



universität
wien

Magisterarbeit

Titel der Magisterarbeit

„Game Theoretical Models of Revolution and
Democratization“

Verfasserin

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angestrebter akademischer Grad

Magistra der Sozial- und
Wirtschaftswissenschaften (Mag.rer.soc.oec.)

Wien, 2012

Studienkennzahl lt. Studienblatt:

A 066 913

Studienrichtung lt. Studienblatt:

Magisterstudium Volkswirtschaftslehre

Betreuer:

Univ.-Prof. Dr. Gerhard Sorger

Acknowledgements

I am deeply grateful to my supervisor Professor Gerhard Sorger for his invaluable guidance, motivation and patience. I consider myself lucky to have had the chance to attend his classes and benefit from his wisdom.

I would also like to thank Assistant Professor Peter Vida for his challenging feedback, encouragement and patience. He had a great influence on my interest in game theory.

The support and care of Gregor Kasieczka were extraordinary. Together, we discussed all the steps of my thesis. I am incredibly lucky to have a hero in my life. My love and gratefulness are beyond words.

I owe a tremendous debt of gratitude to Sarah Dippenaar for correcting my English and discussing my thesis, but more importantly for her great friendship and moral support. My study and life have been more enjoyable with her.

Katharina Schigutt and Markus Wallerberger are great friends. I thank them for sharing good times, their comments on my thesis and also their help in translating the abstract to German.

Last but clearly not least, I thank my parents, Nazife and Ökkeş, and my brother Yunus for their unconditional and unending love and support.

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Chapter 1

Introduction

What are the reasons for the remarkable variation in political regimes and regime transitions among countries? Why do some countries experience revolutions and democracy while others do not? Our goal is to investigate how and why revolutions or democratization occur. More specifically, what are the relevant conditions that drive regime change?

The idea of democracy began to spread in the world by 19th century because of conflict between ruling elites and citizens. Revolutions or the threat of revolutions played a central role on the path to democracy. Revolutions took place, for example, in France (the French Revolution of 1789) and Russia (the Russian Revolution of 1917) while in many European countries the elite were subjected to the threat of revolutions. All countries affected by one of the two, experienced social, political and economic changes.

In this thesis, we simply define a revolution as an attempt by a large number of individuals, to change the form of government, especially by means of violent action. Furthermore, we only consider revolutions against nondemocratic regimes. Because the origin of revolutions can be found in the conflict between elites who hold economic and political power and citizens who have both less economic resources and no voice in politics. This conflict is immediate in nondemocratic regimes. Authoritarian governments support the interest of the elite and redistribution of resources is kept to minimum or is absent. Though revolutions or democratization, as a consequences of a revolutionary threat, redistribution improves in favor of the poor. However, we do not distinguish between different

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kinds of revolutions, democracies and nondemocracies ¹.

To understand the reasons for regime transitions it is necessary to understand the basis of class struggles. In this sense we cannot think of political regime transitions independently from economic structure. Particularly, income inequality is one of the main factors responsible for differences in classes in a society. Regime transitions can be seen as a product of class struggles.

On the subject of revolution and democratization one can find social and philosophical discussions. We do not intend to discuss any of these here. Our objective in this thesis is to understand the economic origins of revolutions and democratization with the application of game theory. To do so, we review two models of political conflict and revolution; namely “*Rationalizing Revolutionary Ideology: A Tale of Lenin and the Tsar*” (Roemer, 1985) and “*A Static Model of Democratization*” (Acemoglu and Robinson, 2006). Following this, we present modifications to the model by Acemoglu and Robinson which we call “*Game on Revolution*”.

Are revolutions rational for an individual and citizens as a collective? Is voluntarily establishing democracy and giving up the political power rational for the elite? At the first glance, it may be thought that explaining revolutions and democratization by using a rational choice approach, or game theory is odd. The main problem in explaining revolutions or the threat of revolutions (which can lead to democratization) is explaining the collective action problem. The collective action problem was first identified by Olson (1965). We can define the collective action problem in revolutions as follows: if the effect of a citizen on the success of a revolution is very small then why should a rational citizen participate in a costly protest or revolution when she or he could benefit from a successful revolution without paying the cost of participation? Revolutions and democracy are accepted as public goods, therefore they include the collective action or free rider problem. As a consequence of the collective action problem, revolution and democratization (as a product of the threat of revolution) cannot occur.

¹ Moore (1966) classifies revolutions as the bourgeois revolutions leading to capitalist democracy, the abortive bourgeois revolutions leading to fascism, and the peasant revolutions leading to communism.

Goldstone et al. (2004) classify regimes into six types; full democracies, weak full democracies, strong and weak partial democracies, autocracies, and autocracies that allow some competition.

Indeed, the first rational approach model was presented by [Tullock \(1971\)](#) “*The Paradox of Revolution*”, based on [Olson \(1965\)](#), focuses on private benefits and fails to explain revolutions. [Tullock](#) finds that revolutions cannot take place due to the collective action problem. Even if revolutions are rare events, in history they in fact did take place. Therefore, citizens have to overcome the collective action problem somehow. [Olson](#) suggests that side payments, which he terms selective incentives, might be useful. However, [Roemer](#) claims that “*the side payments which might overcome such self-interested behavior are generally not offered in revolutionary situations*” ([Roemer, 1985](#), p. 85). [Wintrobe](#) also disagrees with the idea that side payments might solve the collective action problem: “*In many of the classic revolutions such as the French revolution, as well as in modern revolutions such as those of 1989 in Eastern Europe, there seems to have been a great deal of mass participation, and no one, to my knowledge, has suggested that the problem of participation was resolved through the provision of mass selective incentives*” ([Wintrobe, 2006](#), p. 161). [Muller and Weede \(1990\)](#) test [Olson’s \(1965\)](#) theory of collective action. They find that selective incentives in the sense of Olson are largely irrelevant.

If side payments cannot be the solution to the collective action problem how do the masses solve it? [Hardin \(1971\)](#) introduces the collective action problem as an n-person prisoner’s dilemma. However, [Chong \(1991\)](#) points out that it can be seen as an assurance game rather than a prisoner’s dilemma game. He proposes that people benefit from the participation in a social movement and that there exists a threshold point where enough people will participate. This idea converts the problem from a prisoner’s dilemma to an assurance game where individuals cooperate because the incentive to cooperate increases with the number of participants.

[Roemer \(1985\)](#) and [Acemoglu and Robinson \(2006\)](#) introduce the collective action problem briefly. Roemer addresses this problem as follows:

“He possesses charisma which overcomes the free rider problem and is able to convince all members of a formable coalition to organize, to overcome the prisoners’ dilemma, by pointing out that if each follows his narrower self-interest then all will be worse off in expected income. Lenin cannot, however, overcome

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the primary level of self-interest; he cannot induce an agent to join a coalition if his expected income falls short of present income.”

Acemoglu and Robinson suggest that:

“In some situations, the collective action problem will be easier to solve, opponents to the regime easier to coordinate, and revolutions easier and less costly to carry out. These will typically be times of crises, for example, times of harvest failures, economic depressions, international financial or debt crises, or even wars. Such crises and macroeconomic shocks are intrinsically transitory and lead to short-term fluctuations in de facto political power. Our theory therefore predicts that democratizations are more likely to arise in a situation of economic or political crises.”

In a revolutionary situation the collective action problem has to be solved. We briefly discussed the collective action problem of revolution and its potential solutions². Although the collective action problem is a very interesting topic in rational choice theory, a proper treatment would be beyond the scope of this work and therefore is also abstracted from *“Game on Revolution”*.

There is a growing amount of literature published in political economy investigating the reasons why countries democratize. [Acemoglu and Robinson \(2001\)](#) introduce the threat of revolution to explain democratization in the Western world at the beginning of the 19th century. Since revolution is the worst outcome for the elite, in their model the elite might allow democratization where they redistribute the income in favor of the citizens. One of the examples of peaceful extension of the franchise is democratization in Britain. [Conley and Temimi \(2001\)](#), within their framework, analyze a similar question: Is it rational for the disenfranchised group to undertake a costly revolution in order to join the franchise? In both models the elite might give up power and allow democratization under the threat of revolution.

[Lizzeri and Persico \(2004\)](#) ask a different question about the extension of suffrage in Britain. Their question is whether the threat of revolution was so serious, on its own, to motivated the elite to extend the franchise, or whether

²See also [Lichbach \(1994, 1995, 1996\)](#), [Goldstone \(1991\)](#), [Elster \(1988\)](#), [Finkel, Muller and Opp \(1989\)](#), [Kuran \(1989, 1991\)](#), [Moore \(1995\)](#).

there were some other reasons. In their model the elite voluntarily extend the franchise because democratization leads a better outcome for the elite.

[Roemer \(1985\)](#) examines the Russian revolution as a two person game between Lenin and the Tsar. In the model Lenin tries to get maximal support for a revolution from society while the Tsar tries to prevent it. The sequential game has a solution if the Tsar moves first. More interestingly, Roemer studies the strategy of Lenin (new income distribution) and the Tsar (penalties) under specific conditions and he shows that Lenin and the Tsar have rational foundations for their ideologies.

[Grossman \(1991\)](#) discusses revolutions and their deterrence or suppression as economic activities that compete with economic production for scarce resources. The conflict is between a ruler and peasant families. The ruler collects taxes and employs soldiers to prevent revolution while the peasant family allocates their time between production, soldiering, and revolutionary activities. His theory emphasizes the expected private returns to insurgents.

[Wintrobe \(1998\)](#) categorizes dictatorships, which maximize their utility as a function of consumption and power, by using different levels of loyalty and repression. In the equilibrium, if the dictator has enough power to remain in office, there is no revolution.

Obviously explaining revolutions and democratization is very complicated and they can have many foundations. However, game theoretical models undoubtedly provide useful insight in the study of revolution and democratization by virtue of their simplifying quality. Most of these models characterize the interactions between the elite and citizens where citizens can challenge the regime and the regime can respond by making concessions, by repression or by democratization and classify the regimes in two types (democracy and nondemocracy). The decision of whether to participate in revolutions or not depends on the costs and benefits of participation. These costs and benefits may differ with different numbers of participants or in different periods of time.

We are interested in the economic conflict as a two person game. However, for example, the military may be thought of as a strategic³ or nonstrategic player

³See [Acemoglu, Ticchi and Vindigni \(2010\)](#)

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when the elite use repression. The model can also be extended to any number of players with the outcomes depending on the existence of a successful coalition⁴.

The remainder of this thesis is organized as follows: Chapter 2 examines Roemer's (1985) model of revolution. Mainly we review the basic model and its solution. Additionally, we discuss under which conditions the Tsar behaves tyrannical and Lenin has a progressive strategy. In chapter 3 we study one of Acemoglu and Robinson's (2006) models of democratization. The model we study is a static game which captures their basic ideas. In particular, we discuss when the elite use repression, redistribute and create democracy. Chapter 4 presents a modification to Acemoglu and Robinson's model. In this model we show that adding a further action (protest) for the citizens to choose from can lead to democratization in the equilibrium under some conditions. Finally, chapter 5 concludes by comparing the models and summarizing the main findings.

⁴See Lichbach (1995)

Chapter 2

“Rationalizing Revolutionary Ideology: A Tale of Lenin and the Tsar”

2.1 Introduction

This chapter reviews [Roemer’s \(1985\)](#) model of revolution: “Rationalizing Revolutionary Ideology: A Tale of Lenin and the Tsar”. The model examines the situation in Russia before the 1917 revolution. Revolution is treated as a redistribution problem.

Roemer’s model is the first attempt to apply game theory to understand the reasons, mechanisms and results of a revolution. Revolution is introduced as a two person zero-sum game between Lenin and the Tsar. Lenin and the Tsar are two leaders who compete for the support of society. Initially, the Tsar has all political power. Lenin challenges the Tsarist regime by organizing a revolutionary coalition while the Tsar tries to keep the current regime in place. Lenin tries to maximize the probability of revolution whilst the Tsar tries to minimize it.

To obtain support Lenin proposes a new income distribution. This induces people to join the revolutionary coalition. The Tsar tries to reduce the size of the coalition by levying penalties from members of the revolutionary coalition in the case where the revolution fails. The solution to this game defines the instability of the regime, i.e. the probability that it will be overthrown.

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Roemer also assumes that Lenin and the Tsar are not necessarily ideological. The contest between Lenin and the Tsar depends on a number of restrictive assumptions about the probability of overthrowing the regime, and the motivations of Lenin and the Tsar. The model shows that the strategies of Lenin and the Tsar are the result of optimization. In this sense, Roemer rationalizes the ideologies of Lenin and the Tsar by investigating their foundations.

Roemer focuses on the leaders instead of the citizens who actually undertake the revolution. However, he makes a cost and benefit analysis for the individuals faced with the decision to participate or not participate in a revolution. One of the problems concerning the rationality of a revolution is that why rational individuals join the revolutionary coalition while the cost of revolution is high and their individual contributions only slightly change the result. This problem is ignored by abstracting from the collective action problem in the model.

The chapter proceeds as follows. In section 2.2 we present the structure and the assumptions of the model and show the existence of equilibrium. We give the timing of the events in section 2.3. We analyze the game and derive the equilibrium and determine the strategies of the Tsar and Lenin under certain conditions in section 2.4. Section 2.5 presents a brief discussion. Finally, section 2.6 gives a summary.

2.2 The Model

Roemer formulates the revolution as a two person game with complete information. The players are the Tsar and Lenin. The society consists of a finite set of citizens $N = \{1, 2, \dots, n\}$. The citizen $i \in N$ has income z_i . Let $\zeta = (z_1, z_2, \dots, z_n)$ denote the current income distribution vector. Moreover, let the total income of the society be n and let $\bar{z}$ denote the average income.

$$\bar{z} = \frac{1}{n} \sum_i^n z_i. \quad (2.1)$$

Note that the average income equals unity, $\bar{z} = 1$. The citizens support either the Tsar or Lenin depending on the Tsar’s and Lenin’s strategies.

Initially the Tsar is in power, but Lenin can challenge the current regime by organizing a revolutionary coalition. To do so, he proposes a new income distribution. The citizens will join a revolutionary coalition if they gain from the new distribution. Lenin's strategies are all possible income distribution vectors,

$$\eta = (y_1, y_2, \dots, y_n).$$

According to the new income distribution η the citizen i has income y_i . For the citizen $i \in N$ the post revolutionary income cannot be negative, $y_i \geq 0$. Thus Lenin's strategy space consists of the set of all possible redistributions such that $\Omega = \{\eta \mid \sum_{i=1}^n y_i = \sum_{i=1}^n z_i\}$. Lenin can choose a new income distribution from a fixed total income.

On the other hand, the Tsar wants to prevent a revolution. The only action available to the Tsar is repression. He announces a penalty vector to minimize the probability of a revolution. The Tsar's strategies are all possible penalty vectors,

$$\delta = (d_1, d_2, \dots, d_n).$$

It is assumed that the penalties cannot exceed the current income for all citizens, $0 \leq d_i \leq z_i$. If $d_i \leq z_i$ for all components i then we write $\delta \leq \zeta$. Thus the Tsar's strategy space consists the set of all feasible penalties $D = \{\delta \mid 0 \leq \delta \leq \zeta\}$.

The citizens decide whether to join a revolutionary coalition or not. A coalition $S \subseteq N$ is formed at the given income distribution proposed by Lenin and penalties threatened by the Tsar. [Roemer](#) suggests that the probability of a successful revolution is a function of the coalition S , and penalties δ such that $P = P_S(\delta)$. That is coalition S can win a revolution with probability $P_S(\delta)$ if it organizes to fight against the Tsar who has proposed penalties δ .

Now let us think about the participation decision of the citizens. Lenin can organize coalition S if and only if for each member of this coalition it holds that

$$P_S(\delta)y_i + (1 - P_S(\delta))(z_i - d_i) > z_i. \quad (2.2)$$

A coalition S is called η -formable against ζ at penalties δ if (2.2) holds. This inequality tells us the rule for participating in a revolution. The citizens decide

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whether they join the revolutionary coalition or prefer the current regime under the given penalties schedule and proposed income. Two factors influence the citizen’s choice: the probability of the success and the income after penalties. As long as the expected income attached to participation is greater than the current income, citizens will choose to join the revolution. Note that this inequality holds if the collective action problem is not present.

Roemer has a number of assumptions on $P_S(\delta)$. The probability of revolution increases with the size of the revolutionary coalition. For every additional participant in the revolutionary coalition, the probability of success increases. If there is no coalition obviously the probability is 0.

One of the key assumptions is that for each formable coalition the probability of the coalition’s success in a revolution is a non-decreasing function of the penalties announced. This assumption can be interpreted with the idea that higher penalties motivate revolutionaries more strongly. This assumption is critical since it makes the Tsar a nontrivial player. Otherwise the Tsar could prevent the revolution by simply setting the penalties to the incomes of each individual without any cost.

Another assumption is that not only the size of the coalition matters but also the income of the citizens in the coalition affects the probability. A poorer citizen is more motivated to fight against the current regime relative to a richer citizen.

Summarizing the discussion we formally give the following properties of the probability $P_S(\delta)$.

Coalition Monocity: For any $\delta \in D$ and $S \subseteq T$, $P_S(\delta) \leq P_T(\delta)$. $P_\emptyset(\delta) = 0$ where $\emptyset$ is the empty coalition.

Penalty Monocity: For any S and $\delta' \geq \delta$, $P_S(\delta') \geq P_S(\delta)$.

Lean and Hunger: Let S be any coalition and i, j two agents not in S , and $z_i \leq z_j$. Then for all $\delta \in D$, $P_{S \cup i}(\delta) \geq P_{S \cup j}(\delta)$.

Additionally, $P_S(\delta)$ is continuous in δ .

We have a number of η -formable coalitions which satisfy (2.2). Lenin wishes to organize the coalition including the maximum number of citizens. By assuming Coalition Monocity the following lemma states that there is a unique maximal η -formable coalition.

Lemma 2.2.1. *Roemer (1985) Assume Coalition Monocity. For all pairs (η, δ) there is a unique maximal η -formable coalition at δ . Call it S_δ^η .*

Recall that a coalition S is η -formable against ζ at penalties $\delta \Leftrightarrow$

$$\forall i \in S \quad P_S(\delta)y_i + (1 - P_S(\delta))(z_i - d_i) > z_i$$

or

$$\forall i \in S \quad P_S(\delta)(y_i - z_i + d_i) > d_i. \quad (2.3)$$

First, notice that for some pairs (η, δ) the coalition is the empty set, for example $\forall i \in S \ y_i = z_i$. By definition of the empty set, the empty coalition is η -formable because every element of the empty set satisfies any property. Therefore, there is always at least one η -formable coalition which is the empty coalition.

Now assume that we have finitely many η -formable coalitions. Let us denote them by $S_1, \dots, S_k$. Since they are η -formable it holds that

$$\forall i \in S_j \quad P_{S_j}(\delta)(y_i - z_i + d_i) > d_i. \quad (2.4)$$

This implies that

$$\forall i \in \bigcup_{j=1}^k S_j \quad P_{\bigcup_{j=1}^k S_j}(\delta)(y_i - z_i + d_i) > d_i. \quad (2.5)$$

The Union of η -formable coalitions are η -formable because i is an element of at least one S_j and $P_{S_j}(\delta) \leq P_{\bigcup_{j=1}^k S_j}(\delta)$ by Coalition Monocity.

The union of finitely many η -formable coalitions has the unique maximum size. We do not give a formal proof here. It is straightforward to see that

$$\max\{|S_1|, \dots, |S_k|\} \leq \left| \bigcup_{j=1}^k S_j \right|. \quad (2.6)$$

Lemma 2.2.1 states that for any pair of strategies (η, δ) there is a maximal η -formable coalition. Lenin wants to form the maximal η -formable coalition since it maximizes the the probability of success. Roemer defines the maximum probability of winning a revolution as $\mu(\eta, \delta) = P_{S_\delta^\eta}(\delta)$. The Tsar's strategy is

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to minimize this probability by proposing penalties $\delta \in D$ while Lenin’s strategy is to maximize this probability by proposing a new income distribution $\eta \in \Omega$. When the Tsar and Lenin make their decisions they consider how the other one might react. They sequentially choose to

$$\min_D \max_{\Omega} \mu(\eta, \delta) = \mu^*(\zeta). \quad (2.7)$$

Roemer calls the solution probability μ^* as the instability of the regime.

2.3 Timing and Outcomes

The timing of events is as follows:

1. The Tsar moves first and proposes penalties $\delta = (d_1, d_2, \dots, d_n) \in D$.
2. At the given penalties $\delta = (d_1, d_2, \dots, d_n)$ Lenin proposes a new income distribution $\eta = (y_1, y_2, \dots, y_n) \in \Omega$.
3. The revolutionary coalition S_{δ}^{η} is formed at the given penalties $\delta = (d_1, d_2, \dots, d_n)$ and new income distribution $\eta = (y_1, y_2, \dots, y_n)$.
4. Payoffs are received and the game ends.

Lenin receives $\mu(\eta, \delta)$ and the Tsar receives $1 - \mu(\eta, \delta)$. Note that the Tsar moves first. Roemer shows there is a solution to the minimax problem only if the Tsar moves first. Furthermore, he points out that there is no minimax solution to this game if it is played simultaneously by the players.

2.4 Analysis

2.4.1 Equilibrium

To show there is a solution to (2.7) let us begin with the situation where Lenin can organize a coalition by a new income distribution at given penalties.

Lemma 2.4.1. *Roemer (1985)* For fixed ζ, δ, S there is an $\eta \in \Omega$ for which S is η -formable at δ against $\zeta \Leftrightarrow$

$$P_S(\delta) > \frac{\sum_{i \in S} d_i}{\sum_{i \in S} d_i + (n - \sum_{i \in S} z_i)}. \quad (2.8)$$

First show that there is an $\eta \in \Omega$ for which S is η -formable at δ against $\zeta \Rightarrow$ (2.8). Recall that a coalition S is η -formable against ζ at penalties $\delta \Leftrightarrow$

$$\forall i \in S \quad P_S(\delta)y_i + (1 - P_S(\delta))(z_i - d_i) > z_i$$

or equivalently

$$\forall i \in S \quad y_i > \frac{1 - P_S(\delta)}{P_S(\delta)} d_i + z_i.$$

Lenin should propose an income to everybody in the revolutionary coalition which satisfies this equation. On the other hand, Lenin can propose a redistribution which is possible from the total income such that,

$$n \geq \sum_{i \in S} y_i > \frac{1 - P_S(\delta)}{P_S(\delta)} \sum_{i \in S} d_i + \sum_{i \in S} z_i. \quad (2.9)$$

This implies that

$$n > \frac{1 - P_S(\delta)}{P_S(\delta)} \sum_{i \in S} d_i + \sum_{i \in S} z_i. \quad (2.10)$$

If we rearrange the inequality we obtain that

$$P_S(\delta) > \frac{\sum_{i \in S} d_i}{\sum_{i \in S} d_i + (n - \sum_{i \in S} z_i)}.$$

This completes the first part of the proof.

Conversely, show that (2.8) $\Rightarrow$ there is an $\eta \in \Omega$ for which S is η -formable at δ against ζ . Knowing that (2.8) and (2.10) are equivalent, Lenin can construct an η that satisfies (2.9). Lenin can choose y_i 's such that

$$\forall i \in S \quad y_i > \frac{1 - P_S(\delta)}{P_S(\delta)} d_i + z_i \quad (2.11)$$

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since he can choose any η which satisfies the budget constraint (2.10).

This implies that

$$\forall i \in S \quad P_S(\delta)y_i + (1 - P_S(\delta))(z_i - d_i) > z_i.$$

Thus there is an $\eta \in \Omega$ for which S is η -formable at δ against ζ . This completes the proof.

Theorem 2.4.2. *Roemer (1985) A solution (η^*, δ^*) to the minimax problem exists, along with an associated revolutionary coalition $S^* = S_{\delta^*}^{\eta^*}$*

We do not give the formal proof of the Theorem. Theorem 2.4.2 states that the solution exists. Roemer shows that if the probability functions are continuous in penalties the solution exists (given that the Tsar moves first). Additionally, he obtains a number of important results by using this set up and Theorem 2.4.2. In the next section we discuss these results.

2.4.2 Tyranny Doesn’t Pay

Roemer defines that a strategy for the Tsar is tyrannical if and only if optimum penalties equal incomes, $\delta^* = \zeta$. The first interesting result of the model is that Tyranny never pays in a sensitive regime. This means that the Tsar does not have a tyrannical solution. For a better understanding of this result we need to understand the underlying assumptions first.

Let us begin with the meaning of “sensitive” regime. The Tsar cannot simply set the penalties equal to income because Penalty Monocity makes increasing penalties costly for him. In other words, the probability of a successful revolution is sensitive to penalties. Formally, let ∇ denotes partial derivative with respect to δ . The probability of successful revolution is sensitive if $\nabla P_S(\delta) > 0$ for all non empty coalitions S and δ . Otherwise, if the probability is insensitive to penalties, $P_S(\delta)$ is a constant function on D .

If we ignore the Penalty Monocity assumption, the probability of a revolution is only conditional on the size of the coalition. In this case the Tsar will choose

penalties such that $\delta^* = \zeta$ and has a tyrannical solution. However, if the probability is sensitive to penalties even to a small degree, [Roemer](#) shows that optimal strategy cannot be tyrannical for the Tsar.

Next we need to review the constraints for the Tsar for a better understanding of the further results. There are three constraints that must hold in the equilibrium, meaning that the optimum penalty δ^* solves them.

The first one is that the penalties cannot exceed the incomes.

$$0 \leq \delta \leq \zeta. \quad (2.12)$$

This constraint is trivial and it ensures that the penalty vector is an element of the Tsar's strategy space, $\delta \in D$.

The Tsar minimizes the winning probability of the optimal revolutionary coalition S^* , $P_{S^*}(\delta)$. Recall that by Lemma 2.4.1 we stated that there is an $\eta \in \Omega$ for which S is η -formable at δ against $\zeta \Leftrightarrow (2.8)$. The second constraint is that in the equilibrium it should be ensured that S^* is formable.

$$P_{S^*}(\delta) > \frac{\sum_{i \in S^*} d_i}{\sum_{i \in S^*} d_i + n - \sum_{i \in S^*} z_i}. \quad (2.13)$$

Figure 2.1 represents possible coalitions¹. There are many η -formable coalitions. But the equilibrium coalition has the highest probability, at least as high as the probability of any other η -formable coalitions. In other words [Roemer](#) calls it maximally probable formable. The revolutionary coalition S^* is the solution coalition since it has maximum winning probability.

The third constraint is that no coalition with higher probability is formable. Formally,

$$P_S(\delta) \leq \frac{\sum_{i \in S} d_i}{\sum_{i \in S} d_i + n - \sum_{i \in S} z_i} \quad (2.14)$$

for all $S \subset N$ such that $P_S(\delta) > P_{S^*}(\delta)$.

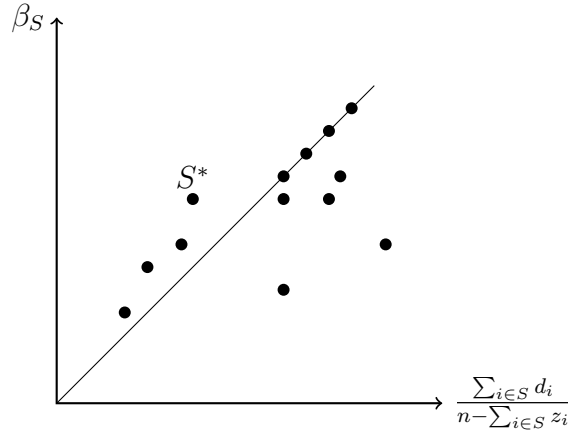
The Tsar's optimal penalty vector δ^* minimizes $P_{S^*}(\delta)$. Recall that the Tsar can increase penalties until some level because of Penalty Monocity. When he

¹Roemer defines an odds victory function $\beta_S(\delta) = \frac{P_S(\delta)}{1 - P_S(\delta)}$. In the equilibrium the odds victory function is $\beta_{S^*}(\delta)$.

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increases the penalties he also increases the probability of a successful revolution. On the other hand, the Tsar cannot decrease penalties in order to decrease this probability. What prevents the Tsar from lowering δ^* is the existence of some coalitions which are on the border of being formable. [Roemer](#) calls these coalitions *critical coalitions*. The critical coalitions satisfy (2.14) with equality.

Figure 2.1: Critical Coalitions, ([Roemer, 1988](#), p. 236)



In Figure 2.1, the coalitions on the 45° line are the critical coalitions. If the Tsar lowers the penalties then the critical coalitions would shift above the 45° line. The Tsar cannot lower the probability of a successful revolution by lowering penalties because then the critical coalitions become formable.

Critical coalitions play a central role in the model. Therefore, before we show that sensitive regimes cannot have a tyrannical solution, we will take a closer look at *critical coalitions*. First, we want show that by Penatly Monocity and the existence of (η^*, δ^*) with S^* there exist critical coalitions.

By optimality if the Tsar chooses $\delta' < \delta$ with the intension of lowering the probability of successful revolution, $P_{S^*}(\delta^*)$ to $P_{S^*}(\delta')$ (by Sensitivity) the constraints 2.12, 2.13 and 2.14 (conditions of optimality) will prevent this change. In fact, we will prove that member j , whose penalty is lowered, will be a member of some critical coalitions.

When the Tsar lowers penalties, optimality implies that at least one of 2.12, 2.13 or 2.14 is violated. We start by showing that for small change in δ 2.12 and 2.13 can remain unviolated.

If $\delta > 0$, then there always exist $0 < \delta' < \delta$. This leaves us with the need to violate 2.13 or 2.14. For small enough changes, by continuity of $P_S(\delta)$, we can find a δ' that does not violate 2.13.

If 2.12 and 2.13 remain unviolated small changes in δ have to violate 2.14. In the following, we will show that this brings us to the existence of critical coalitions.

First, assume that

$$P_S(\delta) < \frac{\sum_{i \in S} d_i}{\sum_{i \in S} d_i + n - \sum_{i \in S} z_i}$$

where $P_S(\delta) > P_{S^*}(\delta)$. Then again by continuity of $P_S(\delta)$, there exists a δ' that does not violate 2.14. This leaves us with

$$P_S(\delta) = \frac{\sum_{i \in S} d_i}{\sum_{i \in S} d_i + n - \sum_{i \in S} z_i} \quad (2.15)$$

where $P_S(\delta) > P_{S^*}(\delta)$.

For clarity, let us say the Tsar reduces δ for citizen j ($d_j^* > 0$). If j is not an element of any critical coalition then only the left hand side of 2.15 would decrease and the critical coalition still would not be η -formable. Therefore j has to be a member of some critical coalition. This is the only way to maintain optimality ².

Theorem 2.4.3. *Roemer (1985) Assume Penalty Monocity and Lean and Hunger. Furthermore, assume that there is a unique richest agent in ζ . Then no sensitive solution has a tyrannical Tsar.*

²Readers might prefer a more constructive proof of the role of the critical coalitions. However, since the functional form of $P_S(\delta)$ is not known we have to resort the implicit proof via optimality because it is not possible to show that the change in δ will cause

$$\frac{\sum_{i \in S'} d_i}{\sum_{i \in S'} d_i + n - \sum_{i \in S'} z_i} < P_{S'}(\delta') < P_{S^*}(\delta').$$

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Let us start by noticing that Lenin cannot organize an η -formable coalition of size n . This is because when all citizens are members of the coalition, redistribution becomes impossible. (Recall that in Lemma 2.4.1 we show that each member has to receive more income than the current income.)

Our aim is to show that in a sensitive regime the Tsar cannot have a tyrannical solution. To do so we assume that the Tsar sets penalties equal to incomes $d_i = z_i$. But before we will show that if a rich citizen k with $(d_j^*, z_j) \leq (d_k^*, z_k)$ is in the critical coalition then a poorer citizen j would be in the critical coalition too.

Assume that S' is a critical coalition with the member k . Now construct a coalition $\hat{S}$ where we simply substitute citizen k by citizen j . This implies

$$P_{\hat{S}}(\delta^*) > P_{S'}(\delta^*) = \frac{\sum_{i \in S'} d_i^*}{\sum_{i \in S'} d_i^* + n - \sum_{i \in S'} z_i} > \frac{\sum_{i \in \hat{S}} d_i^*}{\sum_{i \in \hat{S}} d_i^* + n - \sum_{i \in \hat{S}} z_i}. \quad (2.16)$$

The equality is just the definition of the critical coalition. On the left hand side the greater than sign is a consequence of the Lean and Hunger assumption. On the right hand side the greater than sign follows from arithmetics, i.e. substituting z_k by z_j and d_k^* by d_j^* . This implies that $\hat{S}$ is η -formable with given penalties δ^* . But this contradicts constraint 2.14 because $P_{\hat{S}}(\delta^*) > P_{S^*}(\delta^*)$. Therefore, j needs to be a member of S' .

Going back to proving the theorem if the unique richest citizen (or one of the richest citizens)³ is in the critical coalition, all other citizens will be in the critical coalition too in the presence of a tyrannical solution. However, a critical coalition has to be potentially η -formable. We have already discussed that the entire society cannot form an η -formable coalition. Thus, a sensitive regime under Penalty Monocity and Lean and Hunger cannot have a tyrannical solution.

2.4.3 Progressive Lenin

We have examined the Tsar's strategy—when the regime is insensitive the Tsar has a tyrannical strategy, otherwise he cannot have a tyrannical strategy. What then

³We do not see a need to have the unique richest citizen to prove this theorem. However, Roemer uses this assumption to show further results. This assumption leads that the unique richest agent will not receive the highest penalty.

is Lenin's strategy? For Lenin the optimal strategy is called progressive if and only if there is a redistribution from the rich to the poor. Note that there is no redistribution within the revolutionary coalition. Formally, $\eta \in \Omega$ is a progressive redistribution iff there is an income level z such that,

$$z_i \geq z \Rightarrow y_i \leq z_i, \quad (2.17)$$

$$z_i \leq z \Rightarrow y_i \geq z_i. \quad (2.18)$$

When is Lenin strategy progressive? Lenin can choose a progressive strategy if the revolutionary coalition is poor-connected. S is called poor-connected iff $\exists z$ such that $\forall i \in N \quad z_i < z \Rightarrow i \in S$.

A case in which the revolutionary coalition is poor-connected is given if penalties are increasing monotonic in incomes.

$$z_i \geq z_j \Rightarrow d_i \geq d_j \quad (2.19)$$

But recall that in a sensitive regime the Tsar never sets a penalty vector which is monotonic. The only way in which the penalty vector can be monotonic is if the regime is insensitive and the Tsar then has a tyrannical solution. If we assume that the regime is insensitive – where the probability only depends on the size of a coalition – Lenin has an optimal strategy which is progressive.

Theorem 2.4.4. *Roemer (1985) Assume that assumption Lean and Hunger holds. Furthermore, assume that no two agents have the same income. If the regime is insensitive then the revolutionary coalition S^* is poor-connected and Lenin has an optimal strategy which is progressive.*

If the optimal penalties δ^* are monotonic then there is a revolutionary coalition which is poor-connected. Furthermore, we will show that a poor-connected revolutionary coalition implies an optimal strategy which is progressive.

Let us begin to prove the first part of the theorem: If the regime is insensitive then the revolutionary coalition S^* is poor-connected. Let i be the richest member in S^* and assume that S^* is not poor-connected. This means $\exists j \notin S^*$ with $z_j < z_i$.

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Recall that in the previous section we already discussed that if the regime is insensitive the Tsar sets penalties equal to incomes. It follows that δ^* is monotonic in incomes. In an insensitive regime j 's penalty is less than i 's penalty $d_j < d_i$ because $d_j = z_j$ and $d_i = z_i$. (There are no two individuals with the same income). Now we construct a coalition $\hat{S}$ where we simply substitute citizen i by citizen j , $\hat{S} = S^* \setminus \{i\} \cup \{j\}$. The Lean and Hunger assumption implies that $P_{\hat{S}}(\delta^*) \geq P_{S^*}(\delta^*)$. On the other hand, arithmetic implies that

$$\frac{\sum_{i \in S^*} d_i}{\sum_{i \in S^*} d_i + n - \sum_{i \in S^*} z_i} > \frac{\sum_{i \in \hat{S}} d_i}{\sum_{i \in \hat{S}} d_i + n - \sum_{i \in \hat{S}} z_i}. \quad (2.20)$$

We know that $P_{S^*}(\delta^*)$ is η -formable. We obtain

$$P_{\hat{S}}(\delta^*) \geq P_{S^*}(\delta^*) > \frac{\sum_{i \in S^*} d_i}{\sum_{i \in S^*} d_i + n - \sum_{i \in S^*} z_i} > \frac{\sum_{i \in \hat{S}} d_i}{\sum_{i \in \hat{S}} d_i + n - \sum_{i \in \hat{S}} z_i}. \quad (2.21)$$

This implies that $\hat{S}$ becomes η -formable. This means that S^* was not optimal (in the case of $P_{\hat{S}}(\delta^*) > P_{S^*}(\delta^*)$) or not unique (in the case of $P_{\hat{S}}(\delta^*) = P_{S^*}(\delta^*)$). This completes the proof of the first part.

For the second part we will show that poor-connected revolutionary coalition leads to a progressive optimal strategy. When the revolutionary coalition is poor-connected it contains all agents whose income is less than some given income z . Additionally, recall that (Lemma 2.4.1) Lenin can propose a redistribution which is possible from the total income such that,

$$n \geq \sum_{i \in S} y_i > \frac{1 - P_S(\delta)}{P_S(\delta)} \sum_{i \in S} d_i + \sum_{i \in S} z_i. \quad (2.22)$$

Now if Lenin wants to organize a coalition which is formable, he has to propose a sufficient amount of income for every member in the revolutionary coalition. In addition, if he also wants to form a progressive strategy then by definition (2.18) he has to give at least $z_i = y_i$ to individuals that are not in the revolutionary coalition but have less income than some given income z . Let us denote this

group by S^0 ⁴. For incomes proposed by Lenin it has to hold that

$$n \geq \sum_{i \in S \cup S^0} y_i > \frac{1 - P_S(\delta)}{P_S(\delta)} \sum_{i \in S} d_i + \sum_{i \in S} z_i + \sum_{i \in S^0} z_i. \quad (2.23)$$

We have already shown that we have a poor-connected coalition. It follows that S^0 is empty because every agent that has an income less than some given income is in the revolutionary coalition. That means $\sum_{i \in S^0} z_i = 0$ and (2.23) becomes equal to (2.22). Thus, Lenin has a progressive strategy. This completes the proof.

2.5 Discussion

Roemer argues that the ideologies of Lenin and the Tsar are shaped by good strategies. *“The Tsar does not treat the rich lightly and the poor harshly for ‘ideological’ reasons but as optimal strategy”* (Roemer, 1985, p. 100) and *“Lenin will often propose progressive redistributions of income.”* (Roemer, 1985, p. 86) for the same reason. Concerning rational revolutions he points out that we can not conclude that Lenin only chooses a progressive redistribution because it is good strategy. His result is that *“if Lenin had an ideological precommitment against progressive redistributions, then he would relegate himself to low probability strategies”* (Roemer, 1985, p. 107).

In the model the Tsar uses penalties as the only strategy. On the other hand in some situations the authoritarian governments can offer redistribution, as for example in many European countries at the beginning of 19th century. However, this is not the case here. What is the reason that nondemocratic regimes sometimes offer redistribution? It is worth noticing that the 1917 Russian Revolution took place in an agrarian society. This can be one of the reasons the Tsar preferred repression. Acemoglu and Robinson suggest that this is because the elite is in favor of repression rather than concessions, and when repression fails revolutions take place. *“In more urbanized and industrialized societies, where the*

⁴Please note that this definition corresponds to S^0 in Lemma 5.1 (Roemer, 1985, p. 97). However, the version in Econometrica 53(1) seems to feature a printing error:

“ $S_0 = \{i \notin S | z_i \leq \max_{j \in S} z_j\}$ ”

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elite are invested in capital, concessions are favored and revolutions are observed less often.”([Acemoglu and Robinson, 2006](#), p. 33). .

Next, in [Acemoglu and Robinson’s \(2006\)](#) model we will examine when concessions can be an option for nondemocratic regimes. The citizens sometimes accept these concessions because revolutions are costly and risky events. However, concessions cannot prevent revolutions if they are not sufficient. Then the elite sometimes introduce democracy as an alternative.

2.6 Summary

We have presented [Roemer’s \(1985\)](#) model of revolutions. The model provides an explanation for both the strategies of Lenin and the Tsar. To do so, it deals with the economic structure of revolutionary situations and its effects on the strategies of revolutionary action. [Roemer](#) shows that ideologically motivated behaviors of the Tsar and Lenin actually have a rational foundation. It is discussed under which conditions Lenin adopts a progressive strategy while the Tsar finds high penalties more attractive.

Chapter 3

Acemoglu and Robinson's Static Model of Democratization

The particular model outlined in this chapter attempts to explain the relationship between democratization and revolutions. It encompasses three essential elements: (i) the relationship between inequality and revolution, (ii) the revolutionary threat and (iii) the commitment problem. This model by [Acemoglu and Robinson \(2006\)](#) is able to account for democratization especially in Western European and Latin American countries. They give reasons why some countries democratize (e.g. Britain), some remain nondemocratic with repression (e.g. South Africa) or without repression (e.g. Singapore), and some oscillate between democracy and nondemocracy (e.g. Argentina).

Thus, in this chapter we will examine a model of revolution that may lead to democratization that was presented in the seminal work of [Acemoglu and Robinson \(2006\)](#). The economic outcome is a result of a political regime and it is more beneficial to the class which has the political power. Therefore, different classes in a society prefer different political regimes.

The authors study the conflict between the social classes of a country which leads to transitions between different regimes (Nondemocracy, Democracy and Revolution) by using game theory. There is a static game with two players, the elite and the citizens, who have conflict over their share of income. The elite prefer nondemocracy in which they have the political power and control over most of the economic resources while the citizens prefer democracy in which they

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have the political power and there is an income redistribution from the elite to the citizens.

To study the basic ideas of Acemoglu and Robinson's model, we view the players as making decisions in one period. The authors also develop a richer dynamic model which is an extension of the static model in infinite horizon time.

Section 3.1 introduces the basic ideas of the model, with particular focus on the relationship between democratization and the level of inequality, the commitment problem and the existence of a revolutionary threat. We establish the notation and the specifications of the economy in section 3.2. In section 3.3, we give the timing of the extensive form game. We analyze the game in section 3.4 and derive a unique Subgame Perfect Nash Equilibrium (SPNE) based on comparing the expected outcomes of the elite and the citizens. Section 3.5 presents a discussion of the results as well as questions that are still open. The last section briefly summarizes our discussion.

3.1 Introduction

The model contains two features. The first is the conflict between the elite and the citizens over income shares. The elite are in power and are a minority, but have more economic resources than the citizens. This results in a conflict between the elite and the citizens due to the income inequality existing between these two classes. The poor and disenfranchised citizens are numerous and can therefore pose a threat of revolution to the ruling elite whereby they can overthrow the elite and share their income. However, a revolution is costly to the citizens. The cost of revolution is taken to be exogenous and has central importance in the model. If the cost of revolution is low enough, then the citizens can threaten the elite with a revolution and can induce them to make concessions or to create democracy.

The second feature is the commitment problem of the elite. The only redistribution tool available is the tax rate. The incomes of the elite and the citizens are taxed and tax revenues are redistributed equally—income of the elite and the citizens are taxed at the same tax rate and all agents receive the same amount of redistribution. In the presence of a revolutionary threat they can promise more

redistributive policy. However, the elite can easily reverse this policy when they are in power because they have the right to determine the level of redistribution in the future¹. This is called the commitment problem.

The elite can use democratization as a commitment device because it is not a policy but a structural change. In a democracy, the tax rate is determined by the citizens because they represent a majority². [Acemoglu and Robinson](#) assume that greater inequality promotes a higher tax rate and more redistribution. In this they follow [Meltzer and Richard \(1981\)](#).

Repression is introduced as a costly alternative to redistribution and democracy for the elite. In South Africa a nondemocratic regime used strong repression while in Singapore another nondemocratic regime used (relatively) weak repression. In an authoritarian regime the absence of repression can have two reasons: either repression is too costly or the income inequality is not sufficiently high. In the case where repression is sufficiently costly and a threat of revolution exists, the elite are forced either to democratize or to redistribute in order to reduce the level of inequality.

Acemoglu and Robinson's model has several interesting facets. One is that it derives comparative statics that imply a non-linear relationship between inequality and the emergence of democracy – highly equal or highly unequal societies are unlikely to democratize. This finding is very similar to income distribution-democracy results from [Burkhart \(1997\)](#). He finds through pooled two-stage least-squares estimation that a non-linear relationship exists between democracy and income distribution (inverted U-shaped curves). This means that democracy is not likely to emerge in either low or in high inequality situations.

3.1.1 Commitment Problem

In introducing the essential ideas of Acemoglu and Robinson's model, which govern the decisions of the elite and the citizens, we have emphasized the driving force of future promises to democratization in their model. In the presence of a revolutionary threat, the elite can redistribute income to prevent a revolution.

¹The elite always prefer no taxes because the amount of taxes they pay is higher than what they receive from redistribution.

²It is assumed that policies are determined by the Median Voter Theorem.

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However, they cannot make commitments to bind their future action because there is no third party with the capacity to enforce such an agreement. This raises the commitment problem for the elite.

The elite can use democratization as a commitment device since it shifts the political power from the elite to the citizens. Political institutions play a central role in solving the commitment problem. It is worth noting that reversible policy (income redistribution through taxation) causes this commitment problem. For example, a land reform can be a solution to the commitment problem since it cannot be easily reversed.

[Acemoglu and Robinson](#) integrate the idea that democracy is not only a thing for today but also for tomorrow, and that the elite and the citizens care about the policies both of today and tomorrow. The commitment problem is one of the building blocks of their model³. Together with a sufficiently low cost of revolution, it results in democratization in the equilibrium.

3.1.2 Inequality

In a society, different groups (social classes in the model) have opposing interests with regards to political outcomes which result in opposing interests over the form of political institutions. This conflict is based on the division of income between the elite and the citizens.

The relationship between inequality and democracy has been studied by a number of scholars. On the one hand, there are studies that argue that economic inequality prevents democracy⁴. On the other hand, [Boix \(2003\)](#) finds that economic inequality actually promotes democratic survival instead of hurting it when controlling for wealth as measured by GDP per capita. Only when he ignores a country's wealth he finds that inequality negatively affects the survival of democracy. However, [Lipset \(1959a\)](#) argues that there is a strong relationship between wealth and democracy. Lipset's main result is that rich countries tend to be more democratic.

³For commitment problem see also [North and Weingast \(1989\)](#), [Fearon \(1995\)](#), and [Powell \(2002\)](#)

⁴ See [Rosendorff \(2001\)](#), [Reenock, Bernhard and Sobek \(2007\)](#).

In contrast to most of the empirical studies, which result that there is a linear relationship between inequality and democratization, [Acemoglu and Robinson \(2006, p. 34\)](#) argue that there is a non-monotonic relationship between inequality and democracy:

“Everything else equal, greater inter-group inequality makes revolution more attractive for the citizens: with revolution, they get a chance to share the whole income of the economy (minus what’s destroyed in revolution), while in non-democracy they obtain only a very small fraction of these resources.”

Specifically, they claim that democracy is more likely to emerge in the case of middle level inequality, where citizens are not satisfied with the status quo and where the elite do not lose too much through democratization, and less likely when inequality is either low or high.

3.1.3 Revolutionary Threat

The link between the threat of revolution and democratization plays a key role in the model. After the French Revolution (1789) Europe experienced many revolutions. Among European countries, Britain was a special case. Britain experienced gradual reforms which ended with democratization without revolution. According to some political historians the significant threat of revolutions was the driving force behind democratization in this case ⁵.

The threat of revolution was not unique to Britain. Another example of [Acemoglu and Robinson](#) is the Swedish case. *“Swedish democracy had triumphed without a revolution—but not without the threat of a revolution.”* ([Tilton \(1974\)](#) cited in ([Acemoglu and Robinson, 2006, p. 27](#)))

The threat of revolution has to be credible to be effective and its credibility depends on the cost of revolution for the citizens. This cost is associated with the inequality level. Up to middle level, increasing inequality makes a higher likelihood of revolution and as a result a higher likelihood of democratization.

The approach to conflict can be seen as a bargaining situation. As Schelling points out, *“a ‘successful’ employees’ strike is not one that destroys the employer financially, it may even be one that never takes place.”* ([Schelling, 1980, p. 6](#)).

⁵See [Lee \(1994\)](#), [Tilly \(1997\)](#)

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In revolutions much of the wealth of a society may be destroyed, and this is costly for both citizens and the elite. If there is a credible revolutionary threat, democratization may deter it. Sometimes a “successful” revolution never takes place but leads to democracy⁶.

3.2 The Model

In the theory of political transitions, conflict plays a central role. To study the conflict and its consequences on politics and the economy, in the following section we will define the society, the players and their strategies, and the possible political regimes with their economic outcomes.

Assume that the society consists of two classes, the rich ruling elite and the poor citizens. The size of the population is normalized to 1. Within each group all members are identical. There are two different income levels. Let λ be the proportion of the elite with income w_e and let $1 - \lambda$ be the proportion of the citizens with income w_c . The elite are in power, the society exists in a situation of nondemocracy and the income of the elite is greater than the income of citizens, i.e. $w_e > w_c$. This means that the minority group of the elite in the society has political power and more economic resources than the majority group of the citizens.

The total income of the elite and the citizens is normalized to 1. Let $\bar{w}$ denote the average income in this society. The average income is the total income of the elite and the citizens divided by the population size. Thus, $\bar{w}$ is given by

$$\bar{w} = \lambda w_e + (1 - \lambda)w_c. \quad (3.1)$$

An important parameter of the model is the level of inequality. Letting θ denote the income share of the elite and $1 - \theta$ the income share of the citizens, we can write the incomes such that,

$$w_e = \frac{\theta \bar{w}}{\lambda} \quad \text{and} \quad w_c = \frac{(1 - \theta) \bar{w}}{1 - \lambda}. \quad (3.2)$$

⁶It is usually assumed that the citizens expect to be better off under democracy than under a revolutionary state.

Now, substituting the definitions of incomes in (3.2), into (3.1) we obtain that the average income of the economy is $\bar{w} = 1$. We know that by definition $w_e > w_c$. The resulting inequality implies that

$$\frac{\theta \bar{w}}{\lambda} > \frac{(1 - \theta) \bar{w}}{1 - \lambda} \quad \text{or} \quad \theta > \lambda. \quad (3.3)$$

It follows that there is a distributional conflict between the ruling elite and the citizens because the income share of the elite exceeds their share in the population, i.e. $\theta > \lambda$. An increase in θ represents an increase in the share of the income of the elite. Note that $\theta \in (\lambda, 1)$. When θ becomes higher the income share of the citizens becomes less, the society becomes more unequal. Therefore, we will use the terms the income share of the elite and level of inequality interchangeably. Since we are interested in studying the conflict between the elite and the citizens we will, from now on, express the incomes with respect to the inequality and the average income of the society, but for simplicity we do not write the average income explicitly⁷.

In the given situation, citizens are excluded from politics and they have less income than the minority elite. But still, citizens can challenge the current regime because they constitute the majority. The citizens can challenge the current regime by attempting a revolution. If they undertake a revolution, it is assumed that they always succeed. In this case the elite lose everything and citizens share the remaining income among themselves. A revolution, however, costs a fraction of the total income. Let r be the fraction of the total income destroyed by a revolution. After a revolution, the citizens share the remaining income $1 - r$ evenly. It means that each citizen receives an outcome of

$$\frac{1 - r}{1 - \lambda}. \quad (3.4)$$

There is a threat of revolution resulting from the fact that the citizens can undertake a revolution and it is also the worst outcome for the elite. Therefore, the elite try to prevent a revolution if they can. Another issue is whether this

⁷ Both the total income and the average income are normalized to unity, but notice that they have different units. The average income is the income per person by definition. Thus the unit of the total income is income while the unit of the average income is income/person.

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threat of revolution is credible. The threat of revolution will be credible under specific conditions, but let us discuss them in Section 3.4.

How can the elite prevent a revolution if the threat of a revolution is credible? They can promise that they will share some part of their income through taxation. In the model the only policy decision is the tax rate and since the players differ by income they have different preferences regarding the tax rate. It is assumed that if the tax rate increases, the transfer from the elite to the citizens also increases (Meltzer and Richard 1981). Since the income of the elite is higher than the income of the citizens, the elite prefer a tax rate equal to zero. In other words, they prefer no redistribution. But the threat of revolution can force the elite to set the tax rate different from zero. As a simplification, we do not introduce the tax rate and deathweight losses here ⁸. Instead, we assume that if the tax rate is not equal to zero, the elite promise to share part of their income.

Let $k \in [0, 1)$ be the fraction of the income that the elite promise to redistribute towards the citizens. If the elite hold this promise and make concessions, they receive $(1 - k)w_e$ which makes the cost of concessions equal to $\Delta_e = kw_e$. By using the definition of w_e in (3.2), we obtain the amount of concession for each member of the elite by

$$\Delta_e = \frac{k\theta}{\lambda}. \quad (3.5)$$

If each member of the elite pays Δ_e , then the total concession is equal to $\lambda\Delta_e = k\theta$. Note that as the level of inequality increases the amount of concessions also increases. This total concession is evenly distributed among the citizens. Each of the citizens receives the amount of concession of

$$\Delta_c = \frac{k\theta}{1 - \lambda}. \quad (3.6)$$

Let $\hat{k}$ denote the value of k which the elite set to prevent a revolution. When $k = \hat{k}$, the elite offer $\hat{\Delta}_e$ amount of their income to the citizens in order that they gain $\hat{\Delta}_c$. After observing $\hat{k}$, the citizens decide whether to undertake a revolution or not. If there is such a $\hat{k}$ which can prevent a revolution, the elite can deter the

⁸For more detailed analysis see Acemoglu and Robinson (2006), and Boix (2003).

threat of a revolution. In this case however, $\hat{k}$ is not the only variable that shapes the decision of the citizens. The citizens keep in mind that there is a commitment problem which is one of the core ideas of the model. When the elite offer some concessions, they hold this promise with probability h .

The elite strategy is guided by whether they expect the citizens to accept the concession with the given commitment problem or insist on undertaking a revolution. If concessions are insufficient to prevent a revolution, another option for the elite is to create democracy which is a promise of redistribution in the future to which the elite commit. Democracy can be seen as a maximum concession. In a democracy the citizens determine the value of k , because it is assumed that the policy decision is determined by the median voter. Let $\bar{k}$ denote a specific value of k which the median voter determines⁹. In democracy, the elite share $\bar{k}$ fraction of their income which causes the elite lose $\bar{\Delta}_e = \bar{k}w_e$, or equivalently

$$\bar{\Delta}_e = \frac{\bar{k}\theta}{\lambda}. \quad (3.7)$$

If each member of the elite pays $\bar{\Delta}_e$ then the total redistribution is equal to $\lambda\bar{\Delta}_e = \bar{k}\theta$ and each citizen receives

$$\bar{\Delta}_c = \frac{\bar{k}\theta}{1 - \lambda}. \quad (3.8)$$

We will use y_e and y_c for the income of the elite and the citizens in a democracy to keep in mind that we have a different political regime. In democracy the income of the elite is $y_e = w_e - \bar{\Delta}_e$ and the income of the citizens is $y_c = w_c + \bar{\Delta}_c$. From (3.7) and (3.8), it follows that if the inequality θ is high, the elite redistribute more of their income so that as inequality increases democracy becomes more redistributive. The main point here is that, institutional change solves the commitment problem. Otherwise, the elite could offer a concession level which is equal to redistribution in democracy. In this case there would be no difference in incomes. But citizens are not able to make the same expectation in a nondemocracy due to the probability h . As a result, democratization has a better chance than concessions to stop a revolution. However, democratization does not

⁹It is the solution to maximization problem of the citizens but we do not present maximization problem here. For more detail see [Acemoglu and Robinson \(2006\)](#).

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necessarily prevent a revolution. If democracy is not redistributive enough – if the inequality is too high – the citizens will prefer to initiate a revolution.

To prevent a revolution, the elite can also use repression. However, it can fail where the elite lose everything and the citizens successfully revolt. To be more specific, let f be the probability that repression will fail. If the elite decide to repress and repression does not fail, they lose a fraction of their income. The fraction of income is denoted by $m \in (0, 1)$. If the elite keep nondemocracy by repression, they receive $(1 - m)w_e$ which makes the cost of repression equal to mw_e . Repression is also costly to the citizens and for reasons of symmetry it costs mw_c . Again, by using the definitions of w_e and w_c in (3.2), the cost of repression is equal to $m\theta/\lambda$ for the elite and $m(1 - \theta)/(1 - \lambda)$ for the citizens. The cost of repression increases with increasing inequality, similarly to the cost of concessions and democratization.

The elite have three strategies: concessions, democratization and repression. In response to the elite's choice of concessions or democratization, the citizens decide whether to initiate a revolution or not.

A political regime can be one of the following states in the model: nondemocracy (N), democracy (D) or revolution (R). Initially the elite are in power and the political state is nondemocracy $x_0 = N$. In a nondemocracy the elite decide on the government policy and can repress the citizens. The political regime can be democracy only if the elite create democracy. In a democracy everybody votes on the tax rate and since the median voter is the citizens, they maximize their income. In a revolutionary state, the citizens rule the society and the elite lose their income. As we will discuss in section 3.4, a revolutionary state can emerge only if the elite repress the citizens. At the end of the game, the political regime can remain a nondemocracy (N), or changes to democracy (D) or revolution (R). Thus, $x_1 \in X = \{N, D, R\}$. We assume that the political state can change only once.

We complete the definitions of the model and summarize the notation in Table 3.1. We will analyze the distributional consequences of different political regimes depending on the level of inequality and the choice of the political regime after giving the exact timing and outcomes.

Table 3.1: Table of Symbols for Static Model of Democratization

w_c	Income of the citizens under nondemocracy
w_e	Income of the elite under nondemocracy
y_c	Income of the citizens under democracy
y_e	Income of the elite under democracy
m	Cost of repression for the elite and the citizens
Δ_c	Concession for the citizens
Δ_e	Cost of concession for the elite
r	Cost of revolution under repression
h	The probability that the elite commit to redistribution
f	The probability that repression fails

3.3 Timing and Outcomes

After having given the specification of the economy and the cost of a revolution, repression, and concession of the one shot game, we turn to the extensive form game for a more exact description. The moves and possible political regimes are illustrated in Figure 3.1 with the outcomes summarized in Table 3.2.

The timing of events is as follows,

1. The elite decide whether to use repression or not, $\psi \in \{0, 1\}$. If they use repression, $\psi = 1$, it costs a fraction of their income, $m \in (0, 1)$. Repression fails with probability f , the political state changes to R and the game ends. Repression succeeds with probability $1 - f$, the political state stays in N and the game ends.
2. If the elite do not use repression, $\psi = 0$, they decide whether to create democracy or not, $\delta \in \{0, 1\}$. If the elite democratize, $\delta = 1$, the citizens decide whether or not to initiate a revolution, $\rho \in \{0, 1\}$. If the citizens do not initiate a revolution, $\rho = 0$, the political state changes to D and the game ends. Otherwise, the political state changes to R and the game ends.
3. If the elite do not democratize, $\delta = 0$ they promise a concession that is a fraction of their income, $k \in [0, 1)$. They may promise no concession.

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4. The citizens decide whether or not to initiate a revolution, $\rho \in \{0, 1\}$. If the citizens do not initiate a revolution, $\rho = 0$ the political state stays in N . The elite redistribute the income with probability h and the game ends. If the citizens initiate a revolution, $\rho = 1$, the political state changes to R and the game ends.
5. Incomes are realized.

The outcomes depend on the citizens' and the elite's decision. Each group tries to maximize its outcome by choosing ψ, δ, k and ρ . Each member of the elite receives an outcome of

$$O^e = \psi \left[(1-f)(1-m)w_e \right] + (1-\psi) \left[(1-\rho) \left[(1-\delta) [h(w_e - \Delta_e) + (1-h)w_e] + \delta y_e \right] \right] \quad (3.9)$$

and each member of the citizens receives an outcome of

$$O^c = \psi \left[(1-f)(1-m)w_c + f \frac{1-r}{1-\lambda} \right] + (1-\psi) \left[(1-\rho) \left[(1-\delta) [h(w_c + \Delta_c) + (1-h)w_c] + \delta y_c \right] + \rho \frac{1-r}{1-\lambda} \right] \quad (3.10)$$

We have seven possible outcomes for the elite and the citizens which satisfy equation 3.9 and 3.10 (see Figure 3.1). In the following discussion, we identify how outcomes are calculated in Table 3.2.

Let us begin with the outcome of a revolution. If the elite do not repress, $\psi = 0$, and the citizens undertake a revolution, $\rho = 1$, as we discussed before, the elite receive 0 and the citizens expropriate the total income minus the cost of the revolution $(1-r)/(1-\lambda)$. Outcomes O_1 and O_3 are post revolution outcomes when the elite allow democratization, $\delta = 1$, and offer concessions, $k \in [0, 1)$. Recall that if the elite repress, $\psi = 1$, repression fails with probability f and the revolution takes place. Accordingly, both classes receive as the post revolutionary outcome O_7 .

If the elite create democracy, $\delta = 1$, democratization generates outcome O_2 . The income of each elite is $y_e = w_e - \bar{\Delta}_e$ and the income of each citizen is $y_c = w_c + \bar{\Delta}_c$ if the citizens do not undertake a revolution afterwards. While each member of the elite loses $\bar{\Delta}_e$, each member of the citizens gains $\bar{\Delta}_c$ in democracy.

If the elite do not repress, $\psi = 0$, and do not allow democratization, $\delta = 0$, they can make concessions and keep the status quo. The elite choose $k \in [0, 1)$ and if the citizens do not undertake a revolution both classes receive outcome O_4 with probability h or O_5 with probability $1 - h$. The income of the elite and the citizens are $w_e - \Delta_e$ and $w_c + \Delta_c$ respectively if the elite hold their promise. Otherwise the incomes do not change for both classes, w_e and w_c . Outcome O_5 is the most attractive for the elite since it does not include any cost.

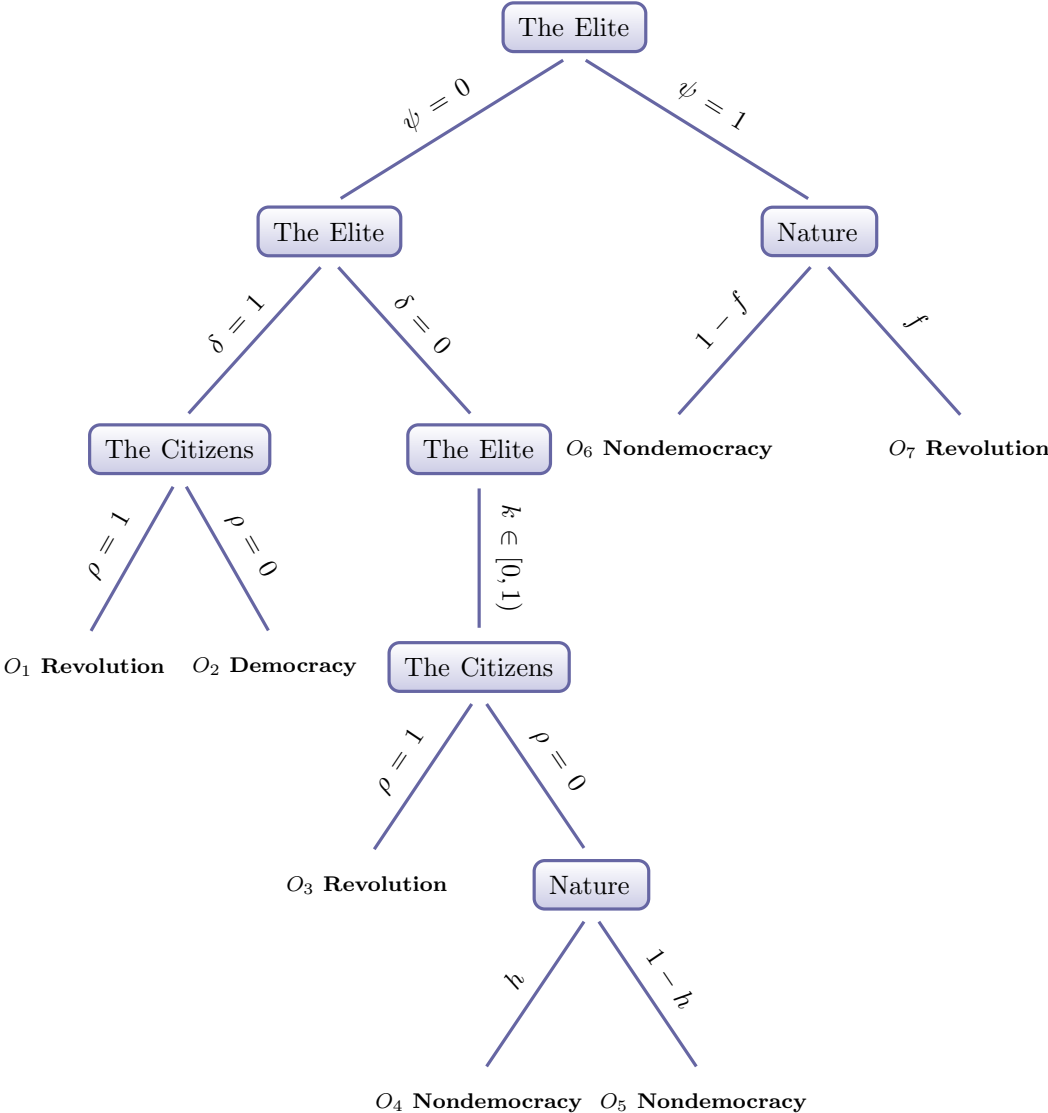
If the elite choose repression, $\psi = 1$, it succeeds with probability $1 - f$. In this case, each group receives outcome O_6 and suffers the cost of repression m . The income of the elite becomes $(1 - m)w_e$ and the income of the citizens becomes $(1 - m)w_c$.

Table 3.2: Outcomes of Static Model of Democratization

Outcome	The elite	The citizens
O_1	0	$(1 - r)/(1 - \lambda)$
O_2	y_e	y_c
O_3	0	$(1 - r)/(1 - \lambda)$
O_4	$w_e - \Delta_e$	$w_c + \Delta_c$
O_5	w_e	w_c
O_6	$(1 - m)w_e$	$(1 - m)w_c$
O_7	0	$(1 - r)/(1 - \lambda)$

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Figure 3.1: Acemoglu and Robinson's Game



3.4 Analysis

3.4.1 Definition of Equilibrium

We solve the game for a SPNE. The actions of the elite are $\sigma_e = \{\psi, \delta, k\}$ and those of the citizens are $\sigma_c = \{\rho(\delta, k)\}$. The elite decide whether to repress or not, $\psi \in \{0, 1\}$, to create democracy or not, $\delta \in \{0, 1\}$, and determine the fraction of their income to share, $k \in [0, 1)$. The citizens decide whether to undertake a revolution or not $\rho(\delta, k) \in \{0, 1\}$ as a response to democratization and concession. A strategy combination $\{\tilde{\sigma}_e\}, \{\tilde{\sigma}_c\}$ is a SPNE if in every subgame $\tilde{\sigma}_e$ and $\tilde{\sigma}_c$ are best responses to each other. We write the equilibrium in the following form:

$$\begin{aligned}\tilde{\sigma}_e &= \{\psi, \delta, k\}, \\ \tilde{\sigma}_c &= \{\rho(1, k), \rho(0, k)\}.\end{aligned}\tag{3.11}$$

The revolution decision of the citizens is conditioned on the current actions of the elite. A decision to initiate a revolution is $\rho(1, k)$, where this decision depends on democratization and $\rho(0, k)$, where this decision depends on concession.

There are various strategy profiles which can be in the equilibrium depending on the cost of revolution, repression, concession and democratization. In the end of this section we state a unique SPNE with associated conditions. Before we analyze the game, it is useful to informally state what happens in the equilibrium.

There is a unique SPNE such that,

1. If the citizens cannot pose a credible revolutionary threat, the elite can stay in power without repressing, redistributing or democratizing. The political state remains in nondemocracy.
2. If the citizens can pose a credible revolutionary threat then:
 - (a) If repression is costly relative to concessions and concessions can stop a revolution, then the elite redistribute income to avoid revolution. The political state remains in nondemocracy and the citizens receive some concessions.

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- (b) If concessions cannot stop a revolution and democratization is costly relative to repression or if repression is not too costly and democracy is not redistributive enough or if concessions prevent a revolution but concessions are relatively costly to repression, then the elite use repression. The political state remains in nondemocracy with probability $1 - f$ and changes to revolution with probability f .
- (c) If concessions are insufficient to avoid a revolution, democracy is redistributive enough and repression is relatively costly, then the elite democratize. The political state changes to democracy.

The fundamental parameters of the equilibrium are r, k, m, f and θ . We are now going to analyze the necessary conditions for these parameters.

3.4.2 The Revolution Constraint

We apply backward induction to solve the extensive form game illustrated in Figure 3.1. To do so, we start at the end of the game by comparing the outcomes of revolution and the status quo for the citizens. If the outcome of a revolution is greater than current income of the citizens, the citizens pose a revolutionary threat. They prefer to undertake a revolution if their income does not change (if no concession is given). Formally,

$$\frac{1 - r}{1 - \lambda} > w_c. \quad (3.12)$$

Substituting the definition of w_c in (3.2) into (3.12) we obtain the following constraint,

$$\theta > r. \quad (3.13)$$

Acemoglu and Robinson (2006) call (3.13) the revolution constraint. If the revolution constraint holds, the citizens can pose a serious revolutionary threat. Otherwise, a revolutionary threat is not credible. The revolution constraint or

the revolutionary threat, is binding if the citizens obtain more¹⁰ income by overthrowing nondemocracy and sharing the income of the elite among themselves. So if this revolution constraint is not binding, $r \geq \theta$, there is no need to make concessions use repression or create democracy. Therefore, the elite set $k = 0$. For any change in political regime or incomes the first necessary condition is that the revolution constraint is binding.

The revolutionary constraint has two intuitive features. First, if the share of income θ increases, (3.13) is more likely to hold because in a more unequal society the income of the citizens increases more after revolution. This feature predicts that in more unequal societies revolutions are more attractive. Second, if the cost of revolution r decreases, (3.13) is more likely to hold. Not surprisingly if the cost is low, there is more to share after revolution.

3.4.3 Concessions, Repression or Democracy?

In the following, we discuss the strategies of the elite if the revolution constraint is binding. If the revolutionary threat is credible they have to choose redistribution, repression or democratization to prevent a revolution.

Let us start with the last decision node where the elite promise redistribution and the citizens decide whether to undertake a revolution or not. Let $\hat{k} > 0$ be a specific value of k which generates $\hat{\Delta}_c$ concession to the citizens. The elite commit to redistribution with probability h . If there is such a concession $\hat{\Delta}_e$ that prevents revolution, the elite can choose $\hat{\Delta}_e$ which is just high enough to raise income of the citizens to after revolution income. Then the expected outcomes are $w_e - h\Delta_e$ and $w_c + h\Delta_c$, where $k = \hat{k}$, $\Delta_e = \hat{\Delta}_e$ and $\Delta_c = \hat{\Delta}_c$. (see Figure 3.2)¹¹.

To determine whether the elite will be able to prevent a revolution by redistributing, we need to know what the maximum amount of concessions that the elite can promise is. Recall that the maximum amount of concession is $\bar{\Delta}_e$,

¹⁰Acemoglu and Robinson (2006) assume that in the case of equality, the citizens would be indifferent between revolution and no revolution, and their choice should also be determined as part of the equilibrium. In the model, they assume that there is no loss in generality that in case of equality, they do not revolt.

¹¹Outcomes are always written in the following form: the elite's outcome, the citizen's outcome.

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where the elite set $k = \bar{k}$ that the elite can promise because then the regime is redistributive as much as democracy. But due to the commitment problem the expected value of nondemocracy with the best promised concession is always less than the expected value of democracy for the citizens.

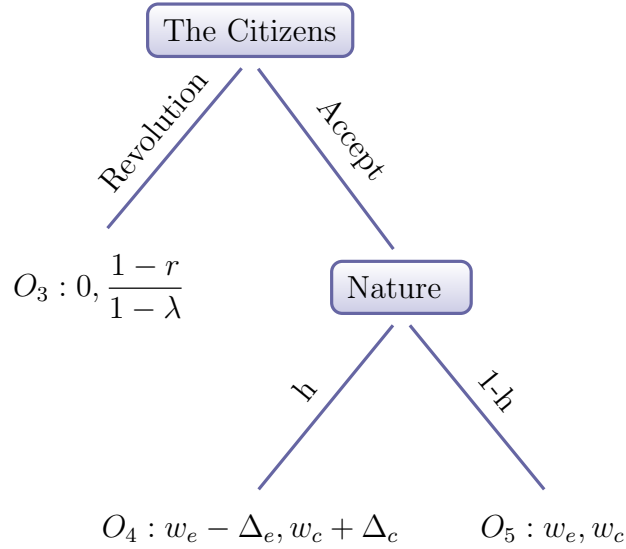
We define a critical value for the cost of revolution such that the citizens are indifferent between attempting a revolution or accepting the best promised concession. This critical value r^* satisfies

$$\frac{1 - r^*}{1 - \lambda} = w_c + h\bar{\Delta}_c,$$

or using definition of w_c in (3.2)

$$r^* = \theta - h(1 - \lambda)\bar{\Delta}_c. \quad (3.14)$$

Figure 3.2: The Elite's Commitment Problem



For all $r < r^*$ a revolution is attractive for the citizens even if the elite promise the best concession $\bar{\Delta}_e$, because a revolution is not very costly. In this situation the elite might allow democratization or use repression. If inequality, θ , is low or the probability of redistribution is high, then $r^* < r$ is more likely to hold.

The elite can avoid revolution and democratization by promising redistribution if $r^* \geq r$. In this case the elite set $k = \hat{k}$ which satisfies

$$r = \theta - h(1 - \lambda)\hat{\Delta}_c. \quad (3.15)$$

When the amount of concession is not sufficient to stop a revolution, democratization can be an option for the elite if the citizens do not revolt after democracy. Note that if the elite allow democratization, they solve the commitment problem. But democratization does not necessarily prevent revolution. Democratization can stop a revolution if it generates enough redistribution. We define a critical value r^{**} for which the citizens are indifferent between democracy and revolution

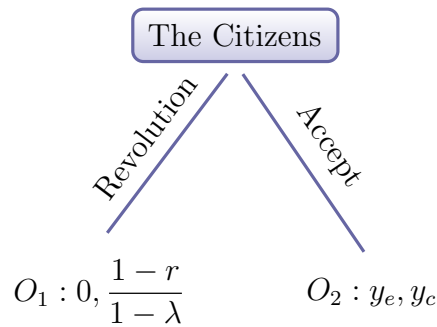
$$y_c = \frac{1 - r^{**}}{1 - \lambda}. \quad (3.16)$$

Recalling that $y_c = w_c + \bar{\Delta}_c$ and w_c is defined in (3.2), we obtain the threshold value such that,

$$r^{**} = \theta - (1 - \lambda)\bar{\Delta}_c. \quad (3.17)$$

The threshold value of revolution r^{**} depends on inequality θ and redistribution in democracy, $\bar{\Delta}_e$.

Figure 3.3: Democratization



When $r < r^{**}$, a revolution is more attractive than democracy. Furthermore, higher inequality implies more redistribution in democracy. When concessions

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cannot prevent a revolution, $r < r^*$, and the cost of revolution is high in democracy such that $r \geq r^{**}$, the elite create democracy and revolution is not of interest to the citizens. This means that for democratization the cost of revolution needs to be sufficiently low that concessions do not work, but not too low that democratization is still attractive.

The citizens prefer to initiate a revolution if r is low enough when the elite allow for democratization. This means that democracy is not redistributive enough. So that, if $r < r^{**}$ neither concession nor democratization is sufficient to prevent a revolution. In this case θ is very high and the elite prefer repression and take the risk of a revolution.

When the elite use repression as a strategy, they make their decision according to two threshold values at which they are indifferent between repression and concession or democratization. Assume that $\hat{\Delta}_e$ prevents revolution. Let us define the first threshold value of m at which the elite are indifferent between the outcome of repression and concession. Formally, the threshold value $\hat{m}$ is such that,

$$(1 - f)(1 - \hat{m})w_e = w_e - h\hat{\Delta}_e$$

or in other words

$$\hat{m} = \frac{h\hat{k} - f}{1 - f}. \quad (3.18)$$

The interpretation of this equation is that for all $m < \hat{m}$ the elite prefer repression to redistribution. Recall that m is the fraction of the total income destroyed by repression. It is clear that lower m implies a higher incentive for repression. Additionally, higher $\hat{k}$ decreases the likelihood of repression since $\hat{m}$ increases in terms of $\hat{k}$. However, repression might fail with probability f so this threshold value of repression decreases in terms of f . That is, when the probability of failure is high, the elite do not prefer repression. Now we have one case such that when $m < \hat{m}$ and $r < r^*$, the elite use repression.

Before the elite move they also compare the outcome of repression and democratization. Assume that democratization stops a revolution. Let $\tilde{m}$ be a threshold value such that,

$$(1 - f)(1 - \tilde{m})w_e = w_e - \bar{\Delta}_e,$$

or in other words

$$\tilde{m} = \frac{\bar{k} - f}{1 - f}. \quad (3.19)$$

When $m < \tilde{m}$ the elite prefer repression to democratization. Similarly, $\tilde{m}$ increases in terms of $\bar{k}$ and decreases in terms of f . Clearly, $\hat{m} < \tilde{m}$ because of the probability h . If the elite prefer repression to redistribution, they also prefer repression to democratization. So, the second case where the elite use repression is $m < \tilde{m}$ and $r < r^{**}$.

Figure 3.4: Repression

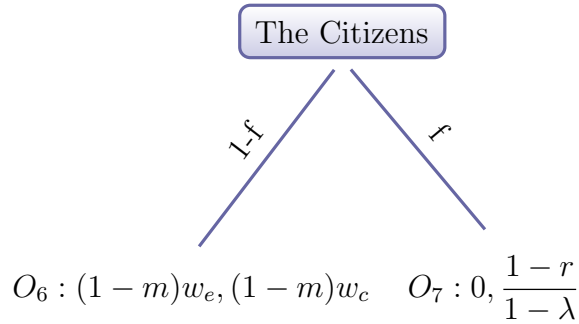


Table 3.3 summarizes the cost of revolution, repression and concession. Recall that $\hat{k}$ is a specific value of k which prevents a revolution and $\bar{k}$ is a specific value of k which maximizes the income of the citizens. Next, we derive a subgame perfect equilibrium depending on the costs.

3.4.4 Equilibrium

We are ready to state the equilibrium. There is a unique subgame perfect equilibrium depending crucially on the size of the parameters, the costs and the probabilities. We write subgame perfect strategy profiles according to (3.11). In

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order to avoid complications in the following theorem we write only the equilibrium path. The full specification of strategy profiles can be found in the proof of Theorem 3.4.1 in the Appendix.

Table 3.3: Table of Symbols for the Cost of Revolution and Repression

	The critical value of costs	Conditions
r^*	Revolution	For $r < r^*$ the citizens prefer revolution to concession.
r^{**}	Revolution	For $r < r^{**}$ the citizens prefer revolution to democratization.
$\hat{m}$	Repression	For $m < \hat{m}$ the elite prefer repression to concession.
$\tilde{m}$	Repression	For $m < \tilde{m}$ the elite prefer repression to democratization.

Theorem 3.4.1. *Acemoglu and Robinson (2006)*

There is a unique SPNE $\{\tilde{\sigma}_e\}, \{\tilde{\sigma}_c\}$ in the game described in Figure 3.1 and it is such that,

1. *If $\theta \leq r$, the revolution constraint does not hold. The elite choose $k = 0$ thus $\Delta_e = 0$ and $\Delta_c = 0$. The citizens do not undertake a revolution. The political regime stays in N . So the elite can stay in power without repressing, redistributing or democratizing. The citizens receive w_c and the elite receive w_e .*
2. *If $\theta > r$, the revolution constraint holds. Let r^* and r^{**} be defined by (3.14) and (3.17), $\hat{m}$ and $\tilde{m}$ be defined by (3.18) and (3.19), then*
 - (a) *If $r \geq r^*$ and $m \geq \hat{m}$, that is concessions are sufficient to prevent a revolution and repression is costly relative to concessions, the elite make concessions. The elite choose $k = \hat{k} > 0$, thus $\hat{\Delta}_e > 0$ and $\hat{\Delta}_c > 0$. The citizens do not undertake a revolution. The political regime stays in N . The citizens receive $w_c + h\hat{\Delta}_c$ and the elite receive $w_e - h\hat{\Delta}_e$.*

-
- (b) i. If $r < r^*$ and $m < \tilde{m}$, concessions are insufficient to prevent a revolution and repression is not costly relative to democratization or,
- ii. $m \geq \tilde{m}$ and $r < r^{**}$, repression is costly relative to democratization and democratization is not sufficient to prevent a revolution or,
- iii. $r \geq r^*$ and $m < \hat{m}$, concessions are sufficient to prevent a revolution and, concessions are costly relative to repression
- the elite choose repression. Repression fails with probability f and the political regime changes to R or stays in N with probability $1 - f$. The citizens receive $(1 - m)(1 - f)w_c + f(1 - r)/(1 - \lambda)$ and the elite receive $(1 - m)(1 - f)w_e$.
- (c) If $r < r^*$, $r \geq r^{**}$ and $m \geq \tilde{m}$, concessions are not sufficient to avoid a revolution, democracy is redistributive enough and repression is relatively costly to democratization. The elite democratize and the citizens do not undertake a revolution. The political regime changes to D . The citizens receive y_c and the elite receive y_e .

Proof. See appendix. □

We split the equilibrium into two parts. The first part states that if the revolutionary threat is not binding, the elite stay safely in power and there is no redistribution. In such a society the citizens are satisfied with nondemocracy because the inequality, θ , is low. Acemoglu and Robinson's model suggests that we might expect to see very equal societies, such as Singapore, remain nondemocratic.

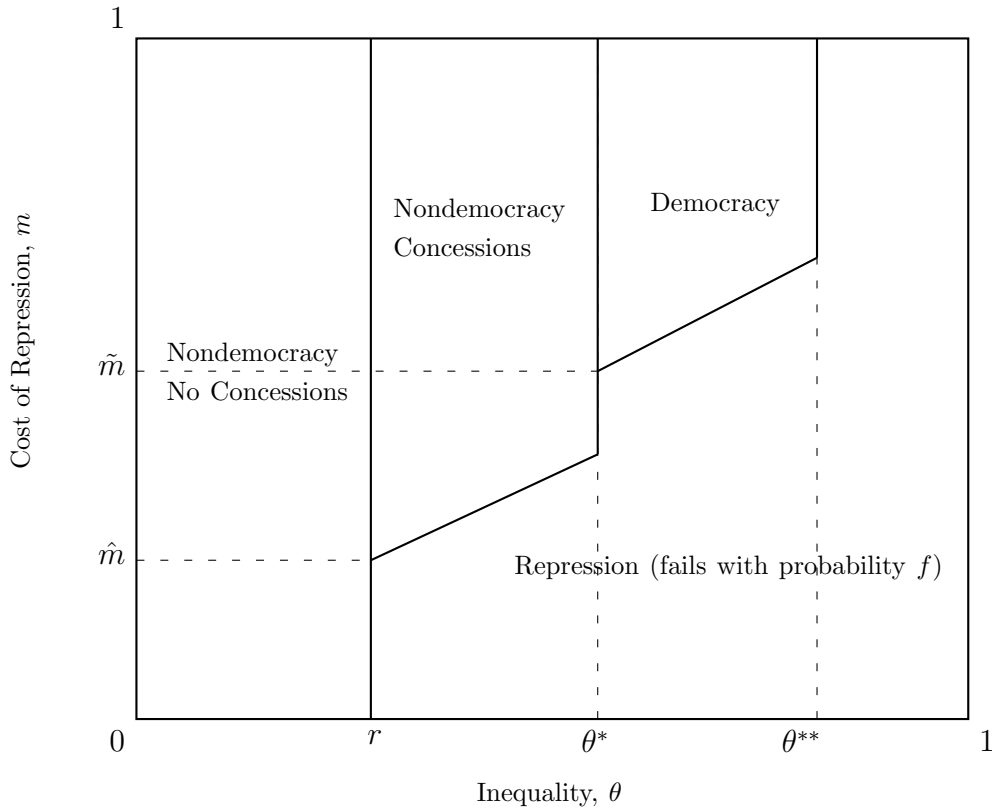
In the second part of the equilibrium we assume that if $\theta > r$, the revolution constraint holds. This means that the citizens pose a revolutionary threat. In addition, let r^* be defined by (3.14) and $\hat{m}$ and $\tilde{m}$ defined by (3.18) and (3.19). If $r \geq r^*$, concessions stop a revolution and if $m \geq \hat{m}$, repression is relatively costly to concessions. In the equilibrium, the elite offer concessions $\Delta_e \in (0, \bar{\Delta}_e]$. In response, the citizens accept concession and do not undertake a revolution. The gradual concessions can prevent a revolution much in the way as one saw in the period between 1832 (The First Reform Act) and 1928 (extended franchise) in Britain.

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If $r < r^*$ and $m < \tilde{m}$, concessions are not enough to prevent a revolution and democratization is relatively costly compared to repression. If $m \geq \tilde{m}$ and $r < r^{**}$, democratization is less costly than repression but it is not redistributive enough. A revolution is then more attractive than democracy for citizens. If $r \geq r^*$ and $m < \hat{m}$, concessions can prevent a revolution, but repression is less costly than concessions. In all of these cases the elite use repression like in Burma, China, and El Salvador.

If concessions can stop a revolution, $r < r^*$, democracy is redistributive enough, $r \geq r^{**}$, and repression is more costly than democratization, $m \geq \tilde{m}$, the elite create democracy like in Britain and Argentina.

Figure 3.5: Concessions, Repression or Democracy? (Acemoglu and Robinson, 2006, p. 214)



In summary, the equilibrium provides us with reasons as to why the elite may allow democratization, make concessions or use repression. If revolution is a more attractive option for the citizens, the elite have to make more concessions to prevent it. However, if the probability of committing to this concession is sufficiently low, the elite allow democratization or use repression. Whether the elite allow democratization or not depends on the values of r and m . Democracy arises when the level of inequality is high enough for citizens to want to initiate a revolution, but sufficiently high for the elite to find the use of repression attractive.

In Figure (3.5), possible regime transitions are plotted according to the cost of repression m and the level of inequality θ . As we stated in Equilibrium (3.4.1), if the revolution constraint is not binding for all m , the elite keeps the status quo without concessions. As inequality increases, depending on the cost of repression the elite can keep the status quo with concessions or if concessions cannot prevent a revolution ($\theta > \underline{\theta}$) and democracy is redistributive enough ($\theta \leq \bar{\theta}$), they create democracy. (We define $\underline{\theta}$ and $\bar{\theta}$ according to (3.14) and (3.17)). For low cost of repression and a high inequality level, the elite prefer repression. In this region, the elite stay in power with repression with probability $1 - f$ or a revolution takes place when repression fails with probability f .

3.4.5 Comparative Statics

An important result can be obtained by returning to the economic motivation provided by inequality. The share of income θ can force the elite to use concession or repression, or democratization. Because the revolution constraint is determined by the inequality level, the revolution constraint states that for low levels of inequality, democratization does not occur, i.e. $r \geq \theta$. As we discussed, the elite could create democracy if concessions are not sufficient to prevent a revolution. Let $\underline{\theta}$ be the inequality level where for all $\theta > \underline{\theta}$ the citizens prefer a revolution to redistribution. From (3.14) we have the following constraint

$$\underline{\theta} > r + h(1 - \lambda)\bar{\Delta}_c(\underline{\theta}). \quad (3.20)$$

Note that by substituting $\bar{\Delta}_c(\underline{\theta})$ in (3.20), we obtain $\underline{\theta} > r/(1 - h\bar{k})$. Clearly $\underline{\theta} > r$ since $0 < h\bar{k} < 1$.

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Furthermore, the elite cannot prevent revolution by democratization if $r < r^{**}$ by the constraint (3.17). Inequality has to be low enough in order for democratization to be able to prevent a revolution such that

$$\bar{\theta}_d < r + (1 - \lambda)\bar{\Delta}_c(\bar{\theta}_d). \quad (3.21)$$

Thus the elite can use democratization as a strategy if

$$\underline{\theta} < \theta \leq \bar{\theta}_d \quad (3.22)$$

Note that $h \in (0, 1)$ and $\bar{\Delta}_c(\theta)$ is increasing in θ . Thus $\underline{\theta} < \bar{\theta}_d$ holds.

Finally, recall that the elite prefer repression to democratization when the inequality level is very high. By (3.19) democracy requires an inequality level satisfying

$$\bar{\theta}_m \leq \frac{\lambda\bar{\Delta}_e(\bar{\theta}_m)}{(1 - f)m + f}. \quad (3.23)$$

Democratization will not occur for very high levels of inequality where $\theta > \bar{\theta}_m$ since repression will be more attractive than high levels of redistribution for the elite. From (3.21) and (3.23) let us define the interval where democracy will be created. Democratization occurs if $(\underline{\theta}, \bar{\theta}]$ where $\bar{\theta} = \min\{\bar{\theta}_d, \bar{\theta}_m\}$. Now we state Acemoglu and Robinson's result:

Result 3.4.1. *Acemoglu and Robinson (2006)*

There is a non-monotonic relationship between inequality and democratization. In particular, when $\theta \leq \underline{\theta}$, the society remains nondemocratic and the elite maintain the power, when $\theta > \bar{\theta}$, the society remains nondemocratic with repression with probability $1 - f$ or a revolution takes place with probability f . Democratization occurs when $(\underline{\theta}, \bar{\theta}]$.

The elite create democracy if concessions do not redistribute enough and democratization prevents revolution. If $\bar{\theta}_d < \bar{\theta}_m$ repression is still an option for the elite and there is no need for democratization. In this case the inequality level lies between $\underline{\theta}$ and $\bar{\theta}_d$. Otherwise the elite find democratization more attractive than repression.

3.5 Discussion

In this chapter, we reviewed some of the essential features of Acemoglu and Robinson's "*Static Model of Democratization*". In the model, two classes, the elite and the citizens, fight over the political regime. A political regime was as the tool to govern the distribution of income among these two classes. Due to the conflict between these two classes the model shows when political and economical changes take place. The level of inequality determines whether the citizens can force the elite to make concession, use repression, or create democracy. To determine equilibrium outcome institution (democratization) plays a key role because the elite can solve the commitment problem by changing the political regime to democracy.

Determinants of Democracy

To obtain clear results, [Acemoglu and Robinson](#) apply Occam's razor principle to minimize the factors used in the model. This principle allows them to focus on essential factors. They define the economy, the society and the political regimes in the simplest way. To do so, they abstract many details like the collective action problem. However, one can argue that in this setting particularly the post revolutionary society is oversimplified. Application of Occam's razor principle is criticized mostly by historians and political scientists.

Democracy, Inequality and Redistribution

In examining the reasons why some societies are democratic while others are not, the model determines which political transitions take place and when the elite use repression or make concessions. [Acemoglu and Robinson \(2006\)](#) assume that the tax rate (concessions) increases in terms of inequality and tax revenues are used to redistribute income to the poor under democracy ([Meltzer and Richard, 1981](#)).

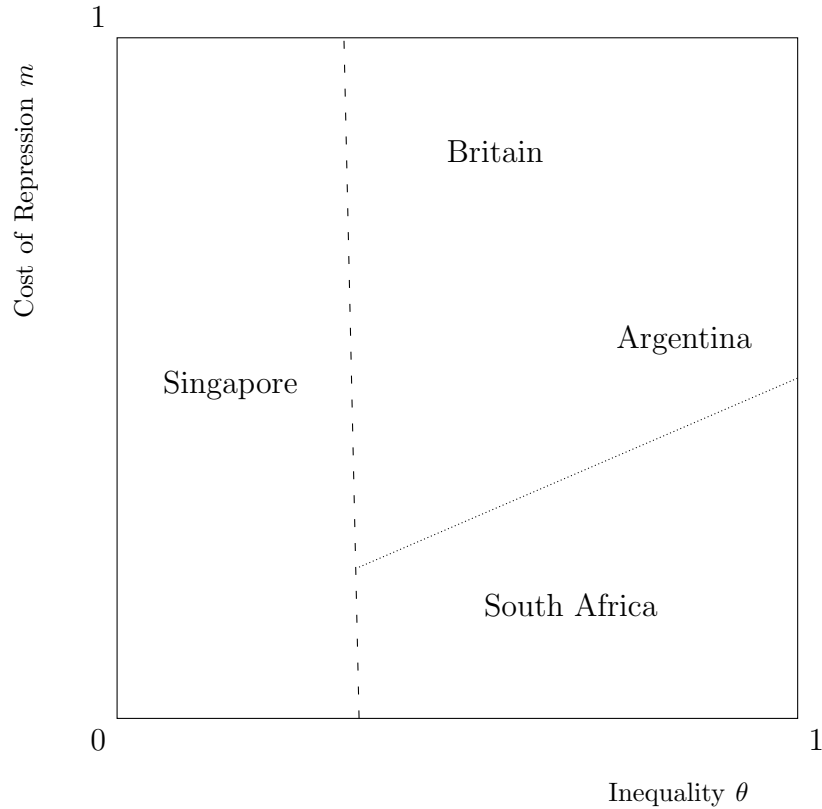
As we discussed in section [3.4](#) the level of inequality plays a key role. Figure [3.6](#) captures the predictions of their theory for democratization¹². The model predicts that Britain is fully consolidated democracy, Argentine is unconsolidated

¹² In the equilibrium there are four possible scenarios: no concession, concessions, democratization, oscillation between democracy and nondemocracy.

3. ACEMOGLU AND ROBINSON'S STATIC MODEL OF DEMOCRATIZATION

democracy¹³, Singapore is nondemocracy without serious repression and South Africa is nondemocracy with repression.

Figure 3.6: Democratization in Picture ([Acemoglu and Robinson, 2006](#), p. 44)



The cost of repression, the cost of revolution and the level of inequality are represented by m, r and θ . When θ is low, $0 \leq \theta \leq r$, the cost of repression is irrelevant because the revolution constraint is not binding. In this case the status quo remains unchallenged as in Singapore. For all $\theta > r$ revolution becomes a threat. If the cost of repression is sufficiently high the elite create democracy as in Britain and Argentina. If this cost is not that high, the elite keep nondemocracy

¹³In dynamic model of democratization, [Acemoglu and Robinson](#) allow the elite to mount a coup in democracy. Furthermore, coups and revolutions can take place only in special periods (for example recession times).

by using repression as in South Africa¹⁴.

The most interesting feature of the model is that democracy emerges when the level of inequality is neither low nor high. There is a nonmonotonic relationship between inequality and democratization. Boix (2003) develops a very similar static model of democratization. His empirical analysis predicts the yearly probability of democratic transitions and democratic breakdowns over years 1950–1990 by using data on income inequality (most African democratizations are excluded). He argues that there is a linear relationship between inequality and the likelihood of democratization. It is plausible to think that democratization is more likely when the income distribution is more equal. However, empirical evidence is mixed (Bollen and Jackman, 1985). Lipset (1959b) and Muller (1988) presents a negative relationship between the level of inequality and democracy.

Burkhart (1997) finds a nonmonotonic relationship between income distribution and democracy. He investigates the relationship between democracy and income distribution for 56 countries over the years 1973–1988. His result is very close to Acemoglu and Robinson (2006)’s theory that democracy and income distribution have nonlinear effects on each other.

However, empirical investigations of the relationship between democracy and redistribution do not suggest strong support for Acemoglu and Robinson’s theory¹⁵. While Mulligan, Gil and Sala-i Martin (2004) claim that on average contemporary democracies are not more redistributive than dictatorships, Lindert (2004) and Boix (2003) argue that democratization provides redistribution. There is also a mixture of empirical analyses investigating the relationship between inequality, revolution and political instability¹⁶.

In the dynamic model Acemoglu and Robinson (2006) limit the threat of revolution to periods of recessions. The commitment problem becomes more feasible because citizens know that they cannot have *de facto* power when the recession is over. The recession periods resulting from economic crises are unusual

¹⁴In Figure (3.6) it is assumed that democratization always prevent revolution and if the elite repress the citizens can not undertake a revolution.

¹⁵Boix (2003) suggests that some scholars find negative relationship between democracy and redistribution due to the lack of broad and reliable data sets of income inequality until very recently.

¹⁶For a review of this literature see Lichbach (1989).

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periods (the probability of recession is $q < 1/2$). However, [Geddes \(2007\)](#) argues that frequent recessions may stabilize nondemocracies with redistribution instead destabilizing them.

The Threat of Revolution

When repression is too costly and there is a threat of revolution democratization is a solution to the elite's commitment problem. However, [Lizzeri and Persico \(2004\)](#) have another perspective on explaining democratization in Britain. In their model voluntary franchise extension is based on divisions within the elite. They agree that the threat of revolution played a important role in the process of democratization in Britain. However, they claim that the possibility of revolution was not serious enough to force the elite to democratize. *"Rather than being forced to give up power, in our model the elites willingly extend the franchise because elections with a broader franchise can give better incentives to politicians."* ([Lizzeri and Persico, 2004](#), p. 708).

Information

In Acemoglu and Robinson's model there is complete and perfect information¹⁷. The elite and citizens know the costs and benefits of revolution, repression, concession and democratization. Thus, informational asymmetry is ignored. These assumptions clearly do not reflect the real world interactions between social classes.

The model provides an enlightening explanation of regime transitions, but it is worthy to note what it does not explain. The citizens only undertake a revolution when they expect it to succeed. It is plausible to assume that if citizens undertake a revolution, it is always effective under complete information. On the other hand, in the real world revolutions might fail. As a result, the model cannot explain why the citizens attempt a revolution if it fails in the end. It might be the reason that uncertainty is one of the important factors of revolutions.

[Boix \(2003\)](#) introduces the concept of uncertainty – citizens are not certain about the cost of repression. If the level of inequality is high and the citizens

¹⁷In the dynamic model the costs of coups and revolutions are determined stochastically ([Acemoglu and Robinson, 2001](#)).

underestimate the strength of the elite, in the equilibrium they undertake a revolution which is followed by a civil war ¹⁸.

3.6 Summary

[Acemoglu and Robinson's \(2006\)](#) static model of democratization provides some insights, in particular, into the process of early democratization in Western Europe. Their dynamic model explains oscillation between democracy and dictatorship which can account for Latin American countries. However, it does not fit so well for Middle Eastern, African and Eastern European countries.

A number of important questions remain open for future theoretical and empirical research. For example, an interesting extension of the model would be to model interactions between international and domestic politics. Also, it would be worth studying the impact of incomplete information on revolutions and democratization. Finally, it would be of interest to quantitatively test some of the implications of the model.

¹⁸He gives revolutions and guerrilla movements in Tsarist Russia, mid-twentieth-century China, Vietnam, Cambodia, Cuba, Central American countries and many sub-Saharan Africa as historical examples.

3. ACEMOGLU AND ROBINSON'S STATIC MODEL OF DEMOCRATIZATION

Chapter 4

Game on Revolution

In “*Static Model of Democratization*” the threat of revolution forces the elite to repress, redistribute or democratize. The most interesting result from Acemoglu and Robinson’s analysis of democratization is that democracy has the best chance of emerging in societies with middle levels of inequality. This happens under two conditions. First, concessions are not sufficient to prevent a revolution. Second, repression is costly in comparison to democracy.

Following the seminal work of [Acemoglu and Robinson \(2006\)](#) in the previous chapter, we consider a modification to their model. For this purpose we introduce two additional ideas: (1) the citizens protest (before their decision to revolt) if they are unsatisfied with the status quo (2) the citizens have two different post revolution incomes—dependent on whether they face concession or repression.

Section [4.1](#) introduces the basic ideas of the model. We establish the notation and the specification of the economy in section [4.2](#). In section [4.3](#) we give the timing of the extensive form game. We analyze the game in section [4.4](#) and derive a unique Subgame Perfect Nash Equilibrium (SPNE) based on comparing the expected outcomes of the elite and the citizens. The last section briefly summarizes the chapter.

4.1 Introduction

The fact that the change in the citizens’ incomes (specifically in the post revolutionary income) results from the elite’s strategy choice in our model raises an

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important question; namely, when the elite offer redistribution or use repression, the citizens might pose a credible revolutionary threat. Our model poses the question of whether the citizens have the same revolutionary constraints in both scenarios.

In the previous chapter we reviewed how a threat of revolution can lead to a peaceful transition to democracy. This threat is determined by the cost of revolution and the level of inequality. If the revolution constraint holds the citizens can pose a credible threat. Inequality θ and the cost of revolution r are given exogenously. Recall when $r < \theta$ the citizens threaten the elite. Therefore, the revolutionary threat is costless for the citizens and the elite. Is it plausible to assume that a regime transition can be costless for the citizens even in the absence of significant repression?

Before we answer these questions we have to define the political regimes with associated income distributions. Following Acemoglu and Robinson, we divide all possible regimes in two groups: a society can be either democratic or non-democratic. The citizens are in favor of democracy not because of ideological preferences, but economic ones. We consider democracy in the narrow sense of suffrage. In a democracy policies are determined by the Median Voter Theorem. Since the median voter is one of the identical citizens, policies are determined by the citizens. In a nondemocracy the elite are in power, make policy decisions and initially there is no redistribution of incomes from the elite to the citizens.

In nondemocracies the citizens can challenge the regime and under specific conditions undertake revolutions. Democratization by the elite prevents revolutions. Nevertheless, if democratization is a costly decision for the elite why do they willingly give up the power? A threat of revolution might be the motivation of the elite. We assume that if a revolution takes place the elite lose everything and the political regime changes to a state of revolution. Democracy can be a rational alternative for the elite, less costly than revolution and for the citizens more beneficial than nondemocracy.

As a starting point, we again consider a nondemocratic society. The elite are in power and they have three options: Democratization, concessions and repression. Furthermore, we abstract from the commitment problem. Our approach suggests that democracy emerges only when concessions are not sufficient to prevent a

revolution. Democracy is seen as the maximum possible concession with regime change. As we will see in section (4.4) if the elite prefer using repression to making concessions, democracy cannot be an option anymore.

4.1.1 Protest

Our model suggests that protests before revolutions may be important for explaining decisions of the elite and the citizens. The elite can use three strategies: Democratization, concession or repression. Initially the ruling elite decide whether to create democracy or not. If they do not allow democratization we assume that the elite make concessions or use repression only if the citizens protest. A protest is costly for the citizens as well as for the elite. This cost can be seen as a cost of time for other productive enterprises. Therefore, to obtain concessions or democracy is costly.

Protest is also critical for how citizens pose the threat of a revolution. After the elite's decision citizens decide whether to undertake a revolution or not. Although revolutions are rather sudden events they have a preparation period. As Kuran (1989, p. 43) points out

“the Russian Revolution of February 1917 was not totally unexpected. For of one thing, there were the precedents the French Revolution and of Russia’s own revolution in 1905. For another, the preceding years witnessed numerous strikes and peasant uprisings, as well as some terrorist acts. Neither industrial supporters nor opponents of Tzar Nicholas II thought that his power was fully secure.”

In Britain there were also protests in the 19th century. The most famous protest was the Battle of Peterloo in 1819. During the Reform Act of 1829-32, masses of people protested on the streets in support of democracy. These protests in Britain motivate the assumption that there was a threat of revolution.

We introduce protest as an action to achieve concession, democracy or produce the threat of a revolution. In section 4.4 we will study the role of protest in determining economic and political outcome. The presence of a protest can lead to two situations: (i) if the elite prefer making concessions to using repression,

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the society either becomes democratic or stays in nondemocracy and the level of inequality decreases. With a lower level of inequality nondemocracies become more likely to survive. (ii) if the elite prefer using repression to making concessions, the society either stays in nondemocracy with repression or a revolution takes place and the regime changes to revolutionary state.

4.1.2 Concessions vs Repression

The literature on domestic conflict share some common concerns. In the case of a (potential) protest there are two responses from the elite: making concessions or using repression. Each has its costs and benefits for the elite and the citizens.

As we have studied in previous chapters, [Acemoglu and Robinson \(2006\)](#) suggest that the elite can use repression or concession as instruments to maintain power if revolution is a threat and in [Roemer's \(1985\)](#) model the Tsar uses penalties to prevent a revolution. Roemer also suggests that a reformist Tsar might use concession. According to [Wintrobe \(1998\)](#) nondemocratic regimes can use repression or the loyalty of citizens in order to survive¹.

We now discuss costs and benefits of concessions and repression with their different effects on the probability of success of a revolution.

Costs of concessions and repression

The elite use concessions or repression because there is a protest. Only if there is no protest the elite can survive without democratization, concession, and repression. [Acemoglu and Robinson's \(2006\)](#) model begins with the elite choosing to repress the citizens or not and if repression is costly they trade between concession or democratization. However, we argue that the elite are forced to use repression or concession because there is a protest and the existence of this protest depends on the nondistributive regime and the absence of democratization.

¹Wintrobe distinguishes four types of nondemocratic regimes: tinpots (low repression and loyalty), tyrants (high repression, low loyalty), totalitarians (high levels of both), and timocrats (low repression, high loyalty). But for simplicity, we consider only repression or only concession. However, nondemocratic regimes sometimes use both but this does not mean that using repression and concession can be preferable to the elite. [Rasler \(1996\)](#) suggests a hypothesis and tests it. The result is that application of both concession and repression increase the opposition.

For simplicity, we assume that the elite use either concession or repression—even though they could use both theoretically². One strategy for the elite in dealing with a protest is repression. Actually, repression is a very popular strategy of authoritarian regimes, but might at the same time raise the strength of opposition. In Acemoglu and Robinson’s dynamic model repression prevents revolution³. Indeed, it has often been claimed in the literature that high levels of repression prevent opposition. Nevertheless, repression might also trigger opposition. Especially in Latin American countries it is a very usual pattern. As [Herrerros \(2006\)](#) puts it:

“In El Salvador, Stanley (1996) portrayed the military state as a protection racket, and political repression as a means of creating enemies that justified precisely this function of the state.”

Repression is an attractive strategy for the elite because we assume it is costly only when it is applied. [Davenport \(2007\)](#) defines state repression as,

“By most accounts, repression involves the actual or threatened use of physical sanctions against an individual or organization, within the territorial jurisdiction of the state, for the purpose of imposing a cost on the target as well as deterring specific activities and/or beliefs perceived to be challenging to government personnel, practices or institutions (Goldstein 1978, p. xxvii). Like other forms of coercion, repressive behavior relies on threats and intimidation to compel targets, but it does not concern itself with all coercive applications.”

The cost of concession can be permanent ([Acemoglu and Robinson, 2006](#)) via raising the tax rate or temporary ([Pierskalla, 2009](#)) like regional autonomy or land reform, which also constitutes a credible policy compromise. Furthermore, we assume that the cost of concession is higher than the cost of repression.

Revolutions are costly too, because instead of working citizens participate in revolutionary actions and it also entails risk of imprisonment, being injured or

²See [Rasler \(1996\)](#), [Goldstone and Tilly \(2001\)](#).

³However, they also show that if we allow repression to fail, it can lead revolution in the equilibrium.

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killed. In Acemoglu and Robinson's model, the cost of revolution is the same irrespective to the elite's strategy. We argue that the cost of revolution also depends on the elite's strategy. The citizens inevitably face a higher cost of revolution if they are repressed. When the strategy of the elite is repression and the citizens undertake a revolution it takes longer to end the conflict. Also during revolution a part of the economic output is destroyed. In the step where the citizens decide whether to attempt a revolution or not we introduce two different costs.

Effects of concessions and repression on revolution

One of the key factors influencing the citizen's decision of whether to attempt a revolution is the probability of success. This probability is difficult to determine. [Roemer \(1985\)](#) assumes that the probability of successful a revolution increases in terms of penalties. In the present model, we assume that a high level of repression increases the likelihood of solving the collective action problem.⁴

We assume that when the revolution takes place it succeeds with probability p if the citizens face a repressive regime and q if the citizens face concession. The probability of success depends on how much effort the citizens put into the revolutionary movement. One can also think of this probability as the probability that the citizens can solve the collective action problem. As we discussed in the introduction there can be numerous solutions to the collective action problem. However, citizens cannot always overcome this problem. This puzzle is one of the reasons despite revolutions taking place their origins are the subject of much attention. Under a repressive regime, we assume that this problem is more likely to be solved. Hence, the success of a revolution is more likely under repression, $p > q$. We believe this setting will allow us to have a more detailed understanding of why and how repression sometimes results in a revolution. In the equilibrium, revolutions may occur under repression and under concession.

4.2 The Model

Our theoretical framework is based on the static model developed by Acemoglu and Robinson (2006). We make identical assumptions about the agents and their

⁴For further discussion see [Marwell, Oliver and Prael \(1988\)](#), [Collier and Mahoney \(1997\)](#)

incomes. Consider a society populated by two groups of individuals: the elite and the citizens. All members are identical within each group and the number of all individuals in the society is normalized to 1. Let $1 - \lambda > 1/2$ be the proportion of the citizens with fixed income w_c while λ is the proportion of the elite with fixed income $w_e > w_c$. The total income is $\lambda w_e + (1 - \lambda)w_c = 1$ and the average income is $\bar{w} = 1$. Recall that, using that the average income is normalized to 1, incomes of the elite and the citizens are defined by the inequality level such that,

$$w_e = \frac{\theta}{\lambda} \text{ and } w_c = \frac{1 - \theta}{1 - \lambda}.$$

The share of income θ is the same as the one defined in the previous chapter. As θ increases, the society becomes more unequal. Due to the income inequality θ there is a conflict between the elite and the citizens because the elite's share of income always exceeds their share in the population, i.e. $\theta > \lambda$.

Initially, the elite are in power. They move first and decide whether to allow democratization or not, $\delta \in \{0, 1\}$ ($\delta = 1$ means democratization). If the elite allow for democratization, the new incomes become y_c for the citizens, and y_e for the elite and the game ends. Since the citizens constitute the majority in a democratic regime, the median voter represents the citizens and they determine the income redistribution, which implies that democratization is costly to the elite, i.e. $w_e > y_e$ and $y_c > w_c$. As before we assume that the elite can share a fraction, $k \geq 0$ of their income. The most preferred value of k is 0 for the elite and $\bar{k}$ for the citizens. In democracy the incomes of the elite and the citizens are

$$y_e = w_e - \bar{\Delta}_e \text{ and } y_c = w_c + \bar{\Delta}_c$$

where $\bar{\Delta}_e = \bar{k}\theta/\lambda$ is the cost of democratization for the elite and $\bar{\Delta}_c = \bar{k}\theta/(1 - \lambda)$ the benefit of democratization for the citizens.

If the elite do not allow democratization, the citizens decide whether to protest at cost $E_c > 0$ or not $\pi \in \{0, 1\}$ ($\pi = 1$ means protest). A protest costs a fraction $\varepsilon \in (0, 1)$ of their income. The cost of a protest is $E_c = \varepsilon w_c$. Substituting the definition of w_c we obtain the cost of protest of the form,

$$E_c = \frac{\varepsilon(1 - \theta)}{1 - \lambda}. \quad (4.1)$$

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To avoid adding more variables, we do not introduce different cost of protest for the elite. The total cost of protest, $\varepsilon(1 - \theta)$, is divided among the elite similar to the case where the amount of concession is divided among the citizens,. The cost of protest for the elite is

$$E_e = \frac{\varepsilon(1 - \theta)}{\lambda}. \quad (4.2)$$

In the presence of a protest there are two responses—the elite can use repression or make concessions ($\psi = 1$ means repression and $\psi = 0$ means concession). As in the previous chapter, repression costs the elite $w_e m$ where $m \in (0, 1)$. If the elite make concessions, they set $k \geq 0$. Let $\hat{k}$ be a specific value of k which the elite set to $k = \hat{k}$ to prevent a revolution. Then the cost of concession for the elite is $\hat{\Delta}_e = \hat{k}\theta/\lambda$. We assume that concessions are not easily reversible. They can be land reform or public goods. In the previous model, we assumed that the elite promise a redistribution but that they hold this promise with probability h and this leads to a commitment problem. Democratization is used as a commitment device: if the elite give up power, then the citizens determine redistribution. In the present model the elite do not have a commitment problem.

After offering a concession or using repression, the citizens decide whether to attempt a revolution or not, $\rho \in \{0, 1\}$ ($\rho = 1$ means revolution). We denote the costs of revolution under repression and concession respectively as $r_m > r_k$. Since we now have two different costs, after revolution two different fraction, r_m and r_k of the resources of the society are destroyed, and the remainder can be divided among the citizens. The citizens receive an outcome of

$$\frac{1 - r_k}{1 - \lambda} - E_c \quad (4.3)$$

if they revolt when the elite offer redistribution and

$$\frac{1 - r_m}{1 - \lambda} - E_c \quad (4.4)$$

if they revolt when the elite use repression. The cost of revolution is higher than the cost of protest, i.e. $E_c < r_k < r_m$.

If the elite use repression, a revolution becomes more costly for the citizens and post revolution income decreases. Furthermore, in the present model we assume that the citizens do not always succeed when they undertake a revolution. If the elite use repression and the citizens undertake a revolution, it succeeds with probability p . If the elite make concessions and the citizens undertake a revolution, it succeeds with probability q . The probability of a successful revolution is always higher when the citizens face repression, $p > q$.

Table 4.1: Table of Symbols for the Model of Game on Revolution

w_c	Income of the citizens under nondemocracy
w_e	Income of the elite under nondemocracy
y_c	Income of the citizens under democracy
y_e	Income of the elite under democracy
E_e	Cost of protest for the elite
E_c	Cost of protest for the citizens
m	Cost of repression for the elite and the citizens
Δ_c	Concession for the citizens
Δ_e	Cost of concession for the elite
r_m	Cost of revolution under repression
r_k	Cost of revolution under concession
p	Probability of successful revolution under repression
q	Probability of successful revolution under concession

There are three political regimes: nondemocracy N , democracy D and revolution R . In a nondemocracy policy decisions are determined by preferences of the elite and the constraints that they face. The elite might keep the status quo if the citizens do not protest or they might stay in power by using repression or concessions. If the elite create democracy, the citizens are in power and make policy decisions. In the case where the citizens undertake a revolution and it succeeds the political regime changes to revolution. In the beginning of the game, the political state is in $x_0 = N$ and it can change to $x_1 \in X = \{N, D, R\}$.

We have now defined the economy and the political regimes necessary for the analysis of the game. Table 4.1 summarizes the variables of the model. Next we

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will give the exact timing and the possible outcomes of the game.

4.3 Timing and Outcome

In this section we briefly present the timing and outcomes of the game. The exact timing of events is as follows:

1. The elite decide whether to democratize or not $\delta \in \{0, 1\}$. If the elite democratize, the political state changes to D and the game ends.
2. The citizens decide whether to protest at the cost of $E_c > 0$ or not, $\pi \in \{0, 1\}$. If the citizens do not protest the political state stays in N and the game ends.
3. If the citizens protest the elite decide to make concession or to repress. Concession and repression cost respectively Δ_e and mw_e .
4. The citizens decide whether to undertake a revolution at the cost r_k under concession or not. If the citizens do not revolt, the political state stays in N and the game ends. If the citizens revolt, with probability q revolution succeeds, the political state changes to R and the game ends; and with $(1 - q)$ revolution fails, the political state stays in N , and the game ends.
5. The citizens decide whether to undertake a revolution at the cost r_m under repression or not. If the citizens do not revolt, the political state stays in N and the game ends. If the citizens revolt, with probability p revolution succeeds, the political state changes to R , and the game ends; and with $(1 - p)$ revolution fails, the political state stays in N , and the game ends.
6. Incomes are realized.

To determine the outcomes of the elite, it is important to distinguish between the payment structure for the costs of repression and concession. The cost of repression is paid if the citizens revolt but the cost of concession is paid if the citizens do not revolt.

Table 4.2: Outcomes of the Model of Game on Revolution

Outcome	The elite	The citizens
O_1	y_e	y_c
O_2	w_e	w_c
O_3	0	$(1 - r_m)/(1 - \lambda) - E_c$
O_4	$(1 - m)w_e - E_e$	$w_c - r_m/(1 - \lambda) - E_c$
O_5	$w_e - E_e$	$w_c - E_c$
O_6	0	$(1 - r_k)/(1 - \lambda) - E_c$
O_7	$w_e - E_e$	$w_c - r_k/(1 - \lambda) - E_c$
O_8	$w_e - \Delta_e - E_e$	$w_c + \Delta_c - E_c$

The outcomes depend on the citizens' and the elite's decisions. Each group tries to maximize its outcome by choosing δ, π, ψ, k and ρ . Each member of the elite receives an outcome of

$$\begin{aligned}
O^e = (1 - \delta) & \left[\pi \left[(1 - \psi) \left\{ (1 - \rho) [w_e - \Delta_e - E_e] + \right. \right. \right. \\
& \left. \left. \left. \rho(1 - q)(w_e - E_e) \right\} + \psi \left\{ (1 - \rho)(w_e - E_e) + \right. \right. \right. \\
& \left. \left. \left. \rho(1 - p)[(1 - m)w_e - E_e] \right\} \right] + (1 - \pi)w_e \right] + \delta y_e,
\end{aligned} \tag{4.5}$$

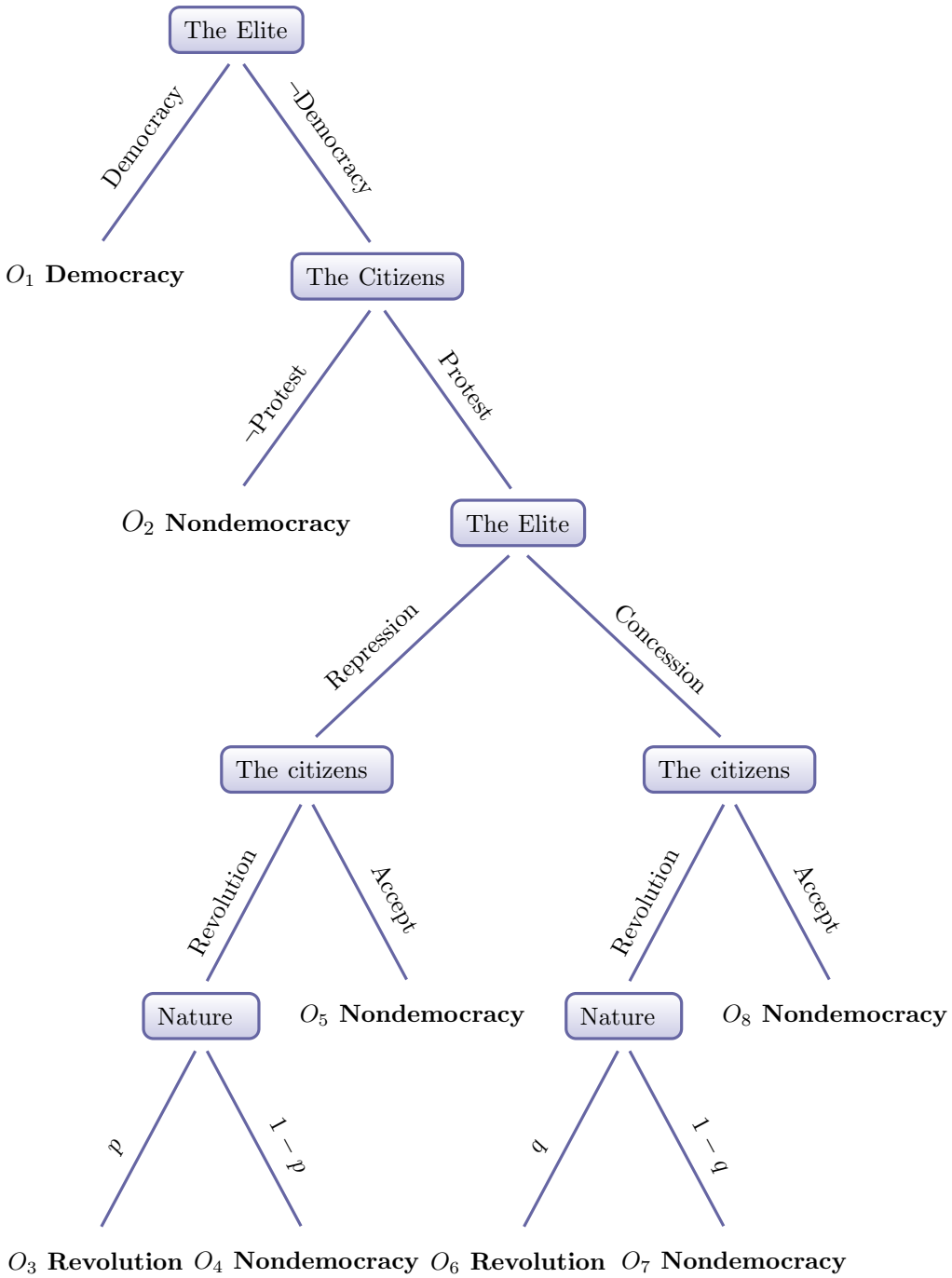
and each citizen receives an outcome of

$$\begin{aligned}
O^c = (1 - \delta) & \left[\pi \left[(1 - \psi) \left\{ (1 - \rho) [w_c + \Delta_c] + \rho \left[q \frac{1 - r_k}{1 - \lambda} \right. \right. \right. \right. \\
& \left. \left. \left. + (1 - q) \left(w_c - \frac{r_k}{1 - \lambda} \right) \right\} + \psi \left\{ (1 - \rho)w_c + \rho \left[p \frac{1 - r_m}{1 - \lambda} \right. \right. \right. \right. \\
& \left. \left. \left. + (1 - p) \left(w_c - \frac{r_m}{1 - \lambda} \right) \right\} - E_c \right] + (1 - \pi)w_c \right] + \delta y_c.
\end{aligned} \tag{4.6}$$

We will now discuss the different outcomes listed in Table 4.2. We have eight possible outcomes for the elite and the citizens which satisfy (4.5) and (4.6).

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Figure 4.1: Game on Revolution



If the elite create democracy, $\delta = 1$, we obtain outcome O_1 . In democracy the citizens always determine $k = \bar{k}$ which maximizes their income. Incomes are $y_e = w_e - \bar{\Delta}_e$ and $y_c = w_c + \bar{\Delta}_e$ where $\bar{\Delta}_e$ is the maximum redistribution. Recall that the cost of democratization for the elite is increasing in terms of inequality θ . As a society becomes more unequal, democracy becomes more redistributive.

If the elite do not allow for democratization, $\delta = 0$, and if the citizens do not protest, $\pi = 0$, both the elite and the citizens receive O_2 . Outcome O_2 does not entail any costs or benefits to either the elite or the citizens. Incomes are w_e for the elite and w_c for the citizens. This outcome is the most favorable for the elite.

On the other hand, if the citizens protest, it costs E_c to the citizens and E_e to the elite. Under this condition the elite must decide whether to repress or redistribute, and then the citizens have the option of revolution or acceptance. If the elite choose to repress, $\psi = 1$, and the citizens undertake a revolution, $\rho = 1$, it succeeds with probability p . If the elite choose to make concessions, $\psi = 0$, and the citizens undertake a revolution, $\rho = 1$, it succeeds with probability q . Post revolutionary outcomes are O_3 and O_6 where the elite receive 0. Since the costs of revolution are different, the citizens receive different incomes, $(1 - r_m)/(1 - \lambda) - E_c$ and $(1 - r_k)/(1 - \lambda) - E_c$.

If a revolution fails under repression, the citizens suffer from the cost of protest and revolution while the elite suffer from the cost of protest and repression. These costs generate outcome O_4 . The elite and the citizens receive incomes of $(1 - m)w_e - E_e$ and $w_c - r_m/(1 - \lambda) - E_c$ respectively.

In the case where the citizens do not undertake a revolution $\rho = 0$ when they face repression, both groups suffer only the cost of protest. The game ends with outcome O_5 where the elite receive $w_e - E_e$ and the citizens receive $w_c - E_c$.

If a revolution fails under concession the game ends with outcome O_7 where the citizens suffer from the cost of protest and revolution while the elite only suffer from the cost of protest. Incomes are $w_c - r_k/(1 - \lambda) - E_c$ for the citizens and $w_e - E_e$ for the elite.

In the case where the citizens do not undertake a revolution, $\rho = 0$, when they are offered concessions the outcome is O_8 . The elite share $\hat{k}$ fraction of their income and it prevents a revolution. The elite pay the cost of concessions while

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the citizens gain a benefit from this concession. Incomes become $w_e - \hat{\Delta}_e - E_e$ for the elite and $w_c + \hat{\Delta}_c - E_c$ for the citizens.

4.4 Analysis

4.4.1 Definition of Equilibrium

We solve the game for pure strategy Subgame Perfect Nash equilibria (SPNE). The outcomes are given in Table 4.2 and the game tree is given in Figure 4.1. The current setup and equilibrium are very similar to that game in the previous chapter.

The actions of the elite are $\sigma_e = \{\delta, \psi, k\}$ and of the citizens are $\sigma_c = \{\pi, \rho(\psi, k)\}$. The elite decide whether to democratize or not $\delta \in \{0, 1\}$, to repress or make concessions $\psi \in \{0, 1\}$ and to choose $k \in [0, 1]$. The citizens decide whether to protest or not $\pi \in \{0, 1\}$, to undertake a revolution or not $\rho(\psi, k) \in \{0, 1\}$ as a response to repression and concession. A strategy combination $\{\tilde{\sigma}_e\}, \{\tilde{\sigma}_c\}$ is a SPNE if in every subgame $\tilde{\sigma}_e$ and $\tilde{\sigma}_c$ are best responses to each other. We write the equilibrium strategies in the following form:

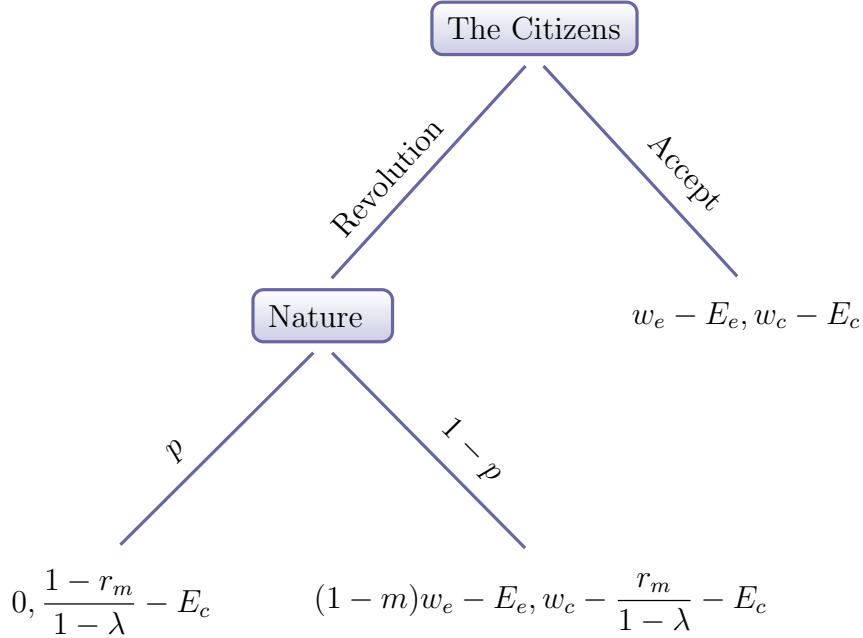
$$\begin{aligned}\tilde{\sigma}_e &= \{\delta, \psi, k\}, \\ \tilde{\sigma}_c &= \{\pi, \rho(1, k), \rho(0, k)\}.\end{aligned}\tag{4.7}$$

The revolution decision of the citizens is conditioned on the current actions of the elite. A decision to initiate a revolution is $\rho(1, k)$ where this decision depends on repression and $\rho(0, k)$ where this decision depends on concession.

4.4.2 The Revolution Constraints

Consider the situation where the elite do not allow democratization. Should the citizens protest or not? The decision depends on how the elite respond to a protest. Should the elite repress the citizens or offer a concession? How the elite respond to a protest depends on whether the citizens prefer to revolt or not. To determine a sequence of optimal actions we solve the game by backward induction.

Figure 4.2: The citizens decision under repression



Let us think about what will happen after a revolution if the elite repress the citizens. The citizens prefer to revolt if they obtain more by overthrowing nondemocracy with probability p . We again say that the revolution constraint is binding if the citizens prefer to revolt (see Figure 4.2)⁵. By comparing outcomes of repression and revolution, we obtain the following constraint:

$$p \frac{1 - r_m}{1 - \lambda} + (1 - p)(w_c - \frac{r_m}{1 - \lambda}) - E_c > w_c - E_c \quad (4.8)$$

If the elite use repression, as we discussed before, the cost of revolution increases but the probability of a successful revolution under repression is higher than under concession. Note that if the elite use repression and the citizens do not try to revolt there is no cost for further repression. This means the elite can successfully deter protest. The comparison of outcomes establishes the following

⁵Outcomes are always written in the following form: the elite's outcome, the citizen's outcome.

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revolution constraint by using (4.8) under repression such that,

$$r_m < p\theta \quad (4.9)$$

Let us define a critical value $\bar{r}_m$ equal to the right hand side of equation 4.9. For all $r_m < \bar{r}_m$ a revolution is attractive for the citizens. If $r_m \geq \bar{r}_m$, the citizens are repressed and they do not initiate a revolution. Note that $\bar{r}_m$ is increasing in terms of θ and p . That is, the greater θ and p the higher $\bar{r}_m$. This means that citizens are more likely to undertake a revolution when society becomes more unequal and the probability of success becomes higher.

Now assume the citizens protest and the elite offer a concession. The citizens prefer to revolt if they obtain more by overthrowing nondemocracy with probability q . (see Figure 4.3). By comparing the outcomes of the maximum amount of concession and revolution, we obtain the following constraint where the citizens prefer to revolt.

$$q \frac{1 - r_k}{1 - \lambda} + (1 - q)(w_c - \frac{r_k}{1 - \lambda}) - E_c > w_c - E_c + \bar{\Delta}_c. \quad (4.10)$$

If the elite make concessions as we discussed before the cost of revolution is $r_k < r_m$ but the probability of a successful revolution is lower, $q < p$. Note that if the elite make concessions and the citizens do not initiate a revolution, they have the benefit of these concessions. Under other conditions, the elite do not pay the concessions. Now we can write the second revolution constraint by using (4.10) such that,

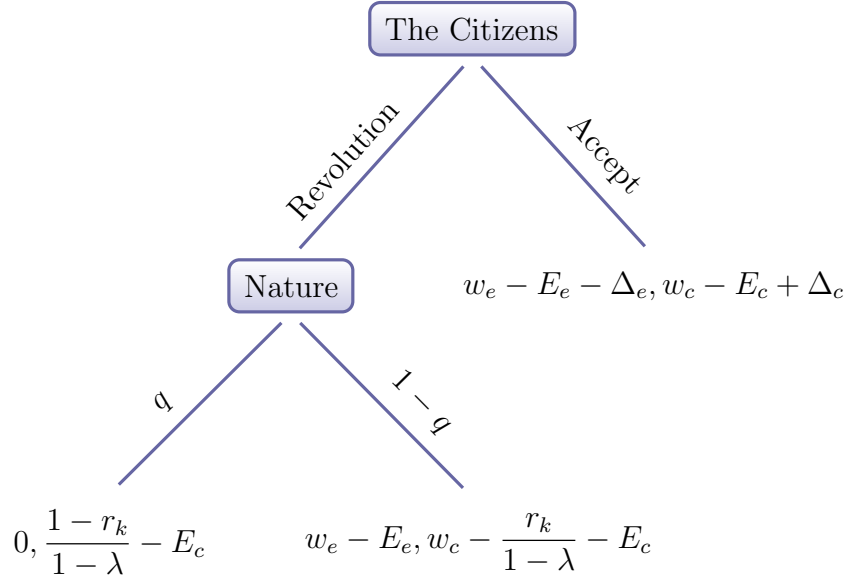
$$r_k < (q - \bar{k})\theta. \quad (4.11)$$

Let us define a second critical value $\bar{r}_k$ equal to the right hand side of (4.11). If $r_k \geq \bar{r}_k$, the citizens do not undertake a revolution for the maximum amount of concession. This inequality ensures that there is a level of concession that prevents a revolution. The elite set $k = \hat{k}$ where the citizens are just indifferent to revolt or not.

$$r_k = (q - \hat{k})\theta. \quad (4.12)$$

Next we will use two critical values $\bar{r}_m$ and $\bar{r}_k$ to determine the equilibrium.

Figure 4.3: The citizens decision under concession



4.4.3 Repression, Concession or Democratization?

To understand what will happen in the equilibrium, we compare the expected values of repression, concession and democratization. We assume that $\hat{k} > \varepsilon(1/\theta - 1)$ to be able to focus on more interesting cases. This assumption imposes that the amount of concession will always be bigger than the cost of protest, $\hat{\Delta}_c > E_c$. We now have four different scenarios with respect to the two revolution constraints.

1. When revolution is too costly under both repression and concession, that is $\bar{r}_k \leq r_k$ and $\bar{r}_m \leq r_m$, the elite compare the value of concession and repression (see Figure 4.4). There is a specific value of $k = \hat{k}$ which prevents a revolution. However, as we discussed before, the elite pay the cost of repression when there is a revolutionary attempt. This obviously provides an incentive to choose repression $\psi = 1$ when the revolution constraint (4.9) is not binding.

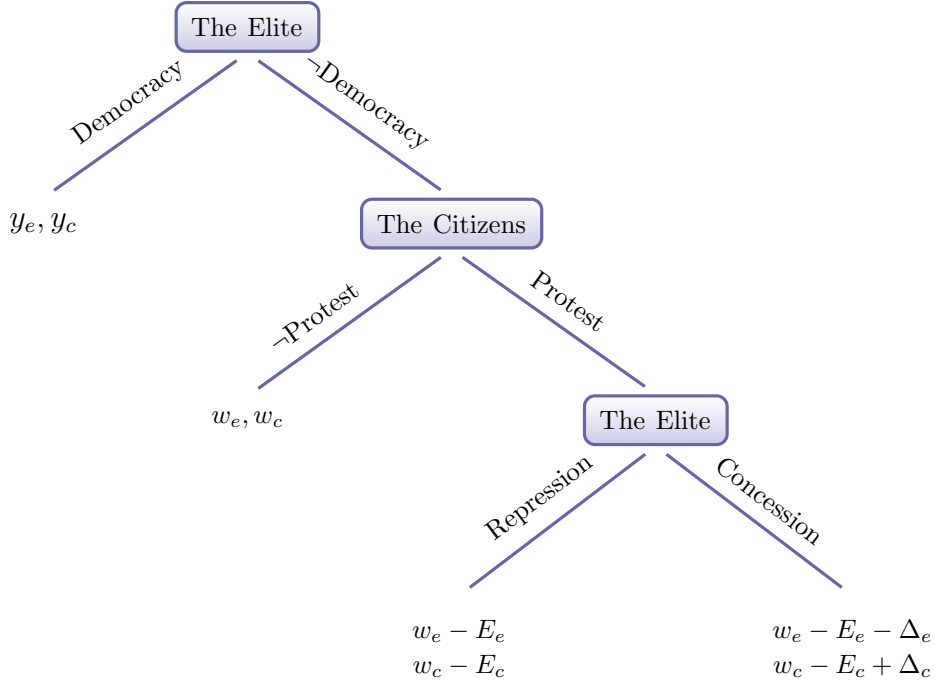
If the citizens protest they will receive the worst outcome $w_c - E_c$ because the elite will use repression. Therefore, no protest will take place $\pi = 0$ because

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citizens always prefer w_c instead of $w_c - E_c$.

In the absence of protest, there is no reason as to why the elite would create democracy thus, $\delta = 0$. The political regime stays in N and the elite and the citizens keep their current income, w_e and w_c . The elite stay in power without democratization, repression or concession.

Figure 4.4: Case 1: $\bar{r}_k \leq r_k$ and $\bar{r}_m \leq r_m$

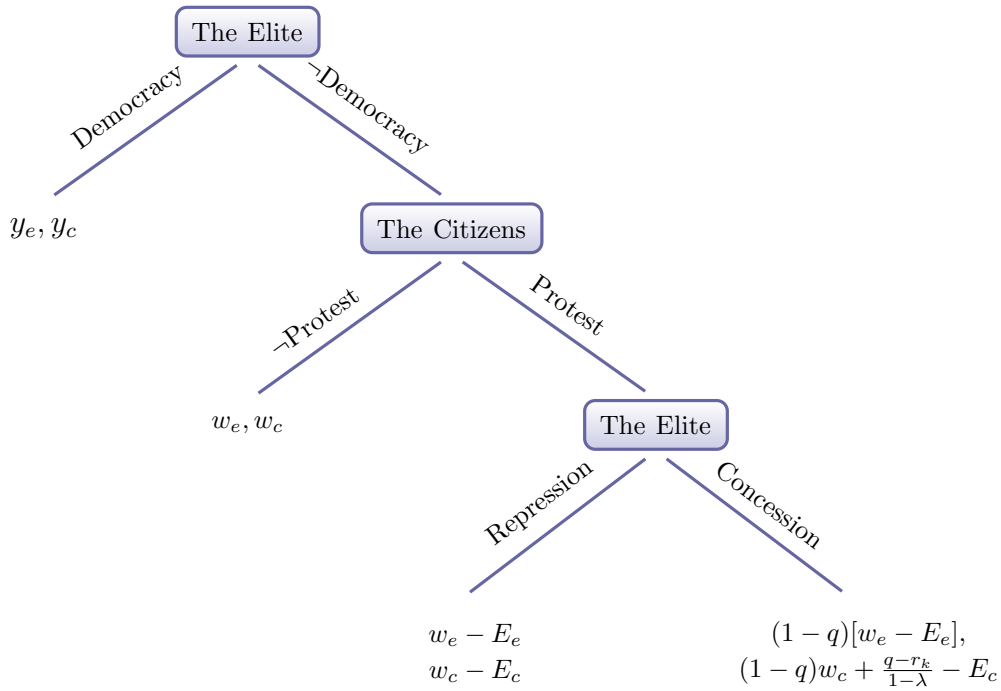


2. If the threat of revolution is present only under concession, that is $\bar{r}_k > r_k$ and $\bar{r}_m \leq r_m$, there still is no incentive for the elite to offer redistribution (see Figure 4.5). The elite know that the citizens will undertake a revolution when they offer redistribution, even if they set $k = \bar{k}$. Furthermore, a revolution succeeds with probability q . However, when they use repression the citizens accept to remain under the current regime and do not revolt. The elite always prefer the expected value of repression $w_e - E_e$ to the expected value of concession $(1 - q)[w_e - E_e]$. Therefore, the elite choose $\psi = 1$.

The citizens cannot undertake a revolution when they face repression. So, as in the previous scenario, they do not protest, $\pi = 0$.

As a response, the elite do not create democracy, $\delta = 0$. The political regime stays in N and the elite and the citizens keep their current income, w_e and w_c . The elite stay in power without democratization, repression or concession.

Figure 4.5: Case 2: $\bar{r}_k > r_k$ and $\bar{r}_m \leq r_m$



3. The elite choose between repression and concession if the threat of revolution is present only under the repression that is $\bar{r}_k \leq r_k$ and $\bar{r}_m > r_m$ (see Figure 4.6). The elite are indifferent between concession and repression if

$$w_e - \hat{\Delta}_e - E_e = (1 - p)[(1 - m^*)w_e - E_e] \quad (4.13)$$

which can be simplified to

$$m^* = \frac{(\hat{k} - p)\theta - p\varepsilon(1 - \theta)}{(1 - p)\theta}. \quad (4.14)$$

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For all $m \geq m^*$ the elite prefer concession to repression which generates $w_e - \hat{\Delta}_e - E_e$ and $w_c + \hat{\Delta}_c - E_c$. The citizens always prefer to protest when they know that they will be offered to redistribute.

In this situation from the point of view of the elite democratization is more beneficial if

$$w_e - \bar{\Delta}_e > w_e - \hat{\Delta}_e - E_e \quad (4.15)$$

or in other words

$$\varepsilon > \frac{\theta(\bar{k} - \hat{k})}{1 - \theta}. \quad (4.16)$$

Let ε_d equal the right hand side of (4.16). For all $\varepsilon > \varepsilon_d$, the elite prefer democratization. Alternatively, they maintain power by concessions. Note that the cost of protest can force the elite to democratize.

On the other hand, the elite prefer to use repression if $m < m^*$. Then the citizens choose whether to protest or not. For this purpose we define a second threshold value of r_m at which the citizens are indifferent between protest and not protesting,

$$(1 - p)w_c + \frac{p - \bar{r}_m}{1 - \lambda} - E_c = w_c$$

or in other words,

$$\bar{r}_m = p\theta - \varepsilon(1 - \theta). \quad (4.17)$$

If $r_m \geq \bar{r}_m$, the citizens do not protest, $\pi = 0$. Therefore, the elite do not create democracy, $\delta = 0$. For $r_m < \bar{r}_m$ the citizens protest, $\pi = 1$. Let us define m^{**} as the point at which the elite are indifferent between repression and democratization.

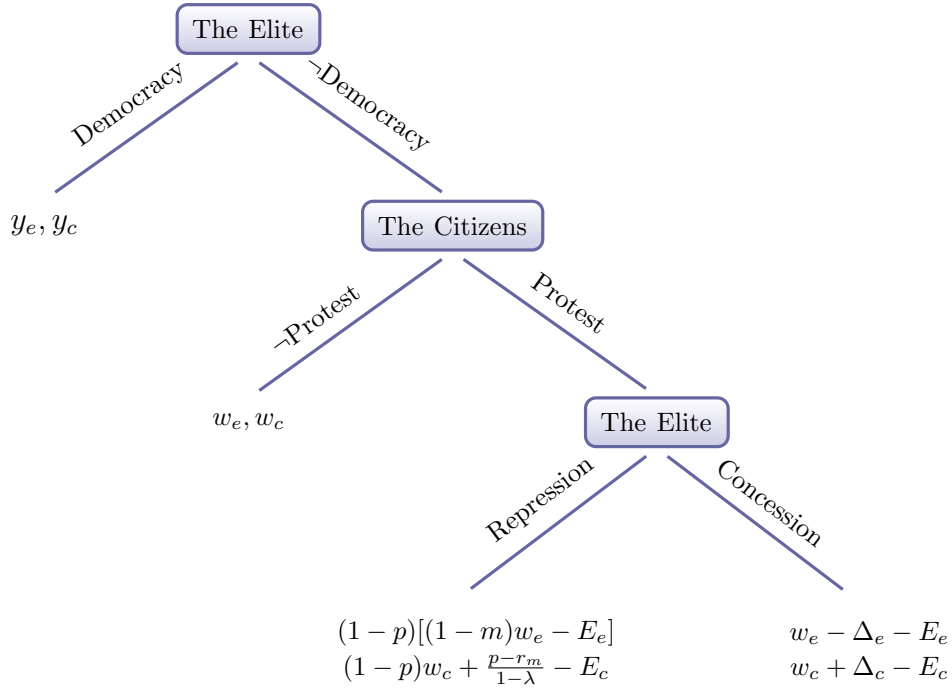
$$y_e = (1 - p)[(1 - m^{**})w_e - E_e] \quad (4.18)$$

or in other words

$$m^{**} = \frac{(\bar{k} - p)\theta - \varepsilon(1 - \theta)(1 - p)}{(1 - p)\theta}. \quad (4.19)$$

For all $m < m^{**}$ the elite prefer repression to democratization. If this is not the case, they democratize.

Figure 4.6: Case 3: $\bar{r}_k \leq r_k$ and $\bar{r}_m > r_m$



4. Finally, the threat of revolution can be present under both concession and repression, that is $\bar{r}_k > r_k$ and $\bar{r}_m > r_m$ (see Figure 4.7). The elite do not use repression because they expect that the value of repression $(1 - p)[(1 - m)w_e - E_e]$ is always less than the expected value of concession $(1 - q)[w_e - E_e]$. The elite always choose $\psi = 0$.

The citizens prefer to protest if the cost of revolution is low enough. Let us define a second threshold value $\bar{\bar{r}}_k$ where the citizens are indifferent between protest and not protesting.

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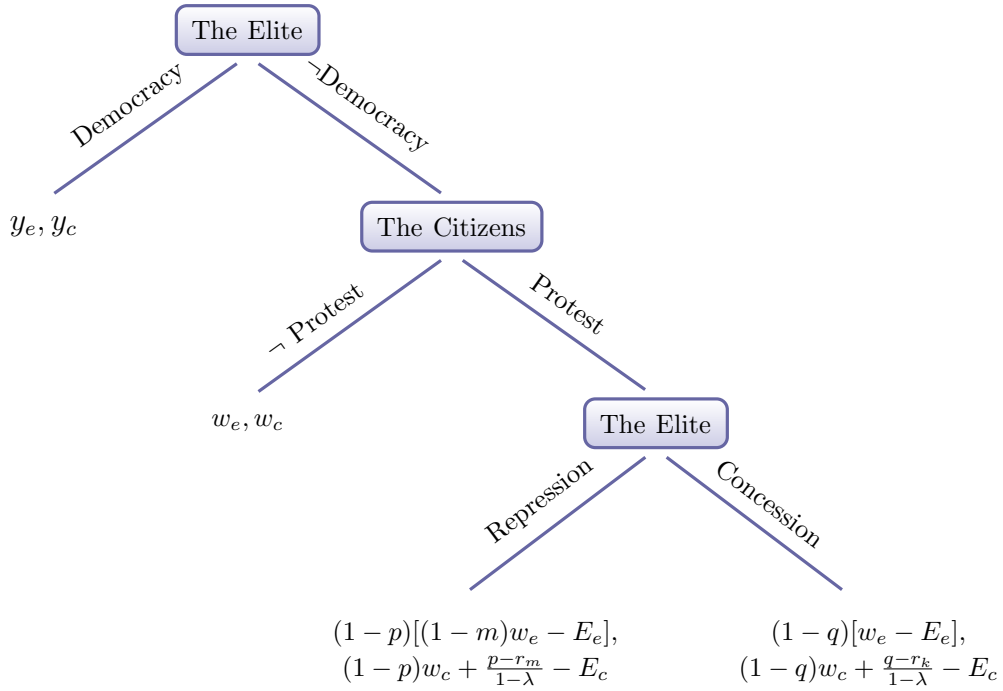
$$(1 - q)w_c + \frac{q - \bar{r}_k}{1 - \lambda} - E_c = w_c$$

or in other words,

$$\bar{r}_k = q\theta - \varepsilon(1 - \theta). \quad (4.20)$$

If $r_k \geq \bar{r}_k$, the citizens do not protest, $\pi = 0$. Therefore, the elite do not create democracy $\delta = 0$. For all $r_k < \bar{r}_k$ the citizens protest $\pi = 1$.

Figure 4.7: Case 4: $\bar{r}_k > r_k$ and $\bar{r}_m > r_m$



In the presence of protest, the elite can choose democratization to prevent a revolution. To do so, they compare the expected value of democratization and revolution. The elite allow democratization if

$$y_e > (1 - q)[w_e - E_e] \quad (4.21)$$

or in other words

$$\varepsilon > \frac{(\bar{k} - q)\theta}{(1 - \theta)(1 - q)}. \quad (4.22)$$

Similarly, let ε_r equal the right hand side of (4.22). For all $\varepsilon > \varepsilon_r$ the elite prefer democratization to the expected value of a revolution. Alternatively, they take the risk of a revolution.

We have defined critical values for the costs of protest, revolution and repression. They are summarized in Table 4.3. Recall that $\hat{k}$ is a specific value of k which prevents a revolution and $\bar{k}$ is a specific value of k which maximizes the income of the citizens.

Table 4.3: Table of Symbols for the Cost of Protest, Revolution and Repression

	The critical value of costs	Conditions
$\bar{r}_k$	Revolution (Concession)	For $r_k < \bar{r}_k$ the citizens revolt.
$\bar{r}_m$	Revolution (Repression)	For $r_m < \bar{r}_m$ the citizens revolt.
$\bar{\bar{r}}_k$	Revolution (Concession)	For $r_k < \bar{\bar{r}}_k$ the citizens protest.
$\bar{\bar{r}}_m$	Revolution (Repression)	For $r_m < \bar{\bar{r}}_m$ the citizens protest.
m^*	Repression	For $m < m^*$ the elite prefer repression to concession.
m^{**}	Repression	For $m < m^{**}$ the elite prefer repression to democratization.
ε_d	Protest	For $\varepsilon > \varepsilon_d$ the elite prefer concession to democratization.
ε_r	Protest	For $\varepsilon > \varepsilon_r$ the elite prefer democratization to revolution.

4.4.4 Equilibrium

We are ready to state the equilibrium. There is a unique subgame perfect equilibrium depending crucially on the size of the parameters, the costs and the probabilities. We write subgame perfect strategy profiles according to (4.7). In order to avoid complications in the following theorem, we write only the equilib-

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rium path. The full specification of strategy profiles can be found in the proof of Theorem 4.4.1 in the Appendix.

Theorem 4.4.1. *There is a unique SPNE $\{\tilde{\sigma}_e\}, \{\tilde{\sigma}_c\}$ in the game described in Figure (4.1) and it is such that,*

1. *If the revolution constraint is $\bar{r}_m \leq r_m$ under repression, the citizens do not protest and the elite can stay in power without concession, repression or democratization. The political state stays in N . The citizens receive w_c and the elite receive w_e .*
2. *If the revolution constraints are $\bar{r}_k \leq r_k$ and $\bar{r}_m > r_m$ then:*
 - (a) *If $m < m^*$ and*
 - i. *$r_m \geq \bar{r}_m$, then the citizens do not protest and the elite can stay in power without concession, repression or democratization. The political state stays in N . The citizens receive w_c and the elite receive w_e .*
 - ii. *$r_m < \bar{r}_m$ and*
 - A. *$m < m^{**}$, then the citizens protest, the elite use repression and the citizens undertake a revolution. The political state changes to R with probability p and stays in N with probability $1 - p$. The citizens receive $(1 - p)w_c + \frac{p-r_m}{1-\lambda} - E_c$ and the elite receive $(1 - p)[(1 - m)w_e - E_e]$.*
 - B. *$m \geq m^{**}$, then the elite create democracy. The political state changes to D . The citizens receive y_c and the elite receive y_e .*
 - (b) *If $m \geq m^*$ and,*
 - i. *$\varepsilon > \varepsilon_d$, then the elite create democracy. The political state changes to D . The citizens receive y_c and the elite receive y_e .*
 - ii. *$\varepsilon \leq \varepsilon_d$, then the citizens protest and the elite offer concessions and the citizens do not undertake a revolution. The political state stays in N . The citizens receive $w_c + \hat{\Delta}_c - E_c$ and the elite receive $w_e - \hat{\Delta}_e - E_e$.*
3. *If the revolution constraints are $\bar{r}_k > r_k$ and $\bar{r}_m > r_m$ then:*

(a) If $r_k < \bar{r}_k$ and

i. $\varepsilon > \varepsilon_r$ then the elite create democracy. The political state changes to D . The citizens receive y_c and the elite receive y_e .

ii. $\varepsilon \leq \varepsilon_r$ then the citizens protest, the elite offer concessions and the citizens undertake a revolution. The Political state changes to R with probability q and stays in N with probability $1-q$. The citizens receive $(1-q)w_c + \frac{q-r_k}{1-\lambda} - E_c$ and the elite receive $(1-q)[w_e - E_c]$.

(b) If $r_k \geq \bar{r}_k$ then the elite do not create democracy and the citizens do not protest. The political state stays in N . The citizens receive w_c and the elite receive w_e .

Proof. See Appendix. □

Theorem 4.4.1 contains three parts. In the first part, if the revolution constraint under repression does not hold $\bar{r}_m \leq r_m$, the elite always prefer repression. In this situation, the citizens know that they will face repression if they protest. Repression makes the citizens worse off because undertaking a revolution is too costly under repression. Consequently, they accept the current regime income distribution and do not protest. This is likely to hold in nondemocratic regimes where the elite can effectively use repression when there is a protest. Part 1 provides the best outcomes for the elite – they stay safely in power.

In part 2, we consider the case where concessions are enough to prevent a revolution and the revolution constraint holds under repression, $\bar{r}_k \leq r_k$ and $\bar{r}_m > r_m$. The elite's strategy changes according to the cost of repression and revolution. If the cost of repression is low enough relative to concessions, $m < m^*$, the elite prefer repression rather than concessions and a revolution and protest are costly, $r_m \geq \bar{r}_m$ the citizens prefer not to protest. In this case, the elite prefer repression to concessions even if concessions stop a revolution and in the equilibrium the citizens do not protest. Therefore, the elite do not create democracy or make concessions. On the other hand, if the cost of a revolution is low enough, $r_m < \bar{r}_m$, there are two possibilities for the elite. A revolution takes place in the equilibrium when the elite prefer repression rather than democratization for $m < m^{**}$. In the

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alternative case where $m \geq m^{**}$, repression is more costly than democratization and the elite create democracy.

When $m \geq m^*$, the elite are in favor of concession instead of repression at the last decision node. We know that concessions stop a revolution. The elite, however, create democracy if keeping the status quo is costly because of the cost of protest, $\varepsilon > \varepsilon_d$. Otherwise, when $\varepsilon \leq \varepsilon_d$, staying in power by concessions is more beneficial for the elite.

In the last part, repression cannot be a strategy for the elite anymore because both revolution constraints hold. If the citizens overcome the cost of revolution and protest, $r_k < \bar{r}_k$, the elite's strategy depends on the cost of protest. They allow democratization if keeping the status quo is costly, $\varepsilon > \varepsilon_r$, otherwise they take the risk of a revolution. On the other hand, if the citizens cannot overcome the cost of revolution and protest, $r_k \geq \bar{r}_k$, the elite keep power without democratization, concessions or repression.

4.5 Summary

In this chapter we presented a modification to Acemoglu and Robinson's *Static Model of Democratization*. As a first modification, we allow revolutions to fail. Furthermore, we assume that the cost of a revolution is higher when the citizens face repression. However, the citizens solve their collective action problem more easily under a repressive regime. Therefore, the likelihood of a successful revolution is higher under repression.

We added one more action for the citizens: protest. In the equilibrium the elite create democracy voluntarily under some conditions. The first one is the same as that which we find in Acemoglu and Robinson's model. When there is a threat of revolution and concessions cannot prevent a revolution and repression is too costly, the elite democratize. The second one is the addition of protest as an action for the citizens which results in a situation where not only the threat of revolution but also the cost of protest can force the elite to create democracy in the equilibrium.

Chapter 5

Conclusion

Our objective in this thesis was to give an overview and to understand the economic origins of revolutions and democratization. First, we reviewed [Roemer's \(1985\)](#) model of revolution to introduce revolution as a two player game and the cost–benefit analyses of individuals in light of the strategies of the players Lenin and the Tsar. Then we studied the model of [Acemoglu and Robinson \(2006\)](#) in which redistribution and democratization were introduced as a result of revolutionary threat. Last, we presented a modification to [Acemoglu and Robinson's \(2006\)](#) model, introducing different costs of revolution in the presence of repression and concession, and adding protest as an option for citizens.

Undoubtedly, there are theoretical difficulties in modeling rare social events such as revolutions or democratization. Particularly, it is not easy to determine the players, their possible strategies and the costs of players' actions. There exists a large variety of models in the literature using different theoretical setups to explain revolutions and democratization. However, despite the complexity of the topic, the models we presented in this thesis provide a good overview and explain the economic foundations of these events.

In Roemer's model, we examined that the revolutionary ideology of Lenin and the counter revolutionary ideology of the Tsar which are based on economic motivations. But we mainly consider insensitive regimes where the probability of a successful revolution only depends on the size of a revolutionary coalition. Lenin organizes the revolutionary coalition whilst the Tsar uses penalties. However, the Tsar does not consider redistribution to prevent a revolution.

5. CONCLUSION

Acemoglu and Robinson introduce redistribution, in the presence of a revolutionary threat, as an option for the dictator or the group which hold economic and politic power. Redistribution leads to a commitment problem because in an authoritarian regime there is no institution which can force the elite to keep their promise. Accordingly, democratization becomes another option for the elite because creating democracy circumvents the commitment problem.

Furthermore, in Acemoglu and Robinson’s model the main reason for regime transitions is income inequality between the elite and the citizens. All the threshold values – for example the critical cost of a revolution – we use to derive the equilibrium are function of income inequality. On the other hand, Roemer hardly discusses income inequality¹. Redistribution and democratization (depending on the level of inequality) lead to two more possible political outcome. In addition to political outcomes in Roemer’s model, transition to revolution and remaining in nondemocracy, the regime can change to democracy or it can remain in nondemocracy with concessions.

In the model “*Game on Revolution*” we obtain that in an equilibrium under the assumption of two different costs of revolution, citizens may receive concessions. Under specific conditions, concessions the result of a threat of revolution as in Acemoglu and Robinson’s model. Our additional assumptions together with the further available action of protest for the citizens result in an equilibrium where there exists a political outcome under specific conditions in which the elite redistribute income even in the absence of a revolutionary threat. This is because protest makes keeping status quo costly.

All three games we study are sequential and take place in one period. However, one may ask whether it is plausible to consider only one period. As we discuss in chapter 2, [Acemoglu and Robinson \(2001\)](#) also have a richer dynamic model. In the dynamic setting they place the basic model into an infinite time horizon. The dynamic setting helps to explain back and forth transitions between democracy and nondemocracy.

Additionally, the models we present in this thesis consider a two player game with complete information. This is one of the points that remains open for

¹As he points out one of the reasons is that the probability functions across sensitive regimes are not easily compared.

discussion. One may argue that in a revolutionary situation it is difficult to make the assumption that we have complete information. The threat of revolution existed in Germany, Britain, Russia and other countries. But a revolution took place in less industrialized Russia and not in Germany or Britain. Acemoglu and Robinson claim that in agrarian societies revolutions can be expected occur more than redistribution and democratization (as in Roemer's model the Russian Revolution of 1917). Authors suggest that in less industrialized countries the elite are less in favor of concessions. As a result, under specific conditions, a revolution is inevitable. On the other hand, there may be other or additional reasons. For example, the speed with which information can be distributed between the workers will vary strongly between societies at different levels of industrialization. This will influence how easily workers can be organized and form revolutionary coalitions.

Another critical point in modeling revolutions is determining the cost of revolution and post revolutionary incomes. As we study in the "*Static Model of Democratization*", undertaking a revolution is costly and in the "*Game on Revolution*", the cost of revolution depends on the elite's strategy. But in "*Rationalizing Revolutionary Ideology*", in the case of a successful revolution, there exist no costs. However, we know that after the Russian Revolution of 1917 a costly civil war arose. A model of revolution should include the cost of the transition of power.

Overall, we conclude that revolutions and democratization are not random events but can to a certain extend be explained by behavior of rational agents following economic considerations. Additionally, strategies that are mostly perceived as ideological such as tyranny or redistribution can be founded in strategic motivations. Given the complex nature of these events, game theoretical studies cannot provide the full picture but help in understanding aspects of the social dynamics.

Looking forward, the game theoretical approach could also be applied to the more recent revolutions that have been taking place throughout the world. Modifications will surely be necessary but important parallels can be drawn. For example, the process of democratization as we saw recently in the authoritarian regime in Egypt followed the logic of the model suggested by Acemoglu and Robinson.

5. CONCLUSION

Additionally, the ongoing protests are increasing the pressure on regimes to redistribute or democratize.

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Appendix A

Proof of Theorem 3.4.1. Recall that the society begins in nondemocracy and that a pure strategy Subgame Perfect Equilibrium is a strategy combination $\tilde{\sigma}_e$ and $\tilde{\sigma}_c$. The elite have three actions $\{\delta, \psi, k\}$ and the citizens have one action conditioned on the elite's action $\{\rho(\delta, k)\}$.

We can solve the game by backward induction. The elite move first and the citizens respond. We have two parts to prove. Let us start with the case in which $r \geq \theta$. Since the revolution constraint (3.13) does not hold, at the first and second decision node of the citizens the unique best response is to not undertake a revolution,

$$\rho(\delta, k) = \begin{cases} 0 & \text{if } \delta = 0 \text{ and } k \geq 0, \\ 0 & \text{if } \delta = 1. \end{cases}$$

The elite maximize the output given by (3.9). It is clear that for the elite the subgame perfect strategy profile is $\tilde{\sigma}_e = \{\psi = 0, \delta = 0, k = 0\}$. This completes the proof of the first part.

To prove part 2 consider the case $r < \theta$. In this case the elite are forced to redistribute, democratize or repress because the revolution constraint (3.13) holds.

Let r^* be defined as in (3.14). Assume that $r \geq r^*$. Equivalently

$$\frac{1-r}{1-\lambda} \leq \frac{1-\theta}{1-\lambda} + h\bar{\Delta}_c \quad (\text{A.1})$$

where the elite set $k = \bar{k}$. Otherwise there is no k can make concessions preferred to revolution. Accordingly if the elite make their best offer the citizens prefer to accept outcome of concession at $k = \bar{k}$ rather than undertaking a

A.

revolution. Recall that the elite always prefer concessions to democratization if concessions prevent a revolution. Equation (A.1) ensures that concessions prevent revolution. Then the elite choose $k = \hat{k}$ which satisfies

$$\frac{1-r}{1-\lambda} = \frac{1-\theta}{1-\lambda} + h\hat{\Delta}_c \quad (\text{A.2})$$

The best response for the citizens is

$$\rho(\delta, k) = \begin{cases} 0 & \text{if } \delta = 0 \text{ and } k \geq \hat{k}, \\ 1 & \text{if } \delta = 0 \text{ and } k < \hat{k}, \\ 0 & \text{if } \delta = 1. \end{cases}$$

Let $\hat{m}$ be defined as in (3.18). Assume that $m \geq \hat{m}$. Equivalently

$$[(1-f)m - f] \frac{\theta}{\lambda} \geq h\hat{\Delta}_c \quad (\text{A.3})$$

This means the elite prefer to make concessions rather than repress because the cost of concession is less or equal to the cost of repression. It follows that the best response for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 0, k = \hat{k}\}$. This completes the proof of 2a. Consequently if $r \geq r^*$ and $m \geq \hat{m}$ the elite stay in power by redistribution.

To prove 2b consider the following cases:

(i) Assume that $r < r^*$ or equivalently

$$\frac{1-r}{1-\lambda} > \frac{1-\theta}{1-\lambda} + h\bar{\Delta}_c. \quad (\text{A.4})$$

This ensures that the citizens prefer to undertake a revolution even if the elite make their best offer. Therefore there is no k can make concessions preferred to revolution. To determine best response for the citizens we have to determine that whether the citizens undertake a revolution when the elite create democracy. Let r^{**} be defined as (3.17). Recall that the citizens undertake a revolution if $r < r^{**}$. The best response for the citizens is

$$\rho(\delta, k) = \begin{cases} 1 & \text{if } \delta = 0 \text{ and } k \geq 0, \\ 1 & \text{if } \delta = 1 \text{ and } r < r^{**}, \\ 0 & \text{if } \delta = 1 \text{ and } r \geq r^{**}. \end{cases}$$

Additionally let $\tilde{m}$ defined as in (3.19). Assume that $m < \tilde{m}$ or equivalently

$$[(1-f)m - f] \frac{\theta}{\lambda} < \bar{\Delta}_c. \quad (\text{A.5})$$

This means the elite prefer repression rather than democratization because the cost of repression is less than the cost of democratization. It follows that the best response for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 1, k = 0\}$.

(ii) Assume that $r < r^{**}$ or equivalently

$$\frac{1-r}{1-\lambda} > \frac{1-\theta}{1-\lambda} + \bar{\Delta}_c \quad (\text{A.6})$$

This means that the citizens prefer a revolution rather than democratization. Therefore the best response for the citizens is

$$\rho(\delta, k) = \begin{cases} 1 & \text{if } \delta = 0 \text{ and } k \geq 0, \\ 1 & \text{if } \delta = 1. \end{cases}$$

Assume that $m \geq \tilde{m}$. The cost of repression is less than the cost of democratization. But the elite do not choose democratization because $\rho = 1$ if $\delta = 1$. Therefore the elite prefer repression rather than democratization. It follows that the best response for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = 0\}$.

(iii) Assume that $r \geq r^*$. The citizens prefer accept concessions rather than a revolution. Then the best response for the citizens

$$\rho(\delta, k) = \begin{cases} 0 & \text{if } \delta = 0 \text{ and } k \geq \hat{k}, \\ 1 & \text{if } \delta = 0 \text{ and } k < \hat{k}, \\ 0 & \text{if } \delta = 1. \end{cases}$$

Furthermore assume that $m < \hat{m}$. The elite prefer repression rather than concessions because the cost of repression is less than cost of concessions. It follows that the best response for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = \hat{k}\}$. These three cases completes the proof of 2b.

Finally if $r \geq r^*$ and $r \geq r^{**}$ the citizens prefer democratization rather than a revolution. The best response for the citizens is

A.

$$\rho(\delta, k) = \begin{cases} 1 & \text{if } \delta = 0 \text{ and } k \geq 0, \\ 0 & \text{if } \delta = 1. \end{cases}$$

Furthermore if $m \geq \tilde{m}$ the elite prefer democratization rather than repression. The best response of the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 1, k = 0\}$. This completes the proof of 2c. □

Proof of Theorem 4.4.1. Recall that the society begins in nondemocracy and that a pure strategy Subgame Perfect Equilibrium is a strategy combination $\tilde{\sigma}_e$ and $\tilde{\sigma}_c$. The elite have three actions $\{\delta, \psi, k\}$ and the citizens have one action conditioned on the elite's action $\{\pi, \rho(\psi, k)\}$. We have three parts to prove. We solve the game by backward induction.

Let $\bar{r}_k$ and $\bar{r}_m$ be defined as in (4.11) and (4.9). First consider that $\bar{r}_k \leq r_k$ and $\bar{r}_m \leq r_m$. Since the revolution constraints do not hold, the unique best response for the citizens is

$$\rho(\psi, k) = \begin{cases} 0 & \text{if } \psi = 0 \text{ and } k \geq \hat{k}, \\ 1 & \text{if } \psi = 0 \text{ and } k < \hat{k}, \\ 0 & \text{if } \psi = 1. \end{cases}$$

The elite maximize the output given by (4.5). Given that the citizens do not undertake revolution when the elite choose to repress. Given that the elite choose to repress the unique best response for the citizens is

$$\pi = \begin{cases} 1 & \text{if } \psi = 0, \\ 0 & \text{if } \psi = 1. \end{cases} \quad (\text{A.7})$$

The citizens prefer to protest if they offered concessions otherwise they do not. There is no reason for the elite to create democracy, use repression or make concessions. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = \hat{k}\}$.

If $\bar{r}_k > r_k$ and $\bar{r}_m \leq r_m$ then the revolution constraint holds under concession and does not hold under repression. The unique best response for the citizens is

$$\rho(\psi, k) = \begin{cases} 1 & \text{if } \psi = 0, \\ 0 & \text{if } \psi = 1. \end{cases}$$

There is no level of concession that prevents a revolution. On the other hand under repression the citizens do not undertake a revolution. The elite prefer repression rather than concessions. Given that the elite use repression the unique best response for the citizens is given in (A.7). There is no reason for the elite to create democracy. Then the subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = 0\}$. The elite stay in power without democratization, repression and concessions. This completes the proof of the first part.

Next consider that $\bar{r}_k \leq r_k$ and $\bar{r}_m > r_m$. The revolution constraint does not hold under concession and hold under repression. Then the unique best response for the citizens is

$$\rho(\psi, k) = \begin{cases} 0 & \text{if } \psi = 0 \text{ and } k \geq \hat{k}, \\ 1 & \text{if } \psi = 0 \text{ and } k < \hat{k}, \\ 1 & \text{if } \psi = 1. \end{cases}$$

Let m^* and $\bar{\bar{r}}_m$ be defined as in (4.14) and (4.20). Assume that $m < m^*$ and $r_m \geq \bar{\bar{r}}_m$. These ensure that the elite prefer repression rather than to make concessions and the citizens prefer to protest when they face to repression. Given that the elite choose to repress the unique best response for the citizens is

$$\pi = \begin{cases} 1 & \text{if } \psi = 0, \\ 0 & \text{if } \psi = 1 \text{ and } r_m \geq \bar{\bar{r}}_m, \\ 1 & \text{if } \psi = 1 \text{ and } r_m < \bar{\bar{r}}_m. \end{cases}$$

Again since the citizens do not prefer protest when they face to repression there is no reason to create democracy. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = \hat{k}\}$.

If $r_m < \bar{\bar{r}}_m$ the elite make their decision according to m^{**} defined in (4.19). The elite prefer repression rather than create democracy if $m < m^{**}$ because repression is sufficiently costly to democracy. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 1, \delta = 0, k = \hat{k}\}$. If $m \geq m^{**}$ the elite prefer to create

A.

democracy rather than repression. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 1, k = \hat{k}\}$.

Now assume that $m \geq m^*$. This ensures that the elite prefer concessions rather than repression. The elite make their choice between concessions and democracy according to ε . When the cost of protest is sufficiently high, $\varepsilon > \varepsilon_d$, the elite create democracy. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 1, k = \hat{k}\}$. Otherwise, $\varepsilon \leq \varepsilon_d$ they stay in power by concessions. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 0, k = \hat{k}\}$. This completes the proof of the second part.

Finally consider that $\bar{r}_k > r_k$ and $\bar{r}_m > r_m$. The revolution constraints hold under concession and repression. The unique best response for the citizens is

$$\rho(\psi, k) = \begin{cases} 1 & \text{if } \psi = 0, \\ 1 & \text{if } \psi = 1. \end{cases}$$

Since the citizens undertake a revolution in both cases the elite prefer concessions rather than repression. Given that the elite choose to repress the unique best response for the citizens is

$$\pi = \begin{cases} 0 & \text{if } \psi = 0 \text{ and } r_k \geq \bar{r}_k, \\ 1 & \text{if } \psi = 0 \text{ and } r_k < \bar{r}_k, \\ 0 & \text{if } \psi = 1 \text{ and } r_m \geq \bar{r}_m, \\ 1 & \text{if } \psi = 1 \text{ and } r_m < \bar{r}_m. \end{cases}$$

The elite make their choice between a revolution and democracy according to ε . When the cost of protest is sufficiently high, $\varepsilon > \varepsilon_r$, the elite prefer to create democracy rather than to take the risk of revolution. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 1, k = 0\}$. Otherwise, $\varepsilon \leq \varepsilon_r$ they allow a revolution. The subgame perfect strategy profile for the elite is $\tilde{\sigma}_e = \{\psi = 0, \delta = 0, k = 0\}$. This completes the proof of the last part. □

Appendix B

Abstract

The focus of this thesis is on a game theoretical examination of reasons for and the rationality behind revolutions and democratization resulting from economic conflict. For the purpose of this study, we review and compare Roemer (1985)'s model of revolution and Acemoglu and Robinson (2006)'s model of democratization. The first model studies a game between Lenin, who tries to organize a revolutionary coalition by proposing a new income distribution, and the Tsar, who tries to prevent a revolution by levying penalties. It shows that ideologies of Lenin and the Tsar have rational foundations. The second model discusses how the “threat” of a revolution may lead to democratization in a game between the elite and citizens. Furthermore, it is shown that the elite creates democracy under neither low nor high inequality conditions. In the light of these models, we present a modification to Acemoglu and Robinson's model where the further addition of an action (protest) for the citizens to choose from may also lead to democratization because protest makes keeping the status quo costly even if the “threat” of a revolution does not exist.

Kurzfassung

Das Ziel der vorliegenden Arbeit ist eine spieltheoretische Studie der Gründe für und der Rationalität hinter Revolutionen und Demokratisierungsprozessen, die sich aus wirtschaftlichen Gegensätzen ergeben. Dazu werden Roemers Modell (1985) für Revolutionen und Acemoglu und Robinsons Modell (2006) für Demokratisierung untersucht und miteinander verglichen. Das erste Modell betrachtet ein Spiel zwischen Lenin, welcher versucht eine revolutionäre Koalition zu formen indem er eine neue Einkommensverteilung in Aussicht stellt, und dem Zaren, der die Revolution durch Strafen zu verhindern versucht. Es zeigt sich, dass die Ideologien Lenins und des Zaren rationale Grundlagen haben. Das zweite Modell zeigt, wie in einem Spiel zwischen der Elite und den Bürgern eine drohende Revolution zur Demokratisierung führen kann. Weiters wird gezeigt, dass die Elite weder bei zu hoher noch bei sehr niedriger Ungleichheit Demokratisierung zulässt. Im Kontext dieser Modelle wird eine Modifikation zu Acemoglu und Robinsons Modell vorgestellt, in dem die Bürger mit der neuen Handlungsoption Protest die Erhaltung des Status Quo so kostspielig machen können, dass sie damit auch ohne drohende Revolution Demokratisierung erzwingen können.

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