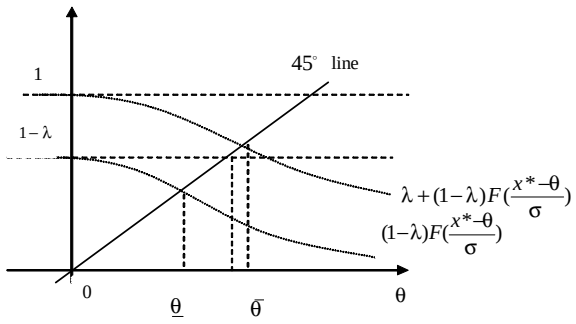

Figure 1: Occurrence of Revolution at θ with party and farmers

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

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. For adding any small $\varepsilon>0$ to y^*, this line will be rotated to southeastern, which means that participating revolution generates lower return than inaction, provided that the party receives signal $y>y^*$; and vice versa, this line will become upward to northeastern by reducing any $\varepsilon>0$ in y^*, which implies that for any signal $y<y^*$, undertaking revolution will bring forward higher payoffs.

We denote q_y as the smallest q such that the party will take switching strategy and is likely to join revolution. Then we have the lemma followed.

Lemma 2 $q_y=\min\{0,c-v_h\}$ *represents the minimal subsidy to spur the party to adopt threshold strategy.*

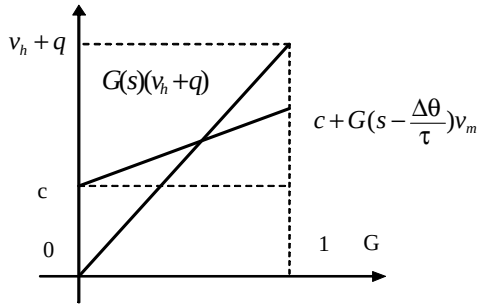

Figure 2: The existence condition of y^*

Proof. *It's obvious that* $G(s), G(s - \frac{\Delta\theta}{\tau}) \in [0,1]$, *and* $G(s) \geq G(s - \frac{\Delta\theta}{\tau})$. *Then the L.H.S. of (3.4), the payoff to revolution, is bounded above from* $v_h + q$, *while the R.H.S. of (3.4), the opportunity cost of participating, has lower-bound c. From now on we treat* $G(s)$ *and* $G(s - \frac{\Delta\theta}{\tau})$ *as independent variables.*
First, if $c \leq v_h - v_m + q$, *thus* $G(s)(v_h + q)$ *and* $c + G(s - \frac{\Delta\theta}{\tau})v_m$ *intersect on* $G(s) = \frac{c}{v_h+q-v_m}$ *in the range* $[0,1]$. *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* $s \leq G^{-1}(\frac{c}{v_h-v_m+q})$, *and* $y^* \geq \overline{\theta} - \tau G^{-1}\left(\frac{c}{v_h-v_m+q}\right)$.
If $v_h - v_m + q < c < v_h + q$, *which means that these two lines have no intersection in the range* $[0,1]$, *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 2 imposes the minimal general restriction on the magnitude of subsidy to ensure the existence of y^*, but the specification of q_y also 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 2 unambiguously demonstrates that with the heterogeneous

institutional returns due to party system, revolution is likely to happen even without any subsidy. This fact is in strong contrast with the stringent condition that $q \geq c$ in the circumstance without party. So the existence of party changes the incentives of citizens.

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 of $\overline{\theta}$ and $\underline{\theta}$, consequently x^*. By differentiating the L.H.S. of (3.3) with respect to y^* 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 $\forall \varepsilon > 0$, for signal $y \in (y^*, y^*+\varepsilon)$, the return difference between action and inaction is strictly smaller than the cost to participating revolution, and vice versa for $y \in (y^*-\varepsilon, y^*)$. So in this small 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 $y \in \mathbb{R}$, 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 inaction 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 $\theta < \underline{\theta}$, despite the conventional wisdom in cooperative games, though the party has no marginal contribution to the success of revolution, he still alters the peasant's future status in democratic politics by his action. If the party joins revolution, the peasants who undertake revolution automatically become the supporter of this party and enjoy the revolutionary premium. Otherwise, they get equal institutional returns as other refrained peasants.

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 returns difference between action and inaction due 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 $(\underline{\theta}, \overline{\theta}]$, where 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 generates strictly fewer benefits than refraining for peasants, and vice versa 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 q.

Now we turn to investigate q_x, the smallest subsidy necessarily to attract the typical peasant to devote to uprising.

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 could rewrite (3.6) as

$$\int_{-\infty}^{\underline{\delta}} f(z) \left[G\left(\frac{\sigma}{\tau}(\overline{\delta} - z) - G^{-1}(T)\right)(v_h - v_l) + q \right] dz + (v_h - v_l + q) \int_{\underline{\delta}}^{\overline{\delta}} f(z) G(\frac{\sigma}{\tau}(\overline{\delta} - z) - G^{-1}(T)) dz - c = 0 \quad (3.7)$$

For either sufficiently low x^* or sufficiently high x^*, by the notation we have $T = \frac{c}{v_h - v_m + q}$. Therefore, for sufficiently high x^*, the L.H.S. of (3.7) is strictly negative, namely the peasants' estimates regarding the strength of autocracy are too high to persuade them into joining revolution.

On the other hand, intuitively, the size of subsidy should guarantee that for sufficiently low estimation of the strength of autocracy, it's always dominance for the peasants to participate revolutionary. Hence for sufficiently low x^*, the L.H.S. of (3.7) should be positive. Since for $z \leq \underline{\delta}$

$$1 - \frac{c}{v_h - v_m + q} \leq G\left(\frac{\sigma}{\tau}(\overline{\delta} - z) - G^{-1}(T)\right) \leq 1$$

the L.H.S. of (3.7) then is a value locates between $\left(1 - \frac{c}{v_h - v_m + q}\right)(v_h - v_l) + q$ and $v_h - v_l + q$.

Therefore, if $\left(1 - \frac{c}{v_h - v_m + q}\right)(v_h - v_l) + q \geq c$, then it's certainly that for sufficiently low x^* the L.H.S. of (3.7) is positive. If $v_h - v_l + q < c$, then for any x^* the L.H.S. of (3.7) is negative, so there won't be any peasant joining revolution. Otherwise, we still could find out that revolution is possible under particular information structure, which will be elaborated by a special example in Section 4.

Moreover, if for sufficiently low x^*, the L.H.S. of (3.7) is strictly positive, and $\frac{d}{dx}\left(L.H.S.of\ \ (3.6)\right) < 0$ also holds for all $x \in \mathbb{R}$, then by Intermediate Value Theorem there is a unique x^* such that (3.7) holds.

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

Lemma 3 *If* $1 > \lambda > 0$, *then* $q_x \geq q_y$, *and* $q^* \leq c$, *namely the presence of party reduce the critical level of* q *to attract the peasants to participate revolution.*

Proof. *see the appendix.* ■

Lemma 3 elaborates the incentive effects of party again, party system itself changes the incentives of not only its members but also other ordinary citizens, thus makes the revolution easier.

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

Proposition 4 *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, which satisfies*
$G(\frac{\overline{\theta}-y^*}{\tau})(v_h+q) - G(\frac{\underline{\theta}-y^*}{\tau})v_m = c$ *(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 proof of the assessment above resembles the argument employed in Corsetti et al (2004), which is based on 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 have constructed the system of equations to characterize the trigger strategies equilibrium, if it exists. In general, there is a formidable challenge to provide clear-cut results concerning the equilibrium strategies tuple $\{x^*, y^*\}$ and the critical level $\{\overline{\theta}, \underline{\theta}\}$.

To ensure that y^* consists a equilibrium, (3.5) is required, but we have no idea about the properties of $G(\cdot)$, hence it's even not guaranteed that the trigger strategy y^* is an equilibrium for general case. Harsanyi and Selten (1988) suggest to adopt special distribution about the perturbation to select the equilibrium, and in later section we will work out some examples to characterize the threshold strategies as the unique equilibrium. Here we provide an analysis concerning the general results in the limiting case with very precise information regarding the strength of old regime, namely, $\tau \to 0, \sigma \to 0$, and $\frac{\sigma}{\tau} \to r$.

Lemma 5 *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 5 characterizes that in the limiting case the optimal trigger strategy for the party is $y^* = \overline{\theta}$. Therefore, when the information received by both sides of players are very precise, 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 occurrence 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 is sufficient subsidy that attracts some 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 overturned 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 degrees 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 6 *If $\lambda > 0, q \geq q^*$, 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 cases. If $\overline{\theta} > 1 - \lambda$, then $\overline{\delta}$ is the solution to
$(v_h - v_l + q) \int_{-\infty}^{\overline{\delta}} f(z) G\left(r(\overline{\delta} - z) - G^{-1}(T)\right) dz = c \quad (3.8)$
If $\overline{\theta} \leq 1 - \lambda$, then $\overline{\delta}$ is the solution to
$\int_{-\infty}^{L} f(z) \left[G\left(r(\overline{\delta} - z) - G^{-1}(T)\right)(v_h - v_l) + q\right] dz + (v_h - v_l + q)$
$\int_{L}^{\overline{\delta}} f(z) G\left(r(\overline{\delta} - z) - G^{-1}(T)\right) dz = c \qquad (3.9)$
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 noticeable that in the analysis above we impose the restriction that there always exists sufficient subsidy to stimulate peasants to incline to participate 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 in the absence of party is still insightful. In Proposition 1 we characterize the existence condition of trigger strategy in the absence of party, which depends on the relative magnitude of private return and cost. Compare that with current situation, we notice

that in the absence of organized citizens, the stringent condition $q > c$ should be satisfied to maintain the possibility of revolution. However, this condition is relaxed in the presence of a party, since becoming the supporter of revolutionary party brings more institutional returns than inaction. Party system generates additional rewards to active revolution participants. In the presence of a revolutionary party, revolution could succeed with lower private returns, and democracy is easier to ensue.

3.3 Subsidy and the prospects of revolution

Now we turn to the relationship between subsidy and the incidence of revolution. To restrict attentions to the issues of interest, similar to Morris and Shin (2002), as a working hypothesis here, each player assumes that all other player using the switching strategies around some common-known cut-off levels regarding the strength of autocracy. If the party and peasants both undertake threshold strategies, then the probability of successful revolution, 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 he receives signal θ. Otherwise, $\theta < \underline{\theta}$ ensures a successful democratization regardless of the action of the 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 return to Lemma 3 and note that the L.H.S. of (3.7) is strictly increasing in q, and the L.H.S. of (3.7) 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 the equation (3.3) no longer effects, since no individual citizen has the incentives to join revolution. But, the party still could take trigger strategy in the

equilibrium since he has non-negligible effect on the consequence, which may generate one-side revolution. This story corresponds to the the event such as Paris Commune.

Following the reasoning in previous subsection, since it's certain that 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 a 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 inaction is 0. To guarantee the possibility of one-side action, we need $q \geq c - v_h$, and by Lemma 2 this condition is permitted.

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

$$G(\tfrac{\lambda-y^{**}}{\tau})(v_h+q) = c \qquad (3.10)$$

We could derive $y^{**} = \lambda - \tau G^{-1}(\frac{c}{v_h+q})$. Clearly the L.H.S. of (3.10) is decreasing in y^{**}, thus y^{**} is the unique dominance solvable equilibrium. So the probability that the party undertakes one-side uprising at θ is given by $G\left(\frac{\lambda-\theta}{\tau} - G^{-1}(\frac{c}{v_h+q})\right)$.

Therefore, we summary the patterns of revolution in general in following proposition.

Proposition 7 *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.*
- *If $q_y \leq q < q_x$, there is one-side revolution carried out by the urban party alone, and the probability that the autocracy will collapse at state θ is*

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

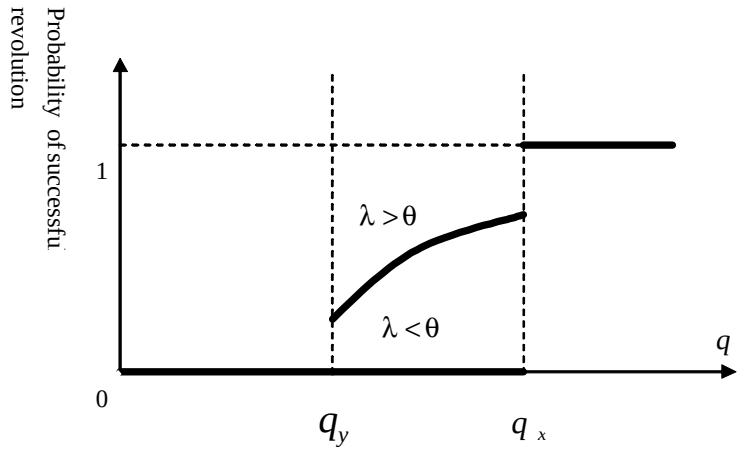

Figure 3: Probability to have a successful revolution with respect to q

- *If $q \geq q_x$, the urban party and some peasants undertake the revolution, 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.

From Figure 3 we find for low level of subsidy, there won't be any revolution. As the magnitude of subsidy raises, for instance, the external organizations start to provide fund for oppositions, there is a jump in the possibility of revolution, since the party is more sensitive to the increasing of subsidy from below. For intermediate level of subsidy, if the party is strong enough, then the autocracy is overthrown by the one-side action alone, otherwise it maintains. However, if the magnitude of subsidy reaches higher level, then there will be party-led masses revolution, and the autocratic regime is more likely to be overturned.

3.4 Illustrative example: only subsidy

Here we study the equilibrium strategies in an extreme case that there are no institutional returns, which could be understood as no democracy comes after the uprising, then the revolution just changes the name of the ruler without any influence on the underlying institutions. Thus only the private return stimulates citizens to join revolution. The parameters 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 $q \geq c$ to illustrate the effects of party on incidence of revolt besides changing incentives.

Therefore, through using the notation $\underline{\delta}$ and $\overline{\delta}$ again, in this context the equations characterizing the threshold equilibrium could be read as

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

The trigger equilibrium identified above is the only strategy that survives 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. Hence we could rewrite Proposition 6 as

Corollary 8 *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
$q\int_{-\infty}^{\overline{\delta}}f(z)G\left(r(\overline{\delta}-z)-G^{-1}(\frac{c}{q})\right)dz=c$ *(3.11)*
If $\overline{\theta} \leq 1-\lambda$, then $\overline{\delta}$ is the unique solution to
$q\int_{-\infty}^{L}f(z)dz+q\int_{L}^{\overline{\delta}}f(z)G\left(r(\overline{\delta}-z)-G^{-1}(\frac{c}{q})\right)dz=c$ *(3.12)*

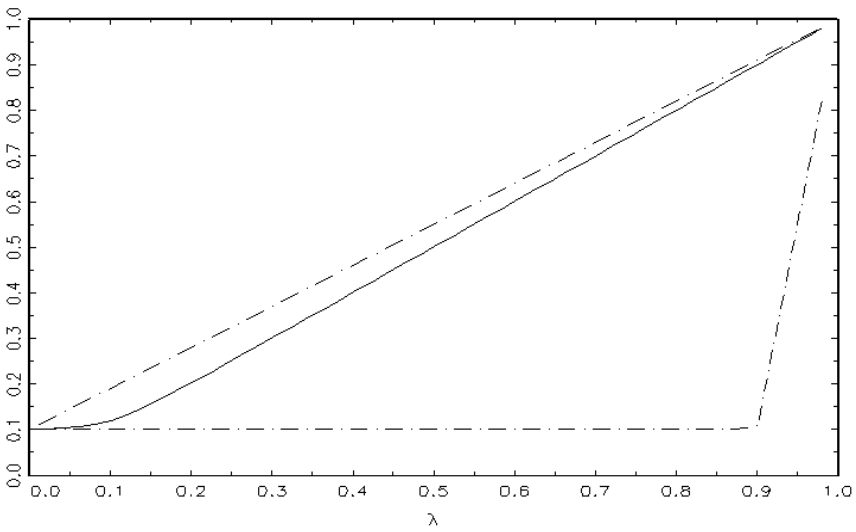

Figure 4: $\overline{\theta}$ at $r = 1$ as function of λ; $\frac{c}{q} = 0.9$, $\tau = \sigma = 0.01, v_h = v_m = v_l = 0$

where $L = F^{-1}(F(\overline{\delta}) - \frac{\lambda}{1-\lambda})$

In this limiting case, the critical state $\overline{\theta}$ is no lower than the corresponding equilibrium strategy in the context of the peasants only. Therefore, we conclude that in the limiting case of precise information, under the same size of subsidy, the presence of party increases the likelihood of successful uprising, which is illustrated in the numerical exercise presented in Figure 4. Hence, even if the current party has no effects on the social fundamentals, his existence also threats the autocracy. This explains why in most modern autocratic countries there is a single party in power persistently, and only the masses organizations under the direct control of government are allowed.

Analogous 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. We will explore these elements in depth in the next section.

4 Promoting Revolution: Political Resources or Incentives?

In this section, we attempt to show the relevance of our asymmetric global games model. Being unsatisfied with the paramount emphasis on the role of incentives in dolomitization process among economists, Glaeser (2007) suggests to pay more attentions to political resources[8]. His insight inspires us to apply previous framework to analyze the interrelation between political resources (λ) and incentives (q, v_h, v_m, v_l). We show that these two elements affect each other, and we could design different effective means to promote democratization in environments characterized by a variety of incentives and political resources.

Due to the difficulty to analyse the general situation, we highlight uniform distribution of noise here. We also use the critical size of c to represent the incentives faced by the citizens, since if q is fixed, critical level of c actually measures the critical magnitude of incentives to initiate revolution.

4.1 Equilibrium under uniform distributed noise

To simplify the exposition and concentrate on the variables of interest, from here we assume that the distributions of noise, η and ε_i, are independently uniform over some finite interval, as the premise employed in Karp et al

[8]The work of Jackson and Morelli (2007) exemplifies how political structure interacts with economic incentives to determine when wars occur.

(2007). Morris and Shin (2002) also suggest the particular significance of using uniform distribution to study strategic uncertainty. Indeed, this methodology is in the spirit of Harsanyi and Selten (1988). This uniformly drawn noise assumption leads to the following claim concerning the difference between $\overline{\theta}$ and $\underline{\theta}$.

Claim 9 *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 $\overline{\theta} - \underline{\theta} = \frac{\lambda}{1+\frac{1-\lambda}{2b\sigma}}$ *(4.1)*

Hence we get $G(\frac{\overline{\theta}-y^*}{\tau}) - G(\frac{\underline{\theta}-y*}{\tau}) = \frac{1}{2a\tau} \cdot \frac{\lambda}{1+\frac{1-\lambda}{2b\sigma}}$, 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 determines switching strategies as follows:

$$(1-\lambda)(1-F(\underline{\delta}))=\underline{\theta} \qquad (4.2)$$

$$(1-\lambda)(1-F(\overline{\delta}))+\lambda=\overline{\theta} \qquad (4.3)$$

$$G(\tfrac{\overline{\theta}-y^*}{\tau})(v_h-v_m+q)+Kv_m=c \qquad (4.4)$$

$$\int_{-\infty}^{\underline{\delta}} f(z)\left[G\left(\tfrac{\sigma}{\tau}(\overline{\delta}-z)-A\right)(v_h-v_l)+q\right]dz+(v_h-v_l+ q)\int_{\underline{\delta}}^{\overline{\delta}} f(z)G\left(\tfrac{\sigma}{\tau}(\overline{\delta}-z)-A\right)dz=c \qquad (4.5)$$

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

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

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

so the L.H.S. of (4.5) 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 uniform distribution of noise

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

If the 2-tuple $\{x^*, y^*\}$ that solves (4.4) and (4.5) 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 (4.5) is strictly increasing in $\overline{\delta}$. Though it's ambiguous with respect to $\underline{\delta}$, 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. of (4.5) through $\underline{\delta}$ is entirely offset by the change in $\overline{\delta}$, thus $\frac{d(L.H.S)}{dx^*}<0$. Hence, the solution to

(4.5) satisfies the equilibrium condition, so threshold value $\{x^*, y^*\}$ consists an equilibrium. Once x^* is determined, the urban party's switching point y^* follows from (4.4). Therefore, the system of equations (4.2)-(4.5) jointly determines the trigger strategies equilibrium, namely the switching points x^* and y^*, and the critical state $\overline{\theta}$ and $\underline{\theta}$.[9]

4.2 Incentives, political strength, and the emergence of revolution

Now we turn to the wider range of actions of party and individual peasants. With the idea presented in Section 3.3, we can separately discuss how the revolutionary behavior differs across circumstances characterized by a variety of incentives and political resources. The basic results are illuminated in Figure 5.

When $c \leq Kv_m$, namely the cost locates in region I in Figure 5, then by the condition identified in the previous subsection, the party gives up the threshold strategy and always carries out revolution regardless of signal y, since the cost is so low that initiating revolution is always beneficial. And $G\left(\frac{\sigma}{\tau}(\overline{\delta} - z) - A\right)$ degenerates to unit.

Being 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 is willing to participate revolution. Therefore 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 revolutionary force is $\overline{\theta}$, where $\overline{\theta}$ and x^* are defined as the follows:

[9] 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 constructed as distributional strategies in the works of Karp et al. Then with some trivial assumptions on the variance of noise σ and τ, the threshold strategy could be shown as an equilibrium.

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

If $v_h - v_l + q < c \leq Kv_m$, though no peasant will join the revolution, the party alone still undertake revolution, notwithstanding.

If the cost locates in region II, namely $Kv_m \leq c \leq v_h - v_m + q + Kv_m$, the party adopts threshold strategy. Taking this strategic uncertainty into account, the peasants also take threshold strategy if the maximum of the L.H.S. of (4.5) 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 (4.2) - (4.5).

But if $v_h - v_l + q \leq c \leq v_h - v_m + q + Kv_m$, as represented in region III, then only the party undertakes threshold strategy, the strategic complementaries between party and peasants disappears, and the size of revolutionary 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 that the cost is placed into region IV in Figure 5. Then the party never participates revolution. Therefore, the only lure for the peasants to revolution 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.

Therefore, we have the following conditions regarding the actions of party and individual citizens. 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:

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

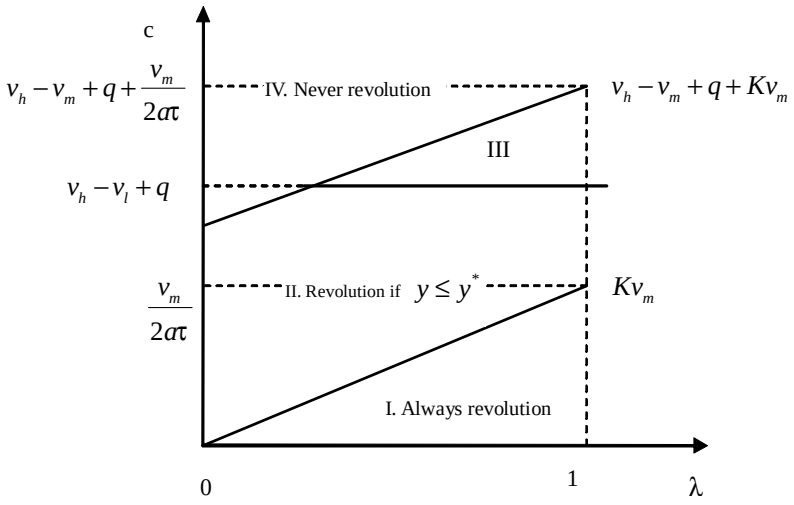

Figure 5: The decision of citizens and the size of cost, as function of λ

Again the different incentives for party and peasants are presented.

Now we could analyze the interplay between the political resources, λ, and 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 upper lines entirely upward, consequently enlarge region II and III.

Intuitively, the incentive for the party, due to his non-negligible impact on the consequences, 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 incentive is the combination of horizontal line $c = v_h - v_l + q$ and the diagonal $c \le v_h - v_m + q + Kv_m$. Figure 5 illuminates these differences graphically. For example, If there are homogeneous institutional returns, and the subsidy is zero, then no peasant will engage in revolution, although the party still may take part in revolution. We also note that in both region I and region III only one-side revolution is permitted.

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

$$Kv_m \leq c \leq v_h - v_m + q + Kv_m \qquad (4.6)$$

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

Inequality (4.6) figures out that in different political and economic circumstances, there are a variety of efficient ways to stimulating revolution, and raising incentives only works in limited scope.

If the first inequality of (4.6) fails, namely the cost is too low, then the sufficiently strong party will abandon threshold strategies, and take pure strategy that always initiates revolution. It implies that if the average institutional returns v_m is high, the information is accurate (τ becomes small), and a large part of citizens are well-organized, then the autocratic regime actually hardly sustains since democratic revolution always happens. Hence, for a highly urbanization autocratic country with big underground political organization, the best ways to promote democratization are the promise of aid to future democracy and the *VOA*. That's exactly 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 sponsoring his members.

On the other hand, if the second inequality of (4.6) doesn't hold, for the party even the threshold strategy also fails. Alternatively, the party chooses to stay out of any revolution. Herewith, since a typical peasant has negligible impact on the consequences, the relative cost to participating revolution becomes too high for every individual peasant, and it's impossible to have any revolution. As to policy implication, to make democratic revolution immediately possible in less-developed agrarian country, the only efficient way is to financing every participants directly.

The above analysis also shows the different roles of the party size and subsidy in stimulating the party to join revolution. Consider the observations of revolutionary party in real world, if we refer to the party who takes threshold strategy as "opportunist party", and the party always initiate revolution as

"rigid opposition"[10], then given the cost to joining uprising, the emergence of opportunistic party and rigid opposition relies on the size of party, the value of democracy and the subsidy. Albeit the increases in subsidy and party size both raise the likelihood of revolution, the raising subsidy only encourages the opportunistic behavior, while the development of party also creates more space for rigid opposition behavior. Hence, large private incentive only buys opportunistic behavior, while high value of liberal democracy as public good tempts those revolutionists who are ready to devote to the risky revolution. Money may buy revolution, but not rigid revolutionists!

We summarize our implications for democracy promotion 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 stronger the party, the larger the subsidy targeted to the revolution participants, the easier to have revolution.

2. Personal incentives and political resources differ in inspiring the party to undertake revolution. Raising personal incentives only encourages the opportunistic revolution behavior, and has no effect on the rigid opposition party. On the other hand, strong party (large λ) is more likely to exhibit rigid behavior than the weak one (small λ).

3. If liberal democracy becomes more attractive to every citizen (v_m increases), 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 salient. Higher subsidy inspires more peasants to participate, while homogeneous institutional returns, regardless of the magnitude, reduce the incentives of peasants. The political resources in the hand of party in general encourage individuals to participate revolution. When $K \leq$

[10]This notation could be understood 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.

$\frac{v_m - v_l}{v_m}$, the increase in the size of party raises the critical cost level, thus favors the individual revolutionary action. But when $K > \frac{v_m - v_l}{v_m}$, the party's political resources only affects the individual threshold level setting, without any effect on the existence of the strategy.

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

The effects of changes in institutional returns on revolution are not clear-cut. Note that in our model the status quo payoff under nondemocracy is normalized to zero, thus institutional returns actually measure the relative attractiveness of liberal democracy. By the definition of institutional returns, the increase has two possible sources: rising fundamental values of liberal democracy, or increasing premium to winning party. While the former implies that democracy is more attractive, the latter means that the government has too much degree of arbitrary over the citizens perhaps because of lack of checks and balances, or too large advantages for revolutionary party to win the election, which is indeed in contrast with healthy democracy. If the former case happens, then the incentives for individuals 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.

4.3 Real world example: students movement

How to interpret our results in real world? Could our model explain the revolutionary behavior in history better than previous studies? Our model gives credit to both rising force of organized opposition and rising incentives as catalyzer of democratization. However, the changes in the size of organized citizens has no effect on the incentives of other citizens, and only the likelihood of one-side action changes. On the other hand, increasing in private benefits to participants raises the incentives faced by citizens, thus increases the possibility of revolution, regardless of the specific type.

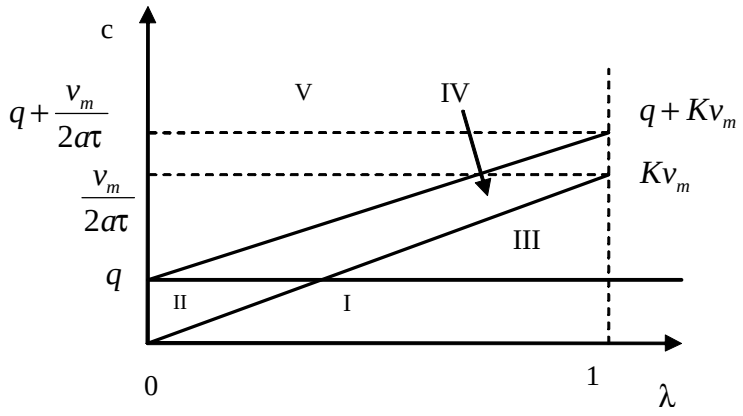

Figure 6: The incentives for students movements with respect to λ

We attempt to apply our framework to explain the frequent occurrence of students movement against the state in nondemocratic countries. Obviously, 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 liberal democracy and easily to be organized[11]. However, since most other citizens keep silence, in reality the students demonstrations usually fail to start the transition to democracy. Traditionally, economists usually consider the motivation of students as temporary impulse, and appeal to social networks structure to answer the question about how to organize students demonstration and why it's alone. However, now we present an interpretation of these observations from the perspective of interplay of incentives and political resources. Figure 6 depicits the incentives structure of students movement.

In most countries, students consist a small but non-negligible group in society, especially in countries with agglomerate huge colleges. By our finding 3, we know that the action of this group could be motivated merely by the vision of liberal democracy. Together with finding 5, our theory predicts that the enlighted students could form an active group against the autocratic

[11]The suppress action from government also contributes 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 of the responses to the pro-democracy students demonstration on Tiananmen Square in the previous year.

regime.

But, a crucial fact is that in any democratic society there is no party which forms exclusively on the basis of students. Therefore, becoming active supporter of students movement could not guarantee revolutionary premium in democracy, so the uncertainty in the political status in the new regime is not resolved. Hence, the heterogeneous institutional returns disappear, as shown in Figure 6. Together with finding 4, in students movement other individuals are exclusively motivated by subsidy, rather than the abstract concept of liberal democracy. Because students and masses conceive quite different incentives to join revolution, when students perceive the strong motives to initiate demonstrations, 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 6, we could observe the lonely students movement. If the autocracy still hold sufficient power to suppress the students demonstration, the students movement alone certainly fails to reach the critical level to overthrow the old regime.

In our account social networks work, since it facilitates communication among students to resolve collective action problem. However, the influence of social networks on the consequence of demonstration is through the changing incentives. As Figure 6 indicates, in the presence of homogeneous institutional return, any change in the size of student movement could not change the incentives for other citizens. The precision of information also works, on the one hand it changes the particular equilibrium strategy, on the other hand it alters the incentives of students. Different incentives perceived by group and individuals account for the lonely students movements.

5 Concluding Remarks

We have presented a model of asymmetric global games concerning the establishment of democracy, a typical public good, and examine the influence of party on the likelihood and patterns of democratization. By the nature

of democratic party system, the presence of party changes the *ex post* payoff structure by bringing forward the possibility of heterogeneous institutional returns. Consequently, it reduces the private return necessarily to initiate revolution, thus increases the probability of successful uprising. In a word, the presence of a party increases the likelihood of democratizations.

The emergence of a variety of revolution also depends on the relative magnitude of private return, which is represented by the critical level of cost to participating revolution. One-side action and party-led masses revolution are characterized as equilibrium strategies in different circumstances. The rigid opposition party differs from the opportunist party due to the different strength of party and the size of incentives.

Furthermore, we apply our theoretical results to provide policy suggestions about democratization promotion, and explain the frequent occurrences of students movement against autocracy. Our asymmetric global game model has the potential to explain a wide range of facts of revolution and democratization. For example, so far we haven't taken the economic factors of democratic regime into account. If we extend the payoff structure to consider the economic value under democracy, we may give new insights about the somewhat ambiguous empirical relationship between income inequality and democratization presented in Przeworski et al (2000), who record that only within-industry income inequality matters to democratization.

It's noteworthy that in our model there is only strategic complement among citizens. However, once there are more than one organized group against the autocracy, the strategic substitutes effects may arise, since different parties may start "revolution race" for revolutionary premium. Further studies should consider this important extension, and investigate the strategic interaction among various revolutionary groups.

Nevertheless, we are aware of that our framework so far has abstracted away from many important elements of revolution. For instance, here the formation and development of party is implicitly assumed as exogenous, which is obviously far from reality and policy operations. The information transmission from the party to the citizens, and the possibly endogenous determination of public signal, which is the strength of autocracy here, as well

as other sequential actions issues, are all neglected here. We think these questions mentioned above constitute promising research agenda in future revolution and democratization studies.

6 Appendix

Proof of Lemma 3

First, we show $q_y \leq q_x$ by induction of contradiction. If $q_y > q_x$, then there exist some $q \in (q_x, q_y)$ such that while the party never joins 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 $q_y > c$, contradicts with Lemma 2. 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 of 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 easy to establish that for some parameters of model $W(c) > c$. 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 4

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

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

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 occurrence 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 of deletion 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 $\underline{x}$ 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 Lemma 5

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

By Lemma 2, 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 $y^* = \overline{\theta}$ consist candidates for trigger strategy equilibrium.

We also note that if $\tau \to 0$, then for any $y < \underline{\theta}$ the equation (3.3) is valid. 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 is not rationalizable. But only $y^* = \overline{\theta}$ is satisfying that for any signal received $y < y^*$, it's dominance to undertake revolution, and vice versa. 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 continuum of weakly dominance strategies in this interval.

If $y^* = \underline{\theta}$, though (3.3) may hold, we have contrast results with respect to 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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