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Mechanism of institutional transition, political instability and expansion of local power through civil wars: A model and comparative history

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Abstract. In this study, in order to examine the turning point of institutional change, we analyzed civil wars from four aspects. Theoretical, simulation, empirical analysis, and case studies. By endogenizing political, economic, and military factors in the model, we have clarified the mechanisms by which civil wars occur. The robustness of the model is evident from simulation analysis and real-life cases. We showed that the weaker the initial challenger to the government, the greater the contribution of cooperation from the population and a third force to the challenger in the process of civil war, and thus the challenger cannot create a new autocratic government with a single group after winning the civil war. The challenger also has the advantage of prolonging the civil war. For the challenger, the probability of winning the civil war increases with the proximity of the challenger's political ideology to the population, and the probability of the challenger winning the civil war is also higher when the government loses the maintenance of the population's property and public goods and the stability of the price level. The decrease in the value of public and private goods of the population due to the hyperinflation described will lower the utility of both urban and rural residents.

Keywords. Comparative institutions; Institutional change; Civil-war; History of Chinese and Japanese political economies; Syria; Myanmar.
JEL. P16; P26; P51.

1. Introduction

The history of the world shows that civil wars resulting in the use of force sometimes result in the formation of stable institutions with the support of the inhabitants, while other times a prolonged civil war leads to the collapse of a country's political economy. Where is the turning point?

This study seeks the turning point of institutional change in civil wars. This study examines the mechanism of civil wars through theory, its simulation, and case and empirical analysis. The consistency of results across multiple approaches to civil war reveals the robustness of our model. It also assumes that institutions reflect the ideology of the

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population. For this study, civil war implies armed conflict by a group of challengers to the government. The players in this study's model are the government, the challengers, an opportunist third force, and the residents of urban and rural areas. We use the model to determine whether opportunists strategically participate in the civil war through strategic interactions with other players. The study considers the influence of political and economic variables by including variables related to residents' political ideology and their ability to take charge of the economic aspects of government in Aoki (2016). We show how the support of the population affects the outcome of civil wars and how civil wars tend to be protracted by weakening the government's ability to take charge of the government.

While most previous studies are two-party games between the government and the opposition, this study is a majority player, which is closer to a realistic model. Based on a discrete dynamic game. If the people believe that the government has lost its legitimacy and effectiveness out of Lipset (1960) legitimacy and effectiveness against politics, while the third force and residents believe that the challenger has an effective policy, the third force and residents will cooperate with the challenger. When the population cooperates with either the government or the challenger, a certain percentage of that population will join the civil war as military personnel. The result of a civil war is that the autocratic challenger may win. Even if the dictatorial challenger announces that he will implement coercive policies after winning the civil war, the population may support the challenger, even though they know they will be deprived of their basic human rights, if they anticipate that their poverty will be alleviated as a result of the coercive policies.

We also envision a case in which a single challenger group against the government will have difficulty winning, but when two or more groups ally, they will have a power that outweighs that of the government. We will examine what mechanisms are used to create alliances. Include and discuss predictions for the post-alliance civil war, including what happens after the alliance is won. Even if the challenger is weaker than the government when it challenges the government to civil war, we predict that the challenger will win the civil war in the long run by gaining support from the local population and a third force. We show that the optimal long-term strategy is for the challenger to challenge the government to civil war. Civil wars also arise from government instability. The reason for government instability can be assumed to be the lack of confidence in either the legitimacy or effectiveness of Lipschitz from the populace. When the people do not have confidence in the government, civil war does not arise if power can be replaced peacefully. If the people do not trust the government, but there is no change of power, and there are forces with military power similar to that of the government, civil war will ensue. Alternatively, civil war is assumed to occur when there is a political power that many people believe may replace the government, even if it has less military power than the government has at the beginning of the civil war.

The above implies that one of the factors that cause civil war is the dispersion of power. This section will examine theoretically how the dispersion of power can generate civil war. We also show that when civil war reduces the government's ability to sanction challengers, it provides an incentive for challengers to continue civil war.

Our model introduces variables on political ideology and the ability of the government to take charge in economic terms in Aoki (2016). For ideology, we assume that residents are divided into two groups: outcome egalitarian (socialist) and opportunity egalitarian (capitalist) ideologies, each with a different utility function in the region.

An important role of government is the guarantee of property rights, which is the preservation of the value of assets held by residents, and the ability to provide services of public goods. This study considers the ability to stabilize the value of these goods as the ability to take charge of the government. The utility function of residents includes the utility obtained from private and public goods. The price level is a function of consider a model that affects value. Assume that the price level is affected by arms imports and domestic debt levels associated with the civil war.

In addition, support from the domestic populace and local authorities and military power are important factors in winning a civil war to secure supplies. We divide the elements of military power into military technology and domestic support and show that the rise in military technology leads to decentralization. When people judge that a government (1) has military technology but no domestic support, (2) has a small number of supporters of the ruling party's political ideology, or (3) is not capable of taking charge in terms of economic stability, the government's relative position is We will show that the government will be weakened and either decentralization will occur or the government will be replaced through civil war. This study considers the following as factors contributing to decentralization The inability of the government to impose decisive sanctions despite the challenger's defeat so that the challenger continues to hold sway in the country after the civil war.

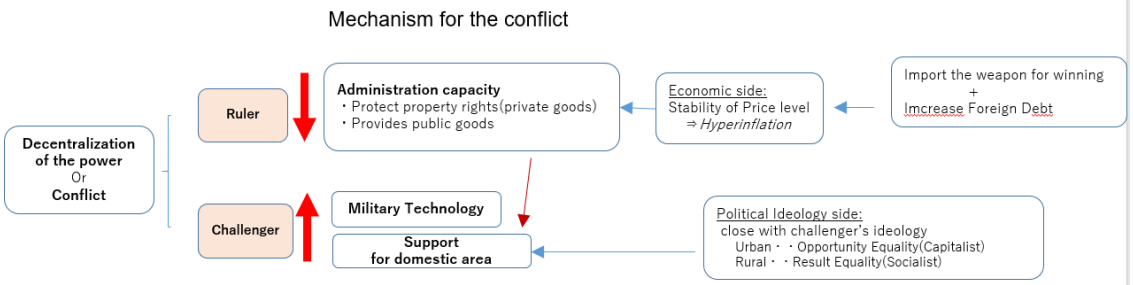

Figure 1. *Mechanism for the Conflict*

While most previous studies are two-party games between the government and the opposition, this study is a majority player, which is closer to a realistic model. It is based on a discrete dynamic game.

The introduction of the ability to take charge of government is consistent with Lipset's (1960) theory.

If the people believe that the government will lose its legitimacy and effectiveness out of Lipset's (1960) legitimacy and effectiveness against politics, while the challenger has an effective policy, the third force and the residents will cooperate with the challenger. When residents cooperate with either the government or the challenger, a certain percentage of their population will join the civil war as military personnel. The result of a civil war is that the autocratic challenger may win. Even if the dictatorial challenger announces that he will implement coercive policies after winning the civil war, the population may support the challenger even though they know that they will be deprived of their basic human rights if they anticipate that their poverty will be alleviated as a result of the coercive policies.

Civil wars also arise from government instability. One reason for government instability can be assumed to be the lack of confidence in either the legitimacy or effectiveness of Lipschitz from the populace. When the people do not have confidence in the government, civil war does not arise if power can be replaced peacefully. If the people do not trust the government, but there is no change of power, and there are forces with military power similar to that of the government, civil war is likely to occur. Or, if there is a political power that many people believe could replace the government, even if it has less military power than the government has at the beginning of the civil war, and if the ideology of that power is supported by the population, it would be desirable for the challenger to challenge the government to civil war.

The above implies that one of the factors that cause civil war is the dispersion of power. This section will examine theoretically how the dispersion of power can generate civil wars. We also show that if civil war reduces the government's ability to sanction the challenger, it provides an incentive for the challenger to continue the civil war.

Furthermore, to predict post-civil war institutions, not only the objectives of civil war for the challenger, but also the characteristics of the challenger itself are important in determining institutions. This model also allows for the challenger to be an extremist.

Challengers in this study are groups that challenge the government by force through civil war. Extremists are groups among the challengers that focus on assassinations and other activities, or groups such as the Islamic State in Syria that do not focus on activities to seek the support of the population and seek to overthrow the government only by military force.

Extremists in this study are hardliners in the broadest sense of the concept as opposed to centrists and moderates, including groups that espouse religious fundamentalism, radicals for the introduction of democratic policies, hardliners for liberalization and protectionist policies, hardliners against other countries and specific groups within their own countries. It is a general term for groups for whom it is very difficult to

tolerate or compromise on the values of other forces or the policies espoused by other forces.

Extremists are often armed and militarily strong. They are also generally perceived as groups with radical ideologies, and therefore often do not enjoy the support of the population. In our model, the militant groups have strong military power, but it is difficult for them to gain the support of the local population. In our model, we assume that the cases in which the political gap between challengers and opportunists is large are extremist groups.

Extremists may participate in civil wars to influence the post-civil war regime. Their proposed policies are often uncompromising with other challenger groups, and the speed and content of reforms are often radical. They often seek to destroy groups with vested interests. The radicals in this study rely on military force to achieve their group's objectives and thus are an effective offensive force to overthrow the government. Because of the magnitude of their offensive power, they have a large voice once a civil war begins, and their voice is likely to have a significant impact on the administration of the government after the civil war is won. In addition, the objectives of the militants are often different from those of the initial democratic movement. The establishment of relationships between extremists and other forces after the victory of a civil war is important from the perspective of regime stability and the direction of institution-building.

Gates *et al*. (2016) show that once civil wars occur, they occur repeatedly. This study also examines the relationship between the number of civil wars and the success of civil wars.

This study examines the mechanism of repeated occurrence of civil wars and shows that when the government is not powerful enough to extinguish the challenger's forces with a single civil war victory, repeated civil wars are more likely to be victorious for the challenger. To this end, we envision a supergame that introduces a finite repetition game during the civil war as a tactical space, apart from the larger strategic decision of who to align with.

This study examines the mechanism of civil war at the juncture of institutional change through theory, its simulation, and case and empirical analysis.

The case analysis deals with several countries: first, Japan at the end of the Edo period (1850s-1867), which triggers the end of feudalism; second, China during the Xinhai Revolution (1911), which brings an end to the Qing Dynasty; third, China during the This is China during the period of the National Communist Civil War that led to the founding of the People's Republic of China (1949). The governments of the above periods were afraid of foreign conquest of their countries, and history confirms that the challengers aimed for strong military power and modernization. Therefore, they aimed for a strong state through centralization rather than federalism.

However, China, which did not have an ideology or strong military force capable of uniting the opinions of nations, and Japan, which was able

to have an ideology to unite the nation, show that their subsequent history and their institutions were different. Two more countries will be treated as examples after World War II. Myanmar and Syria. By treating as cases countries where historically famous civil wars have occurred, we confirm that the model of this study is broadly applicable. Myanmar and Syria were centralized states, but despite the existence of ethnic minorities and ethnic conflicts, they failed to achieve democratic institutions to reflect the opinions of the central government. Myanmar was a socialist country as of 1988, which limited economic and political freedom, and the number of poor people was high, causing difficulties for the people. Under these circumstances, student demonstrations for democratization and liberalization arose, and the party advocating democratization won the elections but was forced to fail by the military. Myanmar has since then remained under military rule, but democratic policies have also been introduced; since 2015, democratization has been implemented. In Syria, however, democratization has not been implemented. In Myanmar, democratization has continued to be blocked by the military, although democratic parties have always won elections from 1988 until 2015. The will of the people was squeezed between the options of federalism and democratization. Although Myanmar has not fought a civil war, it is a case of a successful challenger because the people's will has been consistent and unified, and democratization has finally been achieved. Syria, on the other hand, has the energy to overthrow the ruling party, but there is not enough coordination among the challengers and there is little trust between them.

Syria can be considered a case of failure of the challengers.

2. Previous review

Several studies have examined the impact of fiscal capacity and the level of military technology on political equilibrium; Gennaoli & Voth (2013) examined the process by which powerful nation-states emerge from many small states through military competition. They examined it under two types of actors: those with strong fiscal capacity and those with weak fiscal capacity. Besley & Persson (2011) modeled the competition of challengers to rulers and analyzed the conditions that lead to the defeat or survival of rulers.

Aoki (2016), using a multiple-period game model, found that the Kuhn-Tucker condition is satisfied and that there is always one equilibrium because it is supermodular, and that the ruler's resistance can be reduced by compensating for the reduction in the ruler's losses due to the transition to the new state. The study also showed that the fixed cost of transitioning to the new state decreases, and that the alliance between the challenger and opportunist is assured through a shift in their positions from competitive to complementary, thus increasing the probability of transitioning to the new state. The results of the analysis are applied to Japan and China. As a way to compensate for the reduced losses of the rulers in the transition to the new state, the shogunate returned power to the emperor in the final days of

the Tokugawa shogunate, avoiding the costs of war and the future destruction of the shogunate, and the shoguns lived as an aristocratic class (nobility) after the civil war. In exchange for a certain guarantee of the ruling class's life and property, the guarantee of a reduction in the ruler's losses reduced the cost of transition. The example of regime transition and the end of civil wars has been seen in the past in many countries in order to speed up the end of wars.

An example of lowering the fixed costs of transition to a new state is the alliance between Satsuma and Choshu in Japan at the end of the Tokugawa Shogunate, when multiple players could share the costs of arms, ammunition, and supplies rather than having one clan provide all supplies, weapons, ammunition, etc., and then engage in civil war through the alliance. Not only in civil wars, but also policy making in peacetime, if the cost of policy making and implementation is known in advance, it is not necessary for a single group to make efforts for policy making and implementation if the cost is covered by only one group, both in terms of cost and low probability of success, but if multiple groups If policy decisions and implementation are made jointly, the equilibrium situation is one in which costs are distributed and cooperation takes place.

A case in point is the relationship between Choshu and Satsuma at the end of the Tokugawa shogunate, in which the challenger and the opportunist were able to ensure their alliance by shifting their positions from rivalry to complementarity. After the defeat of the Choshu domain, the Satsuma domain changed its mind that the next attack by the Shogunate would be on the Satsuma domain, and the Satsuma domain joined forces with the Choshu domain to fight against the Shogunate. As a result, throughout the Boshin War of 1867, all clans except the Satsuma and Choshu clans followed the allied forces of the Satsuma and Choshu clans, who were steadily winning the war. The Boshin War was followed by the fall of the shogunate regime and the start of the Meiji Restoration, in which the Choshu clan was the challenger and the Satsuma clan the opportunist (the Satsuma clan was the most important clan that led the Choshu clan to defeat in the first conquest of Choshu, but it did not destroy the Choshu clan and did not take harsh actions against the Choshu clan).) This can be seen as a complement to the rivalry between the Chōshū and Satsuma clans, which were defeated in their respective battles against the Shogunate, but which could have won the war by working together. The clans can be regarded through the military superiority of the combined forces of the Satsuma and Choshu clans in the early stages of the Boshin War, the return of the authority of the shogunate to the Emperor, and the order by the Emperor to overthrow the shogunate, the opportunist clans decided to stop their neutrality and join forces with the Satsuma and Choshu clans during the war to ensure the survival of their clan and their current position after the Boshin War. He believed that the

The Satsuma and Choshu clans accepted allies in time of war to avoid defeat in the Boshin War. This is an example of how challengers and

opportunists shifted their positions from competitive to complementary. The earlier the opportunist third force allied itself with the challenger, the better position it would be in the new government that would be formed after the challenger's victory. This is strongly related to the fact that the challenger's victory in the early stages of the civil war rapidly expands his base of support, leading to a successful civil war by the challenger.

In peacetime, the challenger politician can also seek alliances with opportunist politicians in order to determine and implement policies. The opportunist has little advantage in refusing the alliance because the likelihood of policy realization is greatly increased if the alliance is formed. If the opportunist's benefits after the policy is realized are guaranteed through the transaction, the relationship between the challenger and the opportunist changes from one of competition to one of complementarity, and the alliance takes place.

3. Civil war

3.1. Purpose and types of civil wars

Historically, including since World War II, war has been waged by and between nations. Since then, the actors of war have diversified to include international organizations, local domestic forces, and domestic extremist groups, and the forms of war have also changed to include domestic conflicts and terrorism.

There has been an increase in the number of wars waged by specific groups and organizations, as exemplified by the 9/11 attacks in the United States, aimed at attacking specific countries or challenging specific ideologies or the international community without limiting the attacks to specific nations. Among acts of violence, civil wars still occur throughout the world. Many civil wars do not disappear, even though they destroy not only lives but also the productive activities of nations and the basis of people's lives. Civil wars include wars not only between states but also between states and terrorists.

In addition to stable employment and increased income, domestic economic revitalization has confirmed the importance of guaranteeing citizens' rights to political participation and property rights to realize the design of institutions by citizens and to make their lives easier. On the other hand, there are countries and regions where these rights are not guaranteed or economic activities are not liberalized. As one of the means to realize these, some citizens try to achieve them through civil wars, which may bring about many deaths. Civil wars sometimes occur even when the importance of peace is recognized as a given. By examining the conditions under which civil wars occur, the reasons for their recurrence, and the impact of policy failures of ruling parties and the ideological proximity of local populations and opposing forces (challengers) on the outcome of wars, this study aims to clarify the mechanisms by which civil wars occur

around the world and to provide predictors and consequences of civil wars.

There are different types of civil wars. While some civil wars have clear objectives, such as a civil war against a dictatorial state or a civil war for the transition to a democratic system, there are many cases in which the objectives of civil wars are not clear, i.e., they are simply power struggles.

Sometimes the purpose of the civil war, the direction of the policy after the overthrow of the ruling party, becomes clear during the civil war. In some cases, the goal is to promote the well-being of citizens and the democratization of the country and encourage citizens to participate in politics. In other cases, the goal is to stimulate the economy by liberalizing trade, protecting trade, nationalizing companies, etc. In other cases, the ostensible and real objectives may differ. While it is often simply a struggle for power among capitalists and other emerging powers, it is also possible for civil society to gain power through protracted civil wars. Conversely, although civil society groups may have taken the lead in the early stages of a civil war, they may disappear as the civil war drags on, and the purpose of the civil war may change, becoming a battle between military forces other than civil society groups.

Several reasons for the outbreak of civil war can be cited. Sometimes they are aimed at a simple power struggle for power and gain by challengers and their interest groups, sometimes they are a reaction of the disadvantaged against government policies or a call for a change in policy priorities, sometimes they are aimed at changing some policies, and sometimes they are a movement for democratization by citizens. Sometimes undemocratic institutions are created to create strong governments, led by groups such as workers who are disadvantaged through globalization. In other cases, groups allied during a civil war may win the civil war and establish a new government, but later come into conflict and the civil war is repeated. Also, because of ideological differences even before the alliance is formed, coalition governments are likely to have conflicts between groups in terms of policy priorities and in the formation of public goods, such as how to realize policies and the size of the budget for those policies. This will require patience and deal-making on both sides of the group. The possibility of civil war exists whether the power gap between groups is large or small before the civil war. Aoki (2011) analyzed the nature of endogenous institutional change concerning institutional resilience and institutional transition. He stated that institutional complementarities arise when the leading groups that define the political and economic orders are aligned, respectively, and a foundational domain of strategic complementarities among players and across the political and economic The report states that with a change in the political system, players in the political game and players in the economic game are likely to play a game of economic exchange with both sides. The nature of possible institutional transitions from one political state to another can be examined analytically as a change in the equilibrium state of

play. It also states that certain political transitions may be facilitated and made possible by complementary changes.

The relationship between Hong Kong and China was in a state of flux until the passage of the National Security Maintenance Act of the Hong Kong Special Administrative Region of the People's Republic of China, which came into effect in Hong Kong in June 2020. Demonstrations continued for an extended time. In November 2020, the Hong Kong government disqualified pro-democracy opposition members, and all opposition members resigned en masse in protest. 2010 The late 1990s saw the election of hard-line ruling parties in several countries, including the U.S. and the Philippines; the TPP and other globalization movements waned; and the U.S. and the Philippines saw the emergence of a new globalization movement. Several countries saw protectionism and homegrown prioritization grow as a result of elections won by parties that espoused protectionism. The situation is similar to that before World War II in that an increasing number of countries are putting their own countries first. The actors in civil wars are diversifying and increasing from insurgent groups led by politicians and political parties to terrorists. Not only are the objectives of civil wars diversifying, but the objectives of civil wars are also transforming during civil wars. Sometimes they are backed by civil forces, as in Hong Kong, sometimes by mercenaries or terrorist groups backed by the financial power of capitalists, and sometimes by coups d'etat backed by local or central military forces. Furthermore, the scale of civil wars varies from terrorism and military coups by small groups seeking assassination attempts to civil wars that divide countries in two, such as the Vietnam War and the Korean War.

3.2. Definition and scale of armed conflict

The UCDP classifies armed conflict into three categories: state-based conflict, non-state conflict, and unilateral violence. Armed conflict is defined as the use of force between several organized armed groups (whether governmental or nongovernmental), and "country-based conflict" is defined as "conflict between governments (and/or) localities where the use of force between two parties (at least one of which is a state) results in at least The UCDP defines "more than 25 deaths" as "more than 1,000 combat-related deaths per year, the intensity of which increases from armed conflict to war. The number of Non-state conflict" means that neither party to the conflict is a state, and includes ethnic conflicts and cartel conflicts such as the Mexican drug war. It defines "unilateral violence" as "the use of force against civilians by a state government or formally organized group that results in at least 25 deaths in a single year. It includes attacks against civilians by the governments of Sudan, Myanmar, and Syria, as well as attacks by non-state actors such as al-Qaeda. the UCDP has published the "Journal of Peace UCDP publishes a list of all armed conflicts in Research, as well as its annual report, States in Armed

Conflict.20 The number of armed conflicts in 2011 was 37, of which 6 reached the level of war.

While this study focuses primarily on "country-based conflicts" because it assumes for the sake of convenience that one party to the discussion is the government, the model does not necessarily eliminate the other two categories. The implications of this study can be applied to "non-state conflicts" and "unilateral violence," except for the part where policy effects by the ruling party affect the outcome of civil wars. Although wars between states tend to receive most of the attention, the death toll from civil wars is still high today. Civil wars occurred in 37 countries in 2011 and 32 countries in 2020.

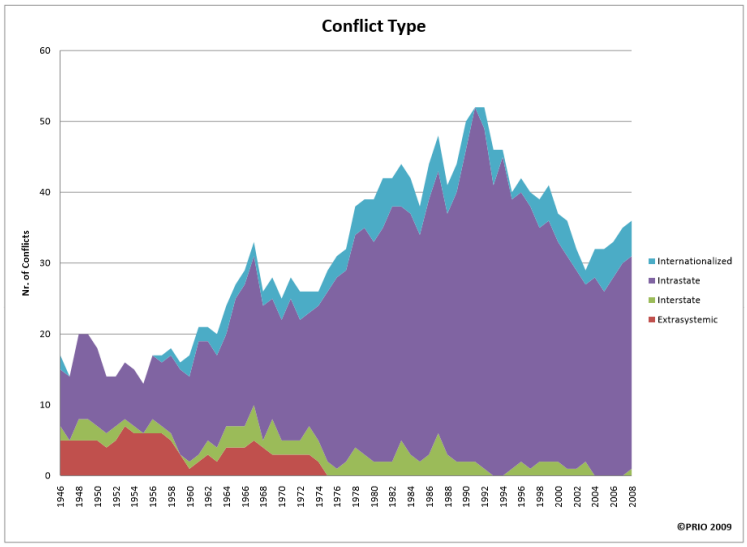

Figure 2.1. *Conflict type for civil wars*
***Source:** PRIO (2009). [Retrieved from].

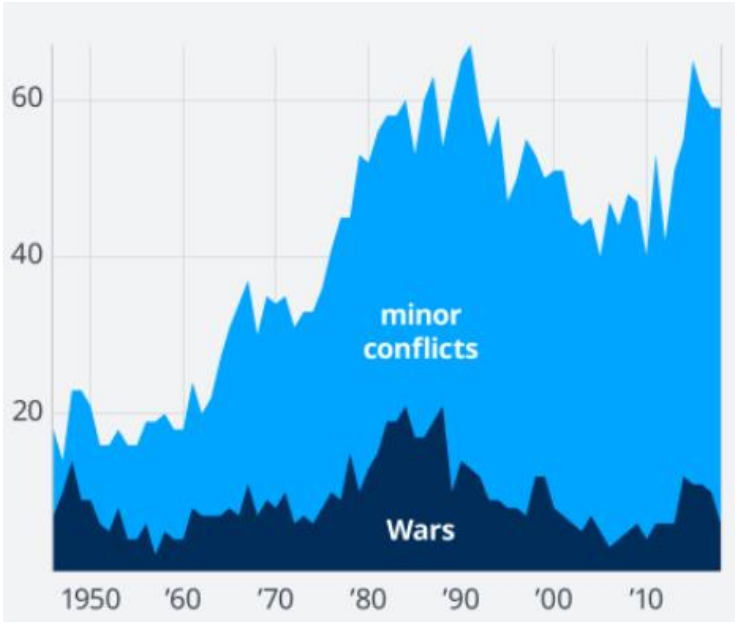

Figure 2.2. *Intensity for civil wars*
*** Source:** Uppsela Conflict Database 2019. [Retrieved from].

Figure 2-1 shows the chronological change in the type of civil war and the number of civil wars. extrastate and interstate have been decreasing since 1974, while intrastate has The number of countries with the largest number of such countries peaked immediately after the end of the Cold War and began to decline.

Figure 2-2 shows a time series of the number of wars and minor battles (Minor) in the world. The difference between the two is the number of casualties, both of which are the subject of this study. minors declined for about 10 years after the late 1990s, but have since increased. Increasing.

3.3. How can civil wars be reduced?

The introduction of democratic institutions that allow minority opinions to be reflected in policy through the political participation of citizens, without the means of civil war, and how policy changes and institutional design can be made possible through regime change is an important idea for reducing civil war.

On the other hand, since democratic systems make possible changes in values, such as responses to minority opinions, through the long-term realization of democratic education, a sufficient time is needed for democratic systems to function before their effects are manifested, and policy stability is necessary during that time. Another disadvantage of democratic systems is that the time it takes to make policy decisions is longer than that of tyranny. Furthermore, democratic institutions are easily associated with liberalizing economic policies, and when liberalizing economic policies are rejected as the domestic employment environment deteriorates, democratic institutions are also rejected and are difficult to maintain.

Economic growth requires capital accumulation. To accumulate domestic capital, institutions that favor domestic capitalists over workers tend to be introduced. Globalization is promoted to allow foreign capital to flow into the country, and as a result of competition with inexpensive foreign firms, domestic firms are eliminated and the labor market is lost, which can be detrimental to workers.

This study examines the mechanisms that give rise to civil wars and the mechanisms that prolong them. It introduces a model in which the more widely a civil war process gains a base of civilian support, the easier it is to win the civil war. Even if civil war does occur, it may be possible to achieve long-term peace by considering an environment in which post-civil war political forms can be relatively democratic.

The weaker the initial challenger's forces against the government, the longer the civil war lasts, and the more the challenger will need the cooperation of the population and other forces to win the civil war. Under these circumstances, a post-civil war coalition government can be expected, and the challenger cannot behave autocratically. Also, if the civil war process has enlisted the cooperation of democratic groups, it is more likely that post-civil war democratization will also be achieved.

While Aoki (2016) focused on the conditions for peace in civil wars, this study will also examine the impact of civil wars.

3.4. Current status of civil war

Figure 3 shows the number of deaths from civil wars since World War II in descending order of magnitude. The duration of the civil war, the name of the country, and the number of deaths are listed. Many of the civil wars were of short duration. Some last for as long as 10 years or more, while others last for a decade or more.

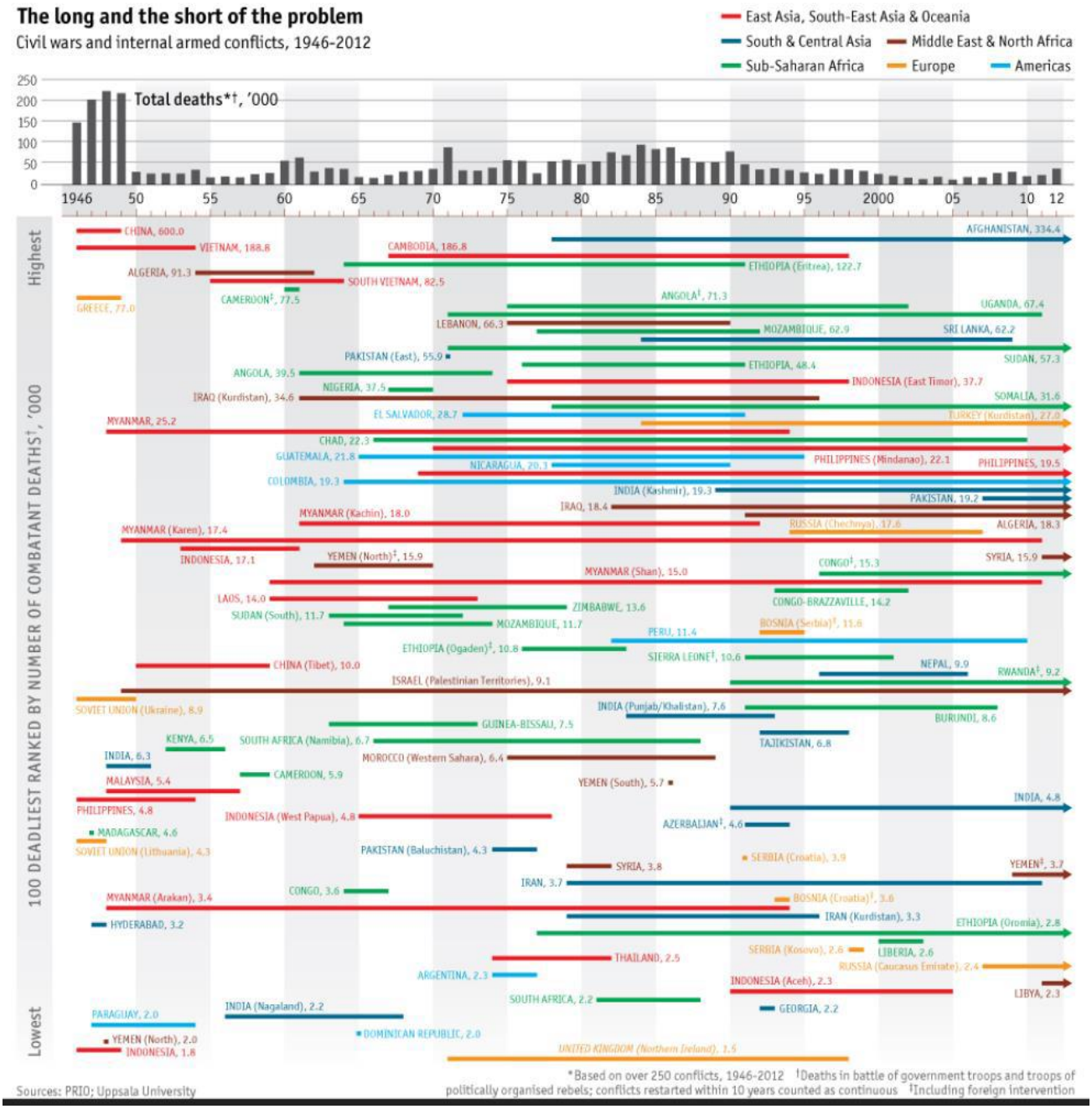

Figure 3. *Civil wars and Internal armed conflicts, 1946-2012*
*PRIO : Uppsala University(2013) [Retrieved from].

Collier & Hoeffler (2004) provide a theoretical econometric analysis of predictive models of civil war using data from 1960 to July 1999. Compared to civil war to gain rights, etc. (Grievance model), they found that the Opportunity model has more explanatory power. The explanatory variables are as follows.

Availability of financing: an increase in primary commodity exports considerably increases the risk of civil war. Diaspora also facilitates financing and increases the risk of resumption of civil war.

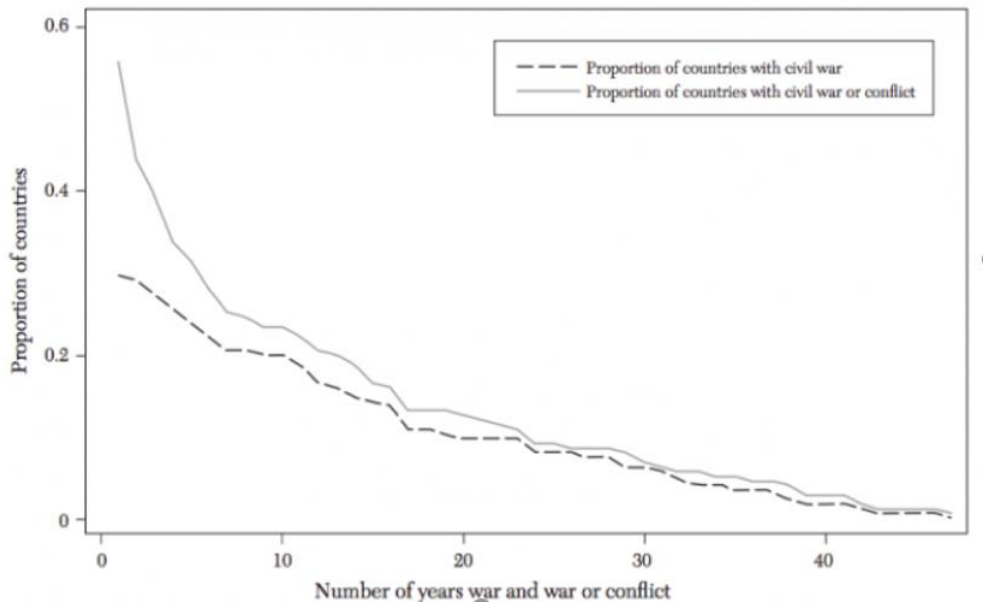

Figure 4. *Distribution of civil war or conflict wars across countries, 1960-2006*
Source: Blattman & Miguel (2006).

The opportunity cost of insurgency: opportunity cost measures such as male enrollment in secondary education, per capita income, and growth rate have conflict-reducing effects.

Military advantage: population dispersion provides insurgents with a military advantage and increases the risk of conflict.

Population size: population size increases the risk of conflict. Deterioration in living standards associated with population pressure leads to conflict.

Discontent (inequality, political rights, ethnic divisions, religious subdivisions, etc.): is not significant, but a single ethnic majority increases the risk of conflict.

Time: time since the last conflict was assumed to reduce new conflict risk.

Their results showed that conflict factors are primarily economic (including the acquisition of political power and resources) and not ethnic or religious conflict, inequality, or the acquisition of rights. The challenge of civil war was reasoned to be a rational individual assessment based on

cost-effectiveness, with an estimated probability of success. Twenty percent of states have experienced more than 10 years of civil war.

Julia Palik *et al.* (2020) in a report by the Peace Research Institution Oslo (hereafter PRIO) classified conflict into four categories: state-based conflict, non-state conflict, One-sided violence, and Battle deaths.

3.5. Civil war repeats itself

The results of this study also provide theoretical support for the merits of repeated challenges by challengers, regardless of the reasons for the civil war. Empirically, Gates *et al.* (2016) showed that civil wars are repeated.

The benefits of repeated civil wars include that through civil wars, the challenger brings in on his side a population that is sympathetic to his civil war objectives. The benefits of repeated civil wars have the potential to outweigh the costs associated with civil wars. The challenger can gain a base of support in areas that are sympathetic to his or her stated political ideology and expand his or her base of support. Expansion of the support base increases the likelihood of victory in the civil war.

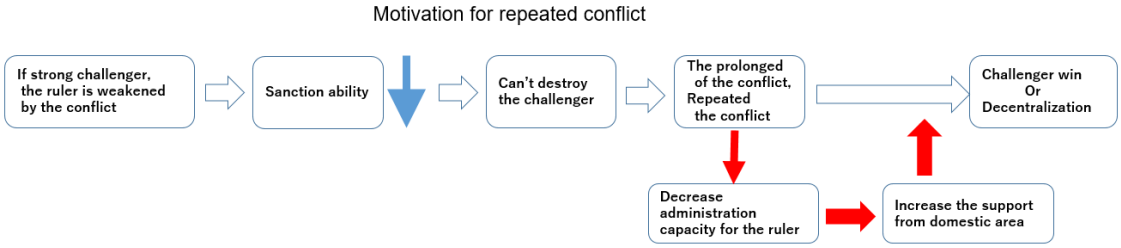

Figure 5. *Motivation for repeated conflict*

Second, the government's use of foreign loans to purchase weapons to end an armed conflict can induce hyperinflation that damages people's property rights and public goods and makes people distrust the government's ability to take charge of the government. This distrust of the government's ability to govern may not increase the number of allies of the challenger, but it will increase the number of regions and neutral organizations that do not support the government, thereby weakening the government and increasing the probability of victory in a civil war.

Third, by weakening the government, even if the challenger loses the civil war, it can reduce the percentage reduction in the support base upon defeat. Securing the support base after defeat will lead to an increase in the reserved gains of the civil war for the challenger. Compared to the case in which the challenger loses all of its support based upon defeat in a civil war, the challenger has less to lose through the civil war and is therefore motivated to repeat the civil war.

Fourth, by challenging the government to a civil war, it is perceived as an enemy to the government. Once perceived as an enemy, it is likely to be unable to set the stage for subsequent discussions.

When a challenger uses force as a form of protest, the challenger has likely given up, even temporarily, on the idea of opposing the policy through debate. Civil war may also result when the challenger loses an argument with the government about a policy that the challenger does not accept and the government forcefully implements that policy. In some cases, a compromise between the government and the challenger's arguments cannot be found.

For the above reasons, it is difficult for the government and the challenger to reengage in future discussions. Armed resistance represents a final, emergency measure of strong opposition, and a compromise is likely to be difficult to find. It is also likely that the challenger and the government will find it difficult to consider future joint policymaking as a group.

Fifth, through the deaths of allies in civil wars, civil wars will be repeated based on the idea that one cannot give up to reward one's allies for their deaths. If the challenger is too weak to prolong the civil war, it has no incentive to continue or carry it out.

The creation of a new government that includes not only the groups that contributed to the victory of the civil war but also those that did not contribute to it, is necessary to prevent civil war from occurring. It is also necessary for the new government to have institutions to coordinate the interests of various groups. Through coordinated institutions, it will be necessary to continue to provide public goods suited to diverse populations. The ability to build such institutions depends on the existence of shared institutional resilience among the public. The presence or absence of institutional resilience will be the turning point between the creation of a new government through civil war, resulting in a new institutional transition, or the realization of a stable system.

4. Model

An infinite period economic model starts with three groups, where the status quo is regulator R, potential adversary A and opportunity-driven B. Each group has state capacity. They are pledged to their political party to govern, and when necessary, they mobilize for civil war or public goods formation in response to the party's call.

Political power *s(t)*:

Let $S_{R(t)}, S_{A(t)}, S_{B(t)}$ be indices of the political power of the governing party R, party A, and party B in period t. Each of these relationships can defeat the governing party R if party A and party B stand together, but after R is overthrown, party A and party B will form a coalition government. Party B and Party A initially cannot overthrow the governing party R alone.

$$a + b > r > \max\{b, a\}$$

All state capacities are the sum of the regions where people belong to R, A, and B, and the rest of the urban $S_{u(t)}$ and rural $S_{r(t)}$.

$$S_{(t)} = S_{R(t)} + S_{A(t)} + S_{B(t)} + S_{r(t)} + S_{u(t)}$$

The second term can be represented by the following model

$$S_{B(t+1)} = S_{B(t)} + k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$$

In each period, each party R, A, and B has the option of peace or civil war.

Residents are divided into urban residents C and rural residents D. The utility of belonging to each party is determined after the choice of action by each party R, A, and B, and they decide which party they belong to. Residents C and D desire peace the most and hope for an early end to civil war as a preliminary step, but if civil war breaks out, they change their party affiliation according to their utility.

Public goods $S_{g_{(t)}}$:

The state capacity of the government is defined by $S_{g_{(t)}}$, which determines the total amount of public goods $G(t) = S_{g_{(t)}}$. $S_{g_{(t)}}$ is determined by the combined state capacity of all parties including the administration in period t. During periods of peace, each party can combine public goods with a fixed unit of labor to produce its consumption.

Introducing the price level $P_{(t)}$ and asset W into the utility function:

The utility function u is a function of each party's real public good value $\frac{S_{g_{(t)}}}{P_{(t)}}$ and real private good value $\frac{W}{P_{(t)}}$. Concerning the variable for the governing party, the government R, both public and private goods are real values, while the variables for the other parties are expected values.

$$u_{B(t)} = u\left(\frac{1}{P_{(t)}}(S_{g_{b(i)}}, W)\right), u_{R(t)} = u\left(\frac{1}{P_{(t)}}(S_{g_{r(i)}}, W)\right)$$

W is the nominal asset value of the people. The price level P is a function of the increase in the amount of additional foreign loans N due to arms procurement by the government, etc., divided by the central government revenue T. The price level increases as the number of foreign loans as a percentage of central government revenue increases. The expected inflation rate increases through residents' expectations of higher tax rates and higher money issuance.

Furthermore, as a stock indicator, GDP Y as a percentage of central government debt St is also included as a function of the price level and is an increasing function of the price level. Decreases in debt outstanding St and increases in GDP help stabilize the price level. An increase in the price level diminishes private property, W, and diminishes public goods, $S_{g_{b(i)}}$. A decrease in public goods implies job insecurity, property rights instability, and security. We consider that a decrease in public and private goods,

taking into account the price level, implies the ability of the government to take charge of the regime.

$$\mathrm{P} = \mathrm{P}\left(\frac{N}{T}, \frac{St}{Y}\right)$$

The utility of party B, $u^{g}_{B(t)}$, compares the utility of supporting the party in power, R, with that of supporting party B.

The utility function for the urban population is

$$u^{g}_{u(t)} = \beta[u_{B(t)} - u_{R(t)}]$$

The utility of the urban populace is the utility that would be obtained from each party minus the party in power, with the utility being greater for the largest party.

For the rural populace, the first term is a model based on Fehr and Schmidt's social preference model, and the second term is a hybrid of magnitudes from the utility reserved for the survival level. It reflects an ideology that abhors disparity and implies outcome egalitarianism. Outcome egalitarianism is more common among poor households and has historically taken root in rural areas. Rural areas are also predominantly rural and historically poor. These are regions that emphasize the equality of outcomes in conditions above the poverty level.

$$u^{g}_{r(t)} = \beta[u_{B(t)} - \varphi_{B}(u_{R(t)} - u_{B(t)}) + (u_{B(t)} - \underline{u_{B}})]$$

The differences in the utility functions of urban and rural populations reflect ideological differences. Urban residents, who emphasize the equality of opportunity, are closer to a capitalist mindset, while rural residents, who emphasize the equality of outcome, are closer to a socialist mindset. The $\underline{u_{B}}$ is the reservation utility at the margin of survival.

$$S_{u(t)} = S_{u(t)(}u^{g}_{u(t)}),\ \ S_{r(t)} = S_{r(t)(}u^{g}_{r(t)})$$

The state capacity of urban and rural residents is determined by their respective utility functions.

People move based on the above utility functions during civil wars.

Productivity β:

Beta represents the productivity of the economy. Each party can govern, and each political power has different public goods, but the same level of technology is required to produce the public goods. Each of the three parties wishes to be integrated into one political force; each of the three parties has a different preference for a particular public good, and when

one political force chooses a particular public good, the other political forces are disutilized.

Politics of the gridlock I_A, I_B:

I_A refers to the political disparity between R and A in charge of government and I_B refers to the political disparity between R and B in charge of the government. Once a political power has a government monopoly, it cannot share institutional formation or government charge with other political powers. The number of coalition governments is limited to two. Under a coalition government, they work with each other to implement policies within the framework of state capacity.

This political disparity coincides with the reduction in gains during the coalition. Even if they win the civil war, the greater the political disparity with their coalition partners, the more difficult it will be to manage policy. The greater the political disparity, the more the public good realized under the coalition is different from the public good he seeks. Therefore, the utility of a coalition government is smaller than that of a single government. Utility under a coalition government is a decreasing function of political disparity. In the case of a single government, $i = 0$.

Military Technology θ:

During a civil war, the side with greater (state capacity x military technology) wins the civil war. Military technology is $\theta(0<\theta<1)$, and the more advanced the technology, the closer θ is to 1. Winning the civil war depends on two factors: the size of state capacity and the level of military technology. During civil war, $S_{(t)}$ of state capacity corresponds to the size of mobilization and supply as an army, and thus represents the quantitative factor for civil war victory. Military technology θ is a qualitative factor for civil war victory. The party in power can also increase military technology through foreign loans. θ_r is an increasing function of N.

$$\theta_r = \theta_r(N)$$

Discount factor δ :

When civil war breaks out, production comes to a halt and a deadweight of the discount factor δ.

Blank zone State capacity expansion α:.

Civil war brings consolidation and expansion of state capacity to political parties. Political forces that are defeated by political power lose the loyalty of the people, state capacity, and instead receive loyalty from new people.

Through the support of different political forces, only a certain percentage α of the state capacity of the party that loses the civil war becomes the state capacity of the winner. Losing political power means that

state capacity cannot be maintained; the expansion of state capacity is $0 < \alpha < 1$.

Percentage of movement from existing parties to state capacity λ :

α was the percentage of migration to the own party from the vacancy, while λ was the percentage of migration to the own party from S_R,S_B and S_A already included in the party as state capacity (as random as α)

$$S_{B(t+1)} = S_{B(t)} + k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$$

After winning in cooperation in period t, the state capacity of $S_{(t+1)}$ as a result of integration is randomly distributed and extended with two political forces S_i and S_j with probability $S_i/(S_i + S_j)$ shares. In other words, a partner that is weak as a cooperative partner will remain small and weak in state capacity even after winning a civil war as a result of cooperation. After the first civil war, the winning side of the civil war becomes clear. Since they fight jointly with different parties, they will make compromises even after the civil war is won, and they are more likely to fail to realize their policies as their party claims than if they win the civil war as a single party. The discount variable *k(0<k<1)* for support assumes a coalition government in both urban and rural areas with compromised policies. λ Inclusion of λ allows us to take into account the spillover to other parties due to the failure of the governing party's policies. It also allows us to account for the transfer of state capacity from the governing party to B after a civil war.

4.1. Rule

At t=0, A decides whether to challenge R. A and B have private information so that R cannot be severely punished before A's challenge; B is opportunistic and always waits for A to move first; when R and A enter a civil war, B decides whether to work with A, R, or neutral; A's challenge is Through B's actions, all political power is revealed.

In the first case, the coalition of A and B challenges R to a civil war, and if A and B win, A and B decide whether to form a coalition government or clash; a civil war between A and B ensues, with the winner taking sole charge of the government.

In the second case, B initially takes neutrality and the winner of the civil war and B face off.

In the third, B acts in concert with R. Even if R is the winner, A's victory in the civil war results in A's administration of the regime, and the initial B status quo does not continue.

In the first coordination case above, stronger political forces lead the design of public goods. The weaker political power decides whether to accept it. If they do not accept it, they clash.

At the end of the civil war, the political power of the defeated side does not necessarily lose all state capacity.

The equilibrium concept in this game is Markov perfect equilibrium: $\beta > \max\{I_A, I_B, i\}$. This implies that the gap between regulators and the rest of

the ideologues is, to some extent, small. Assume that the regulators in each period have the ability to fully control the maximum state capacity and that no particular party is extraordinarily large. Ensure that peace results from equilibrium. Let j be the percentage of state capacity lost in the event of defeat. In contrast, let i be the percentage lost from winning the civil war but not being able to occupy a major party in the subsequent coalition government. Let j>i, assuming that the fraction lost from losing the civil war is greater than the fraction lost from not being a major party. This assumption seems reasonable. Also, if j is set to 1, B will disappear after defeat, which is consistent with the model in Aoki (2016) and is a generalized model. If state capacity S_r for rural residents and state capacity S_t for urban residents are set to 0, the model becomes that of Aoki (2016).

Aoki (2016) had the following strong assumptions, but this study loosened the following assumptions.

・If r>a, the regime manager and strongman R win the civil war with a probability 1.

・A will not fight R without partnering with B.

・If B partners with A, it will defeat R with probability 1.

・When B enters a civil war between A and R, the winner of the civil war gains all state capacity.

On the other hand, the following points are the same

・The size of the state capacity is the gain.

・B chooses between a) cooperating with A, b) cooperating with R, and c) neutrality.

The flow assumed when B decides on its strategy is as follows. The decisions of residents and policy makers are taken into account, which in this study are taken into account during B's decision making based on B's forecasts. In other words, there is no turn of local residents or policy makers.

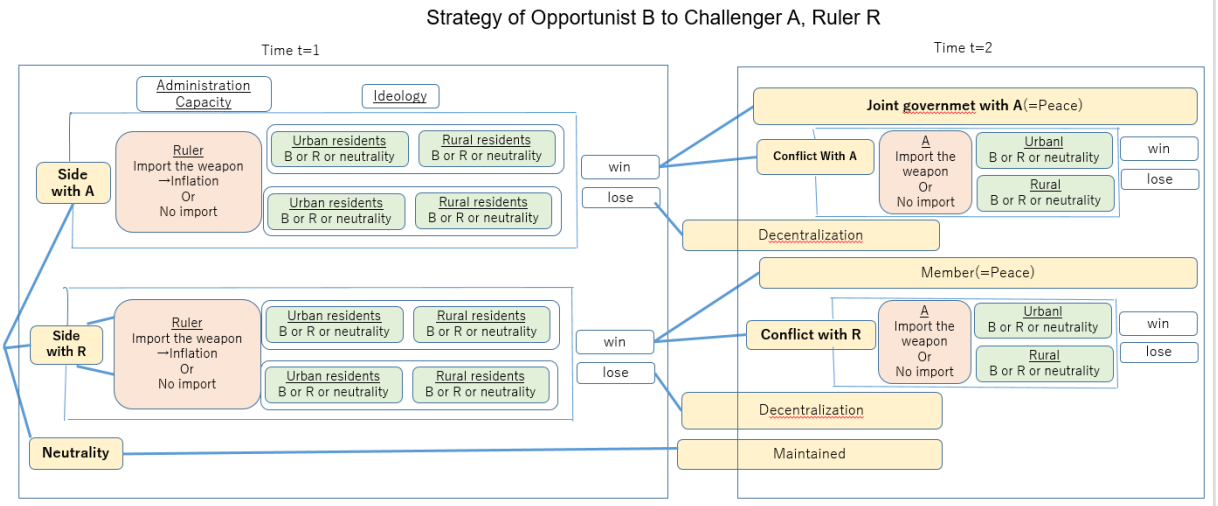

Figure 6. *Strategy of Oppotunist B to Challenger A, Ruler R*

4.2. First round

4.2.1. B cooperates with A:

1.a.1) B decides to work with A and the adversary, R, decides whether to import arms above revenue.

1.a.2) Based on the magnitude of the proximity indices α_u and α_r of political ideology when aligned with A and R's decision in 1.a.1), the price level is determined and the utility of the population is determined. Based on the magnitude of S_u and S_r, the state capacity based on the utility of urban and rural residents, the state capacity of B changes during the civil war.

1.a.3) The sum of the state capacity of A and B, taking into account military technology θ, exceeds the state capacity of R. The allied forces of A and B win the civil war when

When B's state capacity does not exceed R's state capacity, it loses the civil war. In the case of defeat, state capacity decreases as a percentage of μ. μ is smaller the larger B's state capacity is after the change in the state capacity of the population due to 1.a.2). It is the percentage loss of state capacity at the time of defeat. The larger the state capacity before the defeat of the war, the more state capacity is maintained. The stronger the support base is, the smaller the percentage of state capacity lost due to defeat, meaning that support can be retained.

At the time of defeat $S_{B(t+2)} = (1 - j(\mu))S_{B(t+1)}$

4.2.2. B cooperates with R:

1.b.1) As in 1.a.1), B decides to work with R, and R on its side decides whether to import arms above revenue.

1.b.2) Based on the magnitude of the proximity indices α_u and α_r of political ideology when allying with R and R's decision in 1.a.1), the price level is determined and the utility of the population is determined. Based on the magnitude of S_u and S_r, the state capacity based on the utility of urban and rural residents, the state capacity of B changes during the civil war.

1.b.3) The sum of the state capacity of R and B, taking into account military technology θ, exceeds the state capacity of A.

The allied forces of R and B win the civil war when

At the time of victory: .$S_{B(t+2)} = \left(1 - I_{B(t)}\right)\beta[S_{B(t)} + \alpha_u S_{u(t)} + \alpha_r S_{u(t)}$

When the player does not surpass challenger A, he loses the game.

At the time of defeat $S_{B(t+2)} = (1 - j(\mu))S_{B(t+1)}$

4.2.3. Neutrality

1.c.1) $S_{B(t+2)} = (1 - I_{B(t)})\beta[(r + a)S_{B(t)} + \alpha_u S_{u(t)} + \alpha_r S_{u(t)})]$

When B does not cooperate with either R or A, but acts as a third party, it obtains the above utility.

The above r and a are $\frac{\theta_R r}{\theta_A a + \theta_R r}$と$\frac{\theta_R a}{\theta_A a + \theta_R r}$The state capacity, which takes military power into account, indicates the probability of victory.

4.3. Second round

4.3.1. A and B are paired:.

B's turn: If A and B win in 1.a.3) above, A and B assume coalition government.

They choose whether to d) fight a civil war or e) continue the coalition.

4.3.2 A and B become a civil war:

2.d.1) A's turn: after B decides to go to war with A, A, the enemy, decides whether to import arms above its revenue.

2.d.2) Residents: Based on the magnitude of the proximity indices α_u and α_r of political ideology in the case of civil war with A and A's decision in 2.d.1), the price level is determined and residents' utility is determined. Based on the magnitude of S_u and S_r, the state capacity based on the utility of urban and rural residents, B's state capacity fluctuates during the civil war.

2.d.3) Result: B wins the civil war when B's state capacity, taking into account military technology θ, exceeds A's state capacity.

On victory: $\delta\beta S_{B(t+3)}=\delta\beta \ \{S_{B(t+2)} + \alpha_u S_{u(t+2)} + \alpha_r S_{u(t+2)}$

If A is not exceeded, the civil war is lost.

On defeated: $\delta\beta S_{B(t+3)} = (1 - j(\mu))\delta\beta S_{B(t+2)}$

e) A and B remain in coalition

2.e.1) When in coalition, the utility of 1.a.3) is obtained.

$$\delta\beta S_{B(t+3)}=(1\text{-i})\beta \ \{S_{B(t+2)} + \alpha_u S_{u(t+2)} + \alpha_r S_{u(t+2)}$$

i means the loss incurred by a coalition government compared to a stand-alone government.

4.3.3. B and R form a coalition:

3. B's turn: If B wins in 1.b.3) above, R and B do not carry a coalition government. They will be treated like any other majority force that followed the original government. The choice is to either d) fight a civil war or e) continue the coalition.

4.3.4. R and B will have a civil war:

3.d.1) R's turn: after B decides to go to war with R, the enemy R decides whether to import arms above revenue.

3.d.2) Residents: Based on the magnitude of the proximity indices α_u and α_r of political ideology in the case of civil war with R and A's decision in 3.d.1), the price level is determined and residents' utility is determined. Based on the magnitude of S_u and S_r, the state capacity based on the utility of urban and rural residents, B's state capacity fluctuates during the civil war.

3.d.3) Result: B wins the civil war when B's state capacity, taking into account military technology θ, exceeds R's state capacity.

On victory: $\delta\beta S_{B(t+3)}=\delta\beta\ \{S_{B(t+2)}+\alpha_u S_{u(t+2)}+\alpha_r S_{u(t+2)}$

If A is not exceeded, the civil war is lost.

On defeat: $\delta\beta S_{B(t+3)}=(1-j(\mu))\delta\beta S_{B(t+2)}$

e) Continue the coalition.

Even if they teamed up with R and defeated A in a civil war, B could not be a member of the coalition, as it was before the civil war.

4.4. Analysis

The model of this study holds the following.

$$S_{(t)}=S_{R(t)}+S_{A(t)}+S_{B(t)}+S_{r(t)}+S_{u(t)}$$

$$S_{B(t+1)}=S_{B(t)}+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{B(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$

4.4.1. A Cooperation with B for a first term

1) Peace (A and coalition government) for a second term.

In the first term, B chooses to work with A and fights a civil war with R. Assume further that the coalition of B and A defeats R. After the victory, B and A form a coalition government, and in the second term, B can choose to fight a civil war with A or not. Consider B's gain if B does not go to war in the second term and maintains a coalition government with A. The second term is peaceful and the state at B's victory in the first term capacity is B's gain at the end of the second term.

If B's state capacity is greater than A's, then as the major party in a coalition government of B and A, B's gain is greater than when B is smaller than A. In parentheses, p means peace and c means civil war. Alphabets in the upper right of the gain V are groups that are aligned with B. Underbars mean groups with greater state capacity.

$S_{B(t+1)}>S_{A(t+1)}$:

$$V_B^{\underline{AB}}(p)=\delta\beta S_{B(t+1)} \quad (1.1)$$

To $S_{B(t+1)}$, the state capacity in the second period, we add productivity β and the deadweight δ of productivity in B. The deadweight δ is a discount factor for state capacity due to the civil war in the first period.

$S_{B(t+1)}<S_{A(t+1)}$:

$$V_B^{\underline{AB}}(p)=(1\text{-}i)\delta\beta S_{B(t+1)} \quad (1.2)$$

If A, which forms a coalition force, is larger than B, it fights a civil war with A as a coalition force in the first term, and the second term is peaceful. state capacity at the time of B's victory in the first term is B's gain at the end of the second term. In (1-1), B was the main party in the coalition government, but in (1-2), B is not the main party in the coalition

government, so it cannot form a unique public good. Therefore, B's gain is smaller than in (1-1) by a factor of (1-i).

2) The second term was a civil war (civil war with A)

B Victory

$S_{B(t+2)}>S_{A(t+2)}$:

$$V_B^{\underline{AB}}(c)=\delta^2\beta\{S_{B(t+2)}\}=\delta^2\beta\{S_{B(t+1)}+k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\})\} \quad (1.3)$$

In the first term, B works with A and wins against R. In the second term, B is at war with A. As a result, B wins against A. B has the opportunity to expand its state capacity by gaining urban and rural support in the first term and to shift its support base away from the governing party R. Since both the first and second terms are civil wars, a deadweight delta occurs in both terms, which is a discount factor for state capacity.

B Defeat

$S_{B(t+2)}<S_{A(t+2)}$:

$$V_B^{\underline{BA}}(c)=(1-j)\delta^2\beta\{S_{B(t+2)}\}=(1-j)\delta^2\beta\{S_{B(t+1)}+k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\})\} \quad (1.4)$$

In (1-3), the second term is also a civil war and A wins, but in (1-4), A is defeated in the second term. In the case of defeat, the state capacity of the ratio *(1-j)* disappears compared to (1-3). The model in this paper assumes that the group's power continues to exist after the civil war defeat, although it is weakened by a proportion of j.

3) Defeated in the first term (A and B allies defeated)

$S_{B(t)}+S_{A(t)}<S_{R(t)}$:

$$V_B^{\underline{AB}}(c)=(1\text{-j})\delta\beta S_{B(t+1)} \quad (1.5)$$

In cases (1-1) through (1-4), the A-B coalition forces work with A in the first period and win against R. In case (1-5), the A-B coalition forces lose against R. In case (1-6), the A-B coalition forces win against R. In case (1-7), the A-B coalition forces lose against R. In case (1-8), the A-B coalition forces lose against R. Compared to the case of (1-1), where they win the civil war, they lose state capacity by a ratio of *(1-j)*. As in (1-4), the loss of the civil war weakens the forces but the group survives, but the game ends after one period.

4.4.2. R Cooperation with B for a first term

1) Peace (R and coalition government) in a second term.

$S_{B(t+1)}<S_{R(t+1)}$:

$$V_B^{\underline{RB}}(p)=(1\text{-i})\delta\beta S_{B(t+1)} \quad (1.6)$$

1 in one's second term $S_{B(t+1)} > S_{R(t+1)}$No assumption is made that the

In this case, B and R are allied with R, the governing party, in the first term, and the coalition of R and B engages in a civil war with A. The coalition wins the war by choosing civil war in the first term and winning through a change in state capacity, which determines the gain at the end of the first term.

Since the governing party R has added B to the coalition forces as the government, we do not assume that B has a greater state capacity than R through the civil war. Also, B wins in the first term, but its state capacity is reduced by the ratio (1-i) because B cannot form its public goods.

2) The second term was a civil war (R and civil war).

B Victory

$S_{B(t+2)} S_{R(t+2)}$:

$$V_B^{\underline{RB}}(c)=\delta^2\beta\{S_{B(t+2)}\}=\delta^2\beta\{S_{B(t+1)}+k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\})\} \quad (1.7)$$

In the first period, B works with R to defeat A. In the second period, B chooses a civil war with R. As a result of the civil war with R, B wins; because of the two civil wars, the discount factor δ decreases state capacity twice; through two civil wars, B has the opportunity to expand state capacity twice.

B Defeat

$S_{B(t+2)} < S_{R(t+2)}$:

$$V_B^{\underline{BR}}(c) = (1-j)\delta^2\beta\{S_{B(t+2)}\}=(1-j)\delta^2\beta\{S_{B(t+1)}+k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\})\} \quad (1.8)$$

In the first period, B works with R to defeat A. In the second period, B chooses to fight a civil war with R. As a result of the civil war with R, B is defeated. As a result of the defeat, state capacity is reduced by *(1-j)*.

3) Defeated in the first term (R-B coalition forces defeated)

$S_{B(t+1)} + S_{R(t+1)} < S_{A(t+1)}$:

$$V_B^{\underline{RB}}(c) =(1\text{-}j)\delta\beta S_{B(t+1)} =(1\text{-}j)\delta\beta\,[S_{B(t)}+k(\alpha_{u(t)}S_{u(t)}+\alpha_{r(t)}S_{r(t)})+\lambda\,(\,S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\})] \quad (1.9)$$

In case (1-9), B works with R and the allied forces fight a civil war with A, but the allied forces are defeated in the first period. By losing the civil war, state capacity is reduced by the ratio *(1-j)*, and the game ends.

4.4.3 Neutrality

$$V_B^{R} =(1\text{-}i)\beta\;\;[(r+a)S_{B(t)}+k(\alpha_{u(t)}S_{u(t)}+\alpha_{r(t)}S_{r(t)})+\lambda\;\;(\;\;S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)}))] \quad (1.10)$$

This is the case where B does not work with either R or A. Even if R defeats A, or even if R is defeated, B is not involved in the civil war. As a fishing expedition, there is an opportunity for state capacity to expand, moving from R's support base and urban/rural support base to B. Also, regardless of who wins, a coalition of state capacity between R and A will be formed, and through the coalition, more state capacity will be expanded.

4.5. Strategies that take into account the win rate

In the previous section, we showed the gain of each strategy for B. In this section, we obtain the expected gain for each of the cases in which B works with A, works with R, and is neutral. The probability of winning the civil war is created from each party's military technology θ and the standardized state capacity, r, a, b. The gains for each strategy are presented in the previous section.

4.5.1. R and cooperation: s2 (equilibrium point s where peace gains = civil war gains)

The gain V_B^{RB} when B works with R can be considered in three patterns.

The first case is the case (2-1) that does not consider the second period of civil war: victory in the first period and subsequent peace and defeat in the first period; the case in which peace is best achieved in conjunction with R; the second case (2-2) that does not consider the second period of civil war: victory in the first period of civil war and subsequent peace and defeat in the first period; the case in which peace is best achieved in conjunction with R.

This is the sum of the case in which the R and B allied forces fight A in the first period and the allied forces are defeated, and the case in which the R and B allied forces defeat A in the first period and peace is achieved thereafter.

In the former case, the allied forces are defeated by A in the first term of the civil war, and in the latter case, the allied forces are defeated by A in the first term. It is the sum of the expected gain multiplied by $V_B^{RB}(c)$ in (1-9) and the probability that the allied forces of R and B are defeated $\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}$, and multiplied by $V_B^{RB}(p)$ in (1-6) and the Probability of Allied Victory $\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$.

The second case is (2-2), which considers all cases of both defeat in the first term and civil war and peace in the second term. Both cases of peace in the second term and civil war in the second term are shown in (2-1).

The probability that R and B are in a civil war and B wins $\frac{\theta_b b}{\theta_r r+\theta_b b}$ and B's gain in that case

(1-8) indicates a confident conclusion $V_B^{RB}(c)$ and the probability that B loses by deriving the expected gain from 1-$\frac{\theta_b b}{\theta_r r+\theta_b b}$ and B's gain in that $V_B^{BR}(c)$ in (1-9). When a civil war occurs in the second term, it means that

the coalition forces win in the first term, so the probability of a coalition victory $\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ to all expected gains in the second period.

The third case (2-3) does not assume peace in the second period and considers only civil war. It does not include the gain $V_B^{\overline{RB}}(p)$ in the case of peace in (2-2) above.

B can be divided from the above three cases by backward induction into three patterns: a case in which the first-period option is determined assuming only peace in the second period, a case in which the first-period option is determined assuming civil war in the second period, and a case in which the first period is determined assuming both peace and civil war in the second period, leaving both as options Decide among them based on expected gains.

If s(t) = (s2,1] (when B's s can get large and large gain) 1st round loss and 1st round win peace

$$V_B^{RB}=\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}V_B^{\overline{RB}}(c)+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}V_B^{\overline{RB}}(p) \quad (2.1)$$

If s(t) =(s1,s2], 1st round loss and 1st round win peace and 2nd round win and löse

$$V_B^{RB} = \frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}V_B^{\overline{RB}}(c)+ \frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[V_B^{\overline{RB}}(p) + \{ \frac{\theta_b b}{\theta_r r+\theta_b b}V_B^{\overline{RB}}(c) +(1-\frac{\theta_b b}{\theta_r r+\theta_b b})V_B^{\overline{BR}}(c)\}] \quad (2.2)$$

If otherwise,

$$V_B^{RB}=\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}V_B^{\overline{RB}}(c)+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\{\frac{\theta_b b}{\theta_r r+\theta_b b}V_B^{\overline{RB}}(c)+(1-\frac{\theta_b b}{\theta_r r+\theta_b b})V_B^{\overline{BR}}(c)\} \quad (2.3)$$

4.5.2. A and cooperation: s1 (equilibrium point s where peace gains = civil war gains)

The gain $V_B^{\overline{AB}}$ when B works with A can be considered in three patterns.

The first case (2-4) does not consider the second period of civil war: gain from victory in the first period of civil war and subsequent peace, and gain from defeat in the first period. probability of defeat in the first period $\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}$ and the expected gain from the gain $V_B^{\overline{AB}}(c)$ at that time. Also, in the first period, the allied forces of A and B win probability of doing $\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ and, after winning, the gain when B's state capacity is greater than A $V_B^{\overline{AB}}(p)$and gain when A is large$V_B^{\overline{AB}}(p)$ The expected gain is derived from the sum of A and B. B does not know whether B is greater than A after the first period of civil war when working with A.

The second case (2-5) considers the case where the country loses the civil war in the first term and the case where the country wins the first term and maintains peace in the second term or becomes a civil war. When peace is maintained in the second term, the expected gain is the sum of the expected gains when A is large and when B is large; when the second term is a civil

war, the expected gain is the sum of the expected gains when B wins and when B loses.

The third case (2-6) assumes that A loses the civil war in the first period and that B wins or loses the civil war with A in the second period.

If s(t) =(s1,1] , 1st round negative + 1st round win peace (coalition strong and weak, respectively)

$$V_B^{AB}=\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[V_B^{\underline{AB}}(p)+V_B^{\underline{AB}}(p)] \quad (2.4)$$

If s(t) = (s2,s1], 1st round negative + 1st round win peace (coalition strong and weak respectively) and 1st round win (strong x (win/weak) and weak x (win/weak))

$$V_B^{AB}=\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}V_B^{\underline{AB}}(p+\frac{\theta_a a}{\theta_a a+\theta_b b}V_B^{\underline{AB}}(p)]+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}V_B^{\underline{AB}}(c)+(1-\frac{\theta_b b}{\theta_a a+\theta_b b})V_B^{\underline{BA}}(c)] \quad (2.5)$$

if otherwise, 1st round lose and 1st round win and 2nd round battle

$$V_B^{AB}=\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}V_B^{\underline{AB}}(c)+(1-\frac{\theta_b b}{\theta_a a+\theta_b b})V_B^{\underline{BA}}(c)] \quad (2.6)$$

4.5.3 Neutral:

For the neutral case (2-7), the gain is V_B^R, which is consistent with (1-10), since there is no need to consider the probabilities related to winning or losing the civil war.

$$V_B^R=(1-i)\delta\beta S_{B(t+1)}=(1-i)\delta\beta[(\theta_r r+\theta_a a)S_{B(t)}+k(\alpha_{u(t)}S_{u(t)}+\alpha_{r(t)}S_{r(t)}) +\lambda(S_{(t)}-S_{B(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)}))] \quad (2.7)$$

4.6 Partial game equilibrium

Lemma1

- if $S_{(t)}$ =(s1,100],
  1. if (2-4) ≥ (2-1), then B is paired with A. In other words, we have the following.

$$\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[V_B^{\underline{AB}}(p)+V_B^{\underline{AB}}(p)] \geq \frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{RB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}V_B^{\underline{RB}}(p)$$

2. Otherwise, B is paired with R.

- $S_{(t)}$ =[s2,s1],

As $S_{(t)}$ increases, there exists i^* such that (2-5) ≥ (2-2). That is, as follows.

$$\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}\mathrm{V}_{\mathrm{B}}^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(p)+\frac{\theta_a a}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{AB}}(p)+\frac{\theta_b b}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(p)\{\frac{\theta_b b}{\theta_a a}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(c)+(1-\frac{\theta_b b}{\theta_a a})\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(c)\}+\frac{\theta_a a}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(p)\{\frac{\theta_b b}{\theta_a a}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(c)+(1-\frac{\theta_b b}{\theta_a a})\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(c)\}] \geq \frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}\mathrm{V}_{\mathrm{B}}^{\underline{RB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\mathrm{V}_{\mathrm{B}}^{\underline{RB}}(p)+\{\frac{\theta_b b}{\theta_r r}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{RB}}}(c)+(1-\frac{\theta_b b}{\theta_r r})\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BR}}}(c)\}]$$

1. If $1-\delta < i^*$, then B is paired with R.
2. Otherwise, B is paired with A.

Lemma2

If $S_{(t)}$ ≤s1, then

Regardless of whether B sides with R or not, a civil war ensues; since A is weaker than R, B chooses to partner with A instead of R. In other words, the alliance with A dominates the alliance with R. In other words, B chooses to partner with A or remain neutral. This means that (2-5) ≥ (2-1), (2-5) ≥ (2-2) will be realized regardless of whether (2-2) ≥ (2-1) or (2-1) ≥ (2-2).

If (2-7) ≥ (2-5), that is, if the following equality holds, then the neutral dominates the partnership with A.

$$\delta\beta S_{B(t+1)}=(1-i)\delta\beta[(\theta_r r+\theta_a a)S_{B(t)}+k(\alpha_{u(t)}S_{u(t)}+\alpha_{r(t)}S_{r(t)})+\lambda(S_{(t)}-S_{B(t)})] \geq \frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}\mathrm{V}_{\mathrm{B}}^{\underline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(p)+\frac{\theta_a a}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{AB}}(p)+\frac{\theta_b b}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(p)\{\frac{\theta_b b}{\theta_a a}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(c)+(1-\frac{\theta_b b}{\theta_a a})\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(c)\}+\frac{\theta_a a}{\theta_a a+\theta_b b}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(p)\{\frac{\theta_b b}{\theta_a a}\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{AB}}}(c)+(1-\frac{\theta_b b}{\theta_a a})\mathrm{V}_{\mathrm{B}}^{\underline{\mathrm{BA}}}(c)\}]$$

When (2-7) ≥ (2-5) above holds, we define s3=min{s3*,s1}.

4.7. The results of equilibrium

A fights R if it can work with B. Even after that victory, peace if $S_{(t)} > s1$, (s3,s1], choose civil war if [0,s3]. Given a partial equilibrium game in which A and B bring about peace

If (1-6) ≥ (1-1), then A does not fight R.

$S_P^*(i)$ under the condition that (1-6) ≥ (1-1) inequality holds, then $S_P(i)$= max$\{s1, S_P^*(i)\}$. S_P (i)=1 when the inequality does not hold. (1-6) ≥ (1-1), then $S_P^*(i)$ is a decreasing function of i.

$\hat{\imath}$(s(t))=i^*(s(t)) is between (s1,s2] if (s2,1]. $\hat{\imath}$(s(t)) between ($S_{(t)}$,1], status quo is maintained because B is likely to work with R, status quo bounds are drawn

Proposition1

If $S_{(t)}$=(s1,1], then the value is between、

1. If i ≥ $\hat{\imath}$(s(t)), then status quo is maintained
2. If i < $\hat{\imath}$(s(t))

(a) $(S_P(i), 1]$ The status quo is maintained if $S_{(t)}$ is between。

(b) $)(s1, S_P(i)]$ If $S_{(t)}$ between B and A are at peace after war with B and R in coordination with A

Given the equilibrium outcome of the partial game in which A and B are in a civil war, A does not fight R if (2-2) ≥ (2-4).

$$S_C^* \text{ if } (2-2) \geq (2-4).$$

In other words, it is the following.

$$\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r} V_B^{\overline{RB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[V_B^{\overline{RB}}(p)+\{\frac{\theta_b b}{\theta_r r} V_B^{\overline{RB}}(c)+(1-\frac{\theta_b b}{\theta_r r})V_B^{\overline{BR}}(c)\}] \geq \frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r} V_B^{\overline{AB}}(c)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b} V_B^{\overline{AB}}(p)+\frac{\theta_a a}{\theta_a a+\theta_b b} V_B^{\overline{AB}}(p)]$$

Proposition2

if $S_{(t)}$ is between (0,s1], there exists the following S_C

1. If *(2-7) ≥ (2-5), then*

   And if (2-2) ≥ (2-4) then S_C=min$\{S_C^*, s1\}$

   And $if\ (2-2) \leq (2-4)$ then $S_C = S_1$

(a) The status quo is maintained when $S_{(t)}$ in [0,s3]∪$(S_C, S_1]$.

(b) $S_{(t)}$ in$(S_3, S_C]$, then B and R in conjunction with A fight a civil war, and A and B also then fight a civil war.

2. if *(2-7) <(2-5)*

   And if (2-2) >(2-4) then S_c=min$\{S_c^*, S_3\}$

   And if (2-2) ≤ (2-4), then S_c=S_3

(a) The status quo is maintained when S_t between $(S_c, S_1]$.

(b) $S_{(t)}$ between $[0, S_c)$, then B and R in conjunction with A fight civil war, and A and B fight civil war.

Figure shows the results when (2-7) ≥ (2-5).

The figure shows when $S_{(t)}$ is between $(0, S_1]$. When it is between $(0, S_3]$, the status quo is maintained.

$(S_3, S_1]$ When it is between two civil wars, it is between two civil wars.

$(S_1, 1]$ between $\hat{\imath}(s(t))$, showing a gradual increase in the figure when the status quo is unchanged.

5. Policy change analysis

This paper focuses on civil war as a watershed of institutional change and examines it from three perspectives.

The first confirms that the increase in the amount of foreign loans N in line with the availability of loans of the regime group R weakens the support base of the regime group R through hyperinflation, resulting in the loss of R's ability to take charge of the regime; as R weakens, the outflow from R's support base to A and B affects the win or loss of civil war Not only will R's support base move to B, but also from the fourth force, urban and rural, which has not made its support for R, A, and B clear. In addition to the civil war in the first term, consider whether to adopt the A, R, or neutral option in the first term, taking into account the execution of the civil war in the second term; a victory in a civil war against a coalition partner in

the second term would provide greater gains than a coalition government. In addition to the amount of foreign loans as a flow, we treat debt outstanding as a stock and the price level as three economic variables that contribute to hyperinflation.

The simulation is based on a status capacity ratio of R:A:B: urban-rural = 3.5:2.5:1.5:3.5.

The second factor that causes variation in state capacity is the ideological proximity of urban residents to each party and the ideological proximity of rural residents to each party. As in the first case, we assume that the inflow ratio increases due to ideological proximity only in the first term, but not in the second term. In the case of a civil war in the second term, the assumption is that the closer the ideology is to that of the coalition partner, the greater the inflow will be.

The third is the percentage of blank spaces. When the governing party continues the civil war, it not only opposes the party with military power, but also necessarily the residents of the immediate area who participate in the civil war, as well as the fourth force of urban and rural residents who are domestic residents but whom the governing party has yet to support as the immediate area of the governing party, the percentage of areas is given. The larger the percentage of the total urban-rural area in the country, the greater the opportunity for the party challenging the civil war to expand its support base through civil war.

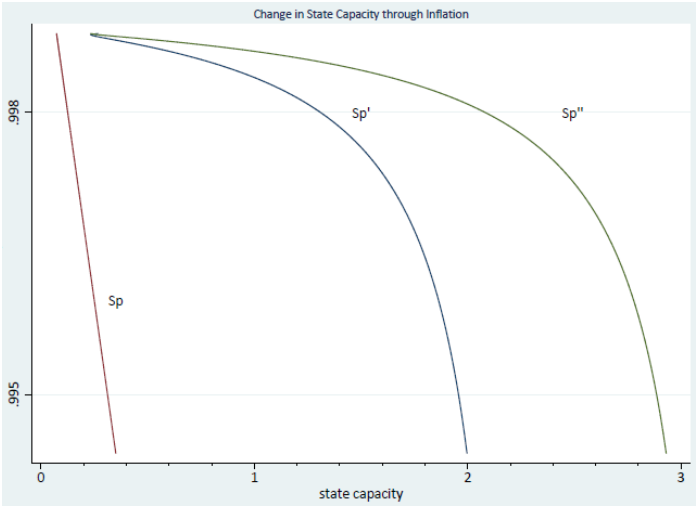

Figure 7. *Change in state capacity through inflation*

Figure 7 shows that the equilibrium S_p of the state capacity subgame in B expands as P rises; S_p' is the equilibrium S_p at a 0.1% rise in P, starting at the top left-most S_p' and increasing by 0.1%, and at the bottom is the equilibrium value at a 10% rise in P. S_p The upper left of S_p'' is the equilibrium point when P rises by 0.1%, increasing by 0.2%, and the lower right is the equilibrium value when P rises by 20%.

Inflation reduces the ability of the government to take charge and broadens B's base of support from urban and rural areas of the country.

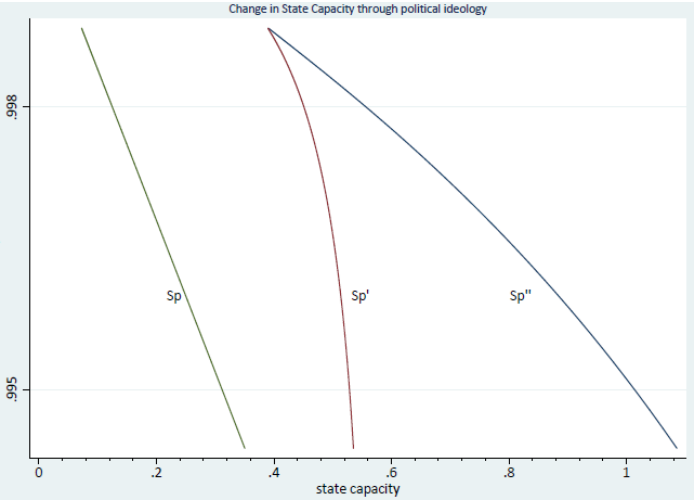

Figure 8. *Change in state capacity through Political ideology*

Figure 8 shows that the equilibrium S_p of the state capacity subgame in B expands as P rises; S_p' is the equilibrium S_p at a 0.1% rise in P, starting at the top left-most S_p' and increasing by 0.1%, and at the bottom is the equilibrium value at a 10% rise in P. S_p The upper left of S_p'' is the equilibrium point when P rises by 0.1%, increasing by 0.2%, and the lower right is the equilibrium value when P rises by 20%.

Inflation reduces the ability of the government to take charge and broadens B's base of support from urban and rural areas of the country.

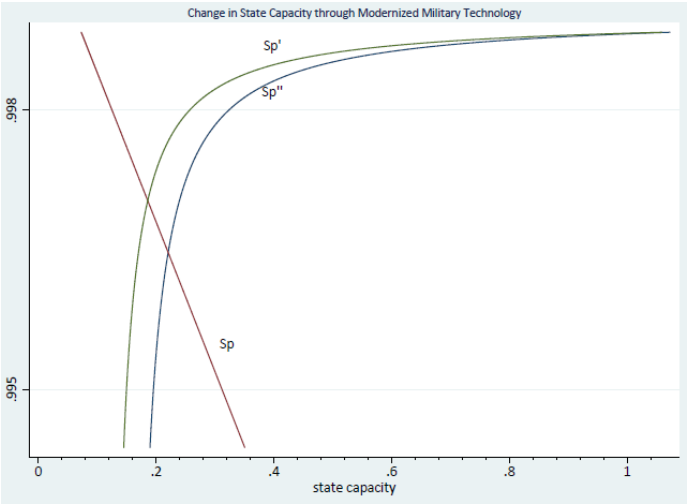

Figure 9. *Change in state capacity through Military Technology*

Figure 9 shows the change in state capacity with increasing military technology in B. S_p'' is the case with a change of 0.1% each, and S_p'' is the case with a change of 0.2% each.

It is confirmed that the higher the level of military technology, the more likely it is to win the civil war, but the gain does not increase as much when the possibility of defeat is taken into account. In the model in which state capacity is considered as a gain and military technology is exogenous to state capacity, the increase in military technology is not a direct factor that

increases state capacity, as is the case with the price level and political ideology described above.

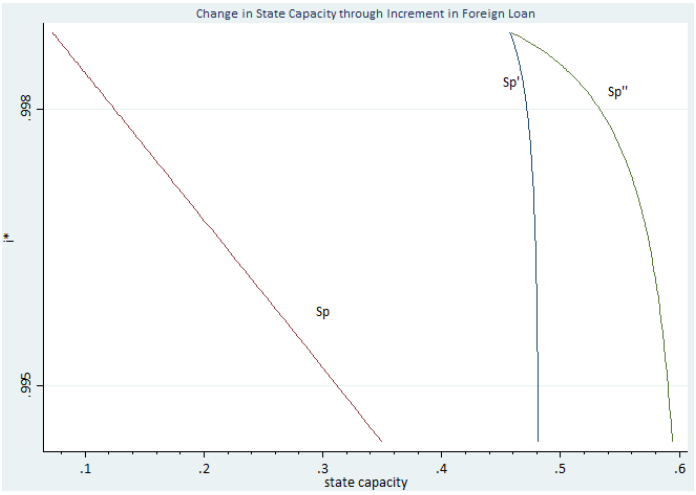

Figure 10. *Change in state capacity through Investment in Foreign Loan*

Figure 10 shows the change in state capacity with an increase in external loans; S_p'' represents the case where the change is 1% each, and S_p'' represents the case where the change is 5% each.

It is confirmed that state capacity increases with an increase in foreign loans. Although the increase in foreign loans is both a cause of hyperinflation and an increase in the military technology of the party in power, the model in this study results in an increase in B's state capacity. It is confirmed that state capacity shifts from rural and urban residents and R to B, expanding B's power base.

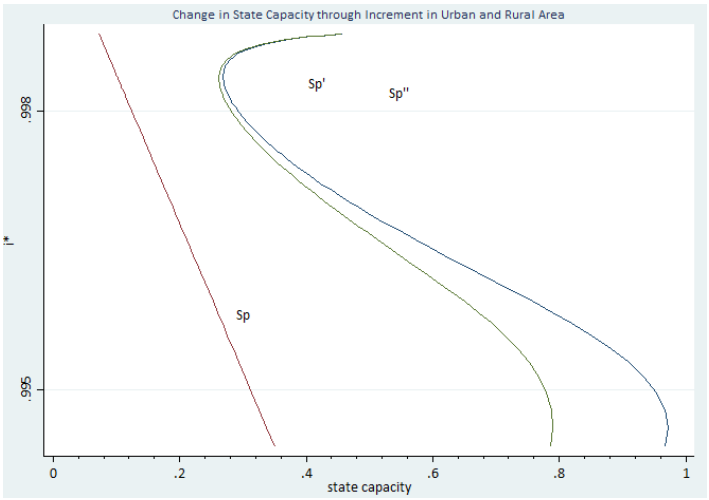

Figure 11. *Change in state capacity through Increment in Urban and Rural Area*

Figure 11 shows the change in B's state capacity when both urban and rural initial state capacity percentages increase by 0.15% each and the initial state capacity percentages of A, B, and R decrease by 0.1% each. and that

they can expand their power based on the migration of their support base from urban and rural areas.

5.1. Tactical space during the civil war

Finite Repeated Games

In this section, we examine theoretically why repeated civil wars occur. During the duration of a civil war, governments can change their policies, such as importing weapons or changing monetary policy. Suppose that the gains of A and coordination, R and coordination, and neutrality in the strategic space can be divided by the number of civil wars. In this section, we confirm that the optimal response is to repeatedly challenge the challenger to a civil war until the challenger wins. compare (1-7) and (1-8) in which B and R fight a civil war after linking with R. B's gain (1-7) when the civil war is won in the second period is as follows.

$V_B^{\underline{RB}}(c)=\delta^2\beta\{S_{B(t+2)}\}$and the gain (1-8) in case of defeat is as follows

$V_B^{\underline{BR}}(c)=(1-j)\delta^2\beta\{S_{B(t+2)}\}$

Suppose that the civil war is not limited to one time and that B challenges N times. Suppose then that the gain of (1-8) is obtained for each of N. Let ϑ be the discount rate at that time.

$$V_B^{\underline{BR}}(c)=\frac{1}{N_1}(1\text{-}j)\,\delta^2\beta\{S_{B(t+2)}\}+\frac{1}{N_2}(1\text{-}j)\vartheta\delta^2\beta\{S_{B(t+2)}\}+\cdots+\frac{1}{N_{N-1}}\vartheta^{N-1}(1-j)\delta^2\beta\{S_{B(t+2)}\}+1/N_N(1-j)\vartheta^N\delta^2\beta\{S_{B(t+2)}\}(N_1=N_2=\cdots=N_{N-1}=N_N=N)$$

$$=\frac{1}{N}(1-j)[\delta^2\beta\{S_{B(t+2)}\}](1+\vartheta+\cdots+\vartheta^{N-1}+\vartheta^N)$$

$$j=1-\frac{V_B^{\underline{BR}}(c)N}{[\delta^2\beta\{S_{B(t+2)}\}](1+\vartheta+\cdots+\vartheta^{N-1}+\vartheta^N)}$$

$$\frac{\partial j}{\partial N}<0$$

The larger N, the larger the denominator, and thus ∂j/∂N becomes smaller and more negative.

In other words, as the number of civil wars increases, the percentage of state capacity lost when B is defeated decreases. As a result, the challenger has motivation to repeat the civil war.

Even if the challenger's S is small in the early stages of the civil war, he will have an incentive to challenge if the ratio λ supported by the population is high.

Realistically, too, even if the challenger suffers a temporary military defeat in addition to an increase in the number of chances by repeating the civil war, along with the decrease in state capacity associated with the defeat, depending on the relationship between the urban and rural areas of state capacity and the gains from the governing party, the military defeat may not lead to a serious state It does not lead to a decrease in capacity.

Since j is not endogenized in this section, it is not modeled that a temporary defeat of the governing party further reduces j. However, the

closer j is to 0, the closer it is to the gain from a civil war victory, since the challenger loses less disadvantage from repeated civil wars It can be assumed that civil wars will be repeated and civil wars will not end.

5.2. Power relations between challengers and opportunists

It was confirmed that after the first civil war, any disparity in power relations or ideological differences would lead to a second civil war, bringing about a weakening of the new government's support base. If $S_A < S_B$ immediately after the first civil war, a coalition government is more likely, and under certain conditions (S_B is much larger), the opportunist B will challenge the civil war and try to form a single government by B, resulting in two civil wars and political instability.

The vertical axis is the political disparity between A, the challenger, and myself, the opportunist B. The higher the value, the greater the disparity. The horizontal axis means the size of state capacity, the more to the right, the greater.

The right side of S_1 means S collaborates with A and maintains peace after the collaboration.

The right side of S_2 means S collaborates with R and maintains peace after the collaboration.

The right side of S_3 means S which is neutral. The figure is divided into groups.

The figure is divided into two groups: upper and lower cases of high political disparity and low political disparity. Divide the left and right into three groups according to the size of state capacity. Of the group with high political disparity, the group with a small S is considered extremist. Extremists have political disparities that are large enough to be uncoordinated with other groups. They are also unable to coordinate with other groups and the forces they support, which are generally small. For this reason, even if a coalition government is achieved through a civil war, a second civil war will occur if the group is extremist. In other words, extremist groups on the left are more likely to experience a second civil war. The group in the center, which has large political differences but not large enough state capacity, is small, and its political differences make it difficult to cooperate with other groups, but it has sufficient state capacity to challenge and win a second civil war. The second civil war will not be attempted because the country does not have the resources to fight a second civil war. The group to the right of the group with the greatest political disparity will fight a second civil war because it has greater political disparity and its state capacity is greater, and it expects to win a second civil war. The group with the largest political disparity has an incentive to go it alone because of the difficulty of managing the government if it continues to be a coalition government. The goal is to increase gains by achieving civil war.

Assume that when a single government is formed, it is likely to be centralized. Assume that when political disparities are large, it is easier to

run an authoritarian government to facilitate policy management. This will be discussed in the case analysis.

Groups with low political disparity can also be grouped into three groups: the group with the smallest state capacity is less likely to win a civil war and therefore will not attempt a second civil war; the group with the largest state capacity is more likely to win a second civil war if its state capacity is greater than its state capacity; and the group with the smallest state capacity is more likely to win a second civil war if its state capacity is greater than its state capacity. If they challenge the civil war and win, they will change to a single government, and policy management will be smoother. If the coalition is weak, it tends to remain in power and become peaceful. If the militant group is weak, the rational choice of the militant group is usually not to challenge civil war and become peaceful, because the political disparities are large and political instability is high. However, if the militants' military power is large, it is a rational choice for the militants to challenge a second civil war. If the political disparity is small and state capacity is low, it can be assumed that the central government will not challenge a civil war and that the central government is likely to devolve power to a coalition government or even to local governments, resulting in a federal system. If the power of the central government is weak and the power of its collaborators and allies is relatively strong, it is reasonable for each group to have a form of self-government within its sphere of influence. A central government coalition among ethnic minorities or religious groups is likely to be a compromise and less effective in its policies. Given such disadvantages, allowing local autonomy for ethnic minorities and different religious groups can make operations easier by narrowing the scope and authority of the central government's policy-making responsibilities and by reducing the scope of central government policy-making. Of the groups with lower political disparities, the central group, whose political disparities are small and whose state capacity is not large enough, would not challenge a second civil war even if they could expect to win a second civil war, due to the size of the gains from continued coalition government The advantage of challenging a second civil war. The group does not challenge the civil war because of the difference between the small public good of its group from the realization of the coalition government, i.e., the benefits it can gain from a single government through victory in the civil war due to its small gains, is not greater than the risks from the decrease in productivity and possible defeat in the civil war.

The left side of the figure means that the opportunist's initial S is small and the challenger A's S is large relative to the opportunist's initial S. The right side of the figure means that the opportunist's initial S is large relative to the challenger's S. Because of the relative weakness of the opportunist's S, it will not engage in a subsequent civil war with R or A, with whom it has partnered after its initial civil war victory. This means that the coalition will remain in power and peace will persist.

5.2.1. Decrease in utility during the coalition government

Let i be the reduction in gains during the coalition government. Even if the coalition wins the civil war, the greater the political gap with its coalition partner, the more difficult it will be to manage policy, and the public goods realized under the coalition will differ from the public goods sought. Therefore, the utility of a coalition government is smaller than that of a stand-alone government. Utility during coalition government is a decreasing function of political disparity. In the case of a single government, $i = 0$.

5.3. Extremists

Extremists are often armed and militarily strong. They are also generally perceived as groups with radical ideologies, and therefore often lack the support of the local population. In our model, the militants have strong military power, but it is difficult for them to gain the support of the local population. In our model, we assume that the cases in which the political gap between challengers and opportunists is large are extremist groups. The political gap between challenger A and opportunist B is *I*. *I* is the political gap between challenger A and opportunist B. The political gap between the challenger A and opportunist B is the political gap between challenger A and opportunist B.

Extremists can be defined as having a small initial S and a large political gap *I* with the challenger. He can be assumed to be located in the upper left of the table.

The political disparity *I* includes not only the ideological disparity but also the possibility of substantial cooperation or coordination with the challenger. We assume that there is a large political disparity between the challenger and the extremist.

Up to a certain level of *I*, S increases as *I* increases, but above a certain threshold, S_p becomes very small. This means that extremists with political disparities above a certain level will not see an increase in *S*. S_p is closest to and to the left of S_3, implying a neutral choice. If he is an extremist, this means he chooses neutrality and does not work with the challenger or the government. If he is an extremist, this means he chooses neutrality, meaning he does not align with the challenger or the government, or he aligns with the challenger and fights a civil war and loses, or he wins a civil war but fights a second civil war and loses as a result. Thus, the final *S* is small.

The weaker the challenger is in the early stages of the civil war, the more likely it is to become a coalition government after the civil war, and the more likely peace will be sustained. However, if the challenger is an extremist group, the extremist group will not cooperate with other groups, so peace will not be sustained after the civil war is won and a new civil war is likely to occur with other groups that should cooperate under a coalition government.

5.4. Federalism and centralization

In our model, a centralized system is likely to be selected when the challenger creates a government alone after two civil wars, or when a militant challenger who does not have the support of the population but has strong military power creates a government alone. On the other hand, we believe that a federal system is more likely to be introduced if a greater proportion of cooperation with the challenger by opportunists in the early stages of the civil war is provided by the challenger. If the challenger fights a civil war among opportunists, we assume that the challenger is more likely to choose a centralized system as a result. If the challenger in the early stages of the civil war has a low support base S and high I (including low λ and low α), the coalition is more likely to continue. Institutional factors leading to centralization and extremists have low support base S and high I in common. On the other hand, the difference between extremist and centrist elements is the strength of military power. When the challenger's ideology is very close to egalitarianism, the ideology of the rural population, the challenger is more likely to be oriented toward a centralized system. This orientation toward a centralized system was seen in Japan and China, where the disparity in domestic inequality was growing and foreign pressure was strong. We believe that groups oriented toward an egalitarian communist state, where the ability to mobilize resources is important, are more likely to have centralized and undemocratic institutions. Our model can explain whether the government will be a coalition or a single government after a civil war, but it cannot indicate whether it will have a centralized or federal system or a democratic system. We discuss this from the case study analysis below.

6. Theoretical interpretation of China and Japan

The analysis in the previous section shows the conditions under which each decision remains stable. In this section, we interpret the theoretical results of the previous section by making the case of China and Japan for institutional transitions. We consider two types of economies, taking into account the differences between China and Meiji Japan. Assume that in both, peace is maintained with the status quo and that the total capacity of the government is weak compared to two opposing political forces, A and B, with large political differences between one (against Shanghai and China, or t Choshu and the Shogunate). Also assume that immediately before the institutional transition, there was a conversion that finally distinguished the two countries, China and Japan, institutionally. Issues related to state sovereignty hit China and Japan in the 19th century, and the impact on these two countries was very large; Aoki (2017) discusses three. (1) the awakening of both countries to the sudden arrival of much more advanced technology (Western technology), technology spearheaded by gunships from the West; (2) the lack of governing ability to defend against foreign powers, both countries were unable to protect their sovereignty

from foreign aggression; (3) political differences between governing regimes and their potential political opposition, potential regime Political differences between adversaries diminished (the differences between Satsuma's kōbugyō and Chōshū's overthrow of the shogunate to eliminate the barbarians disappeared, and before China's Xinhai Revolution, differences in thinking between Sun Yat-sen and others were not emphasized as the Qing dynasty weakened, and the overthrow of the Qing dynasty took priority over the policy differences between challengers).

$$\beta \text{ if } s(t) < s,\ \beta^n \text{ if } s(t) > s$$

In other words, peace at t>t* and productivity gains only if s(t)>s. Peace at t, civil war at t+1, productivity gains after civil war if $s(t)+\alpha(1-s(t))>s$. Further civil war at t+2, productivity gains after civil war if $s+\alpha(2-\alpha)(1-s)>s$. Two periods later. Two further thresholds were set: after the first period of civil war, the expanded state capacity will further increase productivity by s^1

2 periods of civil war, followed by s^1 of state capacity to increase productivity

$$s^1=(s-\alpha)/(1-\alpha),\ s^2=s-\alpha(2-(s-\alpha))/(1-\alpha)^2,\ s^2<s^1$$

In Figure 13, s^1, s^2 s is shown by the blue line. s_1 falls between $s^2$and s^1. If A and B defeat R and the war becomes civil war again, s_1 shifts right to S_1^N from subsequent productivity. Without productivity shocks, under the status quo, economy C is just to the right of s_1. s_p is the threshold at which A challenges R, which works with B and then becomes peaceful. In the range $[s^1, s]$, s_p shifts to S_p^N.

One civil war will bring the economy to exceed the threshold s. Thus, subsequent peace is profitable. However, one civil war is not enough to bring the economy above the threshold. In other words, when assuming peace between A and B, the gains from civil war do not increase.

For $s(t) > s^1$, s_p is constant because productivity does not change before or after the civil war. Economy J changes from status quo to civil war as a result of a productivity shock.

Compared to economy C, economy J is at peace because the political differences between A and B are smaller and the coalition government continues after the first civil war.

Figure 4 shows another mechanism by which productivity shocks move economies. The difference in Figure 4 is that economy C remains to the left of s_1 but between s_c and s_1.

In such an economy, either A understands the disadvantages of challenging R, or A expects it to be a continuous civil war against B, or A wants B to remain neutral and A decides not to challenge R. For $\underline{s^2} < s^1 < s_c$, productivity shocks benefit from two civil wars. With $s^3(b < (1-\alpha)(1-b))$ and s_c^* shifting to the right, the economy C is sent from the

status quo to two civil wars. In economy J, where the political difference between A and B is smaller, it falls to a larger state capacity between s_1 and s. For the same reasons as in Figure 3, s_p shifts right to S_p^N and moves to economy J with one civil war.

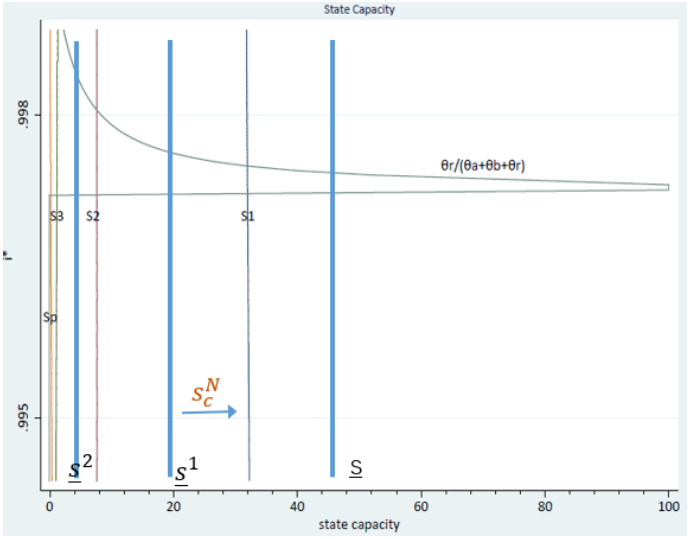

Figure 12. *Change in state capacity*

7. Empirical analysis

In this section, based on the theoretical analysis and simulation results in the previous section, we conduct an empirical analysis using actual data. It will be shown that hyperinflation and ideology are factors that cause civil wars and that the number of civil wars and other factors are factors that contribute to the success of civil wars. The former will be shown through survival analysis and the latter through regression analysis. The degree of democratization of the mechanism for determining the head of state will be included as a variable indicating the impact of ideology on civil war. Data are from POLITY5 [Retrieved from] and the Gini coefficient is WDI.

Table1. *Statistical Description*

	N	mean	Sd	min	Max
scoup1	5416	0.03	0.19	0	2
dcpi	5416	3.04	74.87	-1479.9	4464.1
atcoup2	5416	0.04	0.22	0	5
jini	1694	38.6	9.43	20.2	65.8
xr	5416	7.02	2.75	0	10
xrreg	5416	2.46	0.67	0	3
xropen	5416	2.94	1.53	0	4
xrcomp	5416	1.62	1.05	0	3
resignex	5416	0.01	0.09	0	1

Table 1 shows the descriptive statistics for the variables treated in this section.

The variable scoup1 is a dummy variable that is 1 if the civil war succeeds within the year and 0 if it fails, dcpi is the rate of change in the consumer price index, atcoup2 is the number of civil wars, xr is the xrreg is the regulation of chief executive recruitment xropen stands for openness of executive recruitment, whether hereditary, mandated, or elected, and xrcomp for the number of years in office. competitiveness of executive recruitment. Created by the number of people in power and the number of candidates through elections or by-elections, the resignex is 1 if the cause of the civil war calls for democracy and 0 otherwise. The combined variable xr is the sum of the three variables xrreg, xropen, and xrcomp.

7.1. Model for empirical analysis

The empirical analysis will determine the relationship between the variables addressed in the theoretical model of this study and the occurrence of civil war and the success of civil war. By considering both the impact on the probability of success of civil war and the impact on the probability of occurrence of civil war, we will examine the causes of civil war and the factors that contribute to its outcome. The fact that the challenger of the civil war addressed in this section aims for civil war success through civil war and that the success and occurrence factors are the same suggests that the challenger anticipates success at the start of the civil war, i.e., that the challenger is acting strategically. The following is the model for the empirical analysis addressed in this section.

$$y=\alpha+\beta 1\gamma+\beta 2\delta+\varepsilon$$

y is a variable indicating the occurrence of civil war or the success of civil war.

γ is the variable used in this theoretical study, indicating the Gini coefficient, the number of civil wars, and price increases. This section explains the expected sign of the variable indicating the success of civil war as the dependent variable. We expect the Gini coefficient to be positive because we assume that the greater the inequality within a country, the more the local population expresses support for the challenger during a civil war, increasing the challenger's probability of success in the civil war. The sign is expected to be positive because the greater the number of civil wars, the greater the probability of success of the civil war. Expect the sign to be positive because higher price increases are assumed to increase the probability of a successful civil war challenger.

Similarly to the above, we expect the sign to be positive for the Gini coefficient, positive for the number of civil wars, and positive for price increases when analyzing the probability of civil war. The larger the Gini coefficient, the more the challenger expects to expand its base of support from the local population, creating an incentive to carry out civil war. We also believe that the greater the degree of inequality, the more social unrest will be fostered to carry out civil war. This is also true for price increases;

we believe that hyperinflation reduces the value of residents' assets and salaries, and fosters social unrest, which increases the likelihood of a successful civil war as well as the probability of its occurrence. We consider that the increase in the number of civil wars not only increases the probabilistic probability of success through repetition but also increases the probability of occurrence through changes in circumstances, such as an increase in the support base of the governing party due to its lack of ability to take charge of the government.

δ was a variable related to politics that affects the occurrence and outcome of civil wars.

7.2. Empirical results

Table 2 shows the results of a survival analysis conducted to explore the causes of the outbreak of civil war. For the survival analysis, we add the change in the consumer price index (dcpi), the number of civil wars (atcoup2), and a variable related to the appointment of the head of state (xr). As a factor for the success of civil wars, we can confirm that an increase in the number of civil war challenges increases the probability of winning a civil war, since both equations (1) and (2) are positive and significant. Since the consumer price index is positive and significant, inflation increases the probability of success, which confirms the results of this study. Inflation weakens the ability of the governing party to govern and succeed through the weakening of the governing party's support base and the strengthening of the challenger's support base. It is confirmed that the greater the restrictions on the appointment of the head of state and the lower the degree of openness, the greater the probability of success in a civil war.

Table 2. *The results of Survival-Analysis*

	(1)	(2)
dcpi	-0.249***	-0.256***
	(0.0185)	(0.0188)
atcoup2	1.722***	1.655***
	(0.243)	(0.264)
Xr		-0.0158***
		(0.00353)
Jini		1.008
		(0.01970)
Constant	-6.511***	-6.569***
	(0.311)	(0.328)
N	2,624	1,690

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

While the above section on survival analysis was conducted to ascertain the factors that led to civil war, Table 3 shows the results of panel analysis to ascertain whether the dependent variable is the success of civil war or

not. Variables that are relevant to the theoretical model of this study and that affect success in the analysis in this section may have been strategically selected by the challenger from the theoretical model of this study.

The dependent variable is the number of civil wars (atcoup2), the explanatory variables are the change in the consumer price index (dcpi), consumer price index x civil movement (dcpi x res), variables related to the appointment of the head of state (xrreg, xropen, xrcomp), and whether the civil war was triggered by a civil movement (resignex) is added.

Table 3. *The results of Regression*

Each conflicts: Regress Success for Conflicts

	(1)	(2)	(3)	(4)	(5)	(6)
atcoup2	0.0779***	0.101***	0.0780***	0.100***	0.0786***	0.106***
	(0.0147)	(0.0146)	(0.0148)	(0.0146)	(0.0152)	(0.0151)
cpi	-0.000176***	-0.000207***	-0.000173***	-0.000204***	-0.000146***	-0.000201***
	(4.71e-05)	(4.19e-05)	(4.70e-05)	(4.19e-05)	(4.64e-05)	(4.09e-05)
cpi*res	0.000633	0.000790*			0.000338	0.000296
	(0.000437)	(0.000437)			(0.000611)	(0.000616)
xrreg					0.0506***	0.0184***
					(0.00832)	(0.00463)
xropen					-0.0183***	-0.0146***
					(0.00470)	(0.00318)
xrcomp					-0.0328***	-0.00424
					(0.0101)	(0.00557)
resignex			0.00901	0.0269	-0.0879*	-0.0606
			(0.0309)	(0.0309)	(0.0452)	(0.0454)
Constant	0.0339***	0.0349***	0.0339***	0.0348***	0.0367***	0.0466***
	(0.00398)	(0.00384)	(0.00399)	(0.00385)	(0.00865)	(0.00606)
Observations	3,072	3,072	3,072	3,072	3,023	3,023
R-squared	0.015		0.014		0.038	
Hausman		43.06***		43.07***		71.35***
Panel	FE	RE	FE	RE	FE	RE
Num. of obs.	69	69	69	69	69	69

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

As a success factor for civil war, we can confirm that an increase in the number of civil war challenges increases the probability of civil war victory, since both equations (1) and (2) are positive and significant. Since the consumer price index is positive and significant, inflation increases the probability of success, which confirms the results of this study. Inflation weakens the ability of the governing party to govern and succeed through weakening the base of support for the governing party and strengthening the base of support for the challenger. The greater the restrictions on the appointment of the head of state, the lower the degree of openness, and the greater the probability of success in a civil war. These variables are often used throughout previous studies as variables that indicate factors in the

occurrence of civil wars, but they are also used as factors in the success of civil wars. The civic movement variable did not yield significant results.

Through the analysis in this section, the results of the theoretical analysis were confirmed to be correct through the empirical analysis, as it was confirmed that inflation and the number of civil wars not only lead to the occurrence of civil wars, but also to their success. The results of the empirical analysis could affect the causes and consequences of civil wars regardless of region or time period, as they were confirmed through panel analysis using data from around the world since World War II.

8. Case study: Japan and China: Factors reducing regulators' abiality to manage

8.1. Hyperinflation in Japan at the end of the Edo Period

Through the Japan-U.S. Treaty of Amity and Commerce of 1858, the monetary exchange ratio between the two countries and the free export of gold and silver (Mikami, 2011) were decided. Japan insisted to the U.S. on an exchange ratio of one U.S. dollar silver piece for one Japanese silver tithe, but the U.S. insisted on three silver tithes for one U.S. dollar silver piece. As a result, the U.S. side's claim was adopted. However, the increase in the price difference between domestic and foreign currencies (the exchange ratio was 100:311) resulted in a very large outflow of gold (said to be as much as 100,000 ryo) during the six-month months from 1859 to 1860. The disruption caused by the massive gold outflow led to Harris's proposal to match the gold price with the international price. exchange). The value of silver coins fell from one-fourth to one-twelfth of their gold counterparts, and the increase in the volume of money in circulation due to the issuance of new coins also contributed to the decline in the value of money, leading to higher prices. This led to a decline in the value of the market. In addition, the shortage of goods due to exports ("Edo Kaisensho Ordinance" issued by the shogunate) and the outflow of currency due to increased imports for the modernization of the clan's military equipment also contributed to hyperinflation.

The price of rice in Osaka increased approximately 11-fold between 1858 and 1866 (Kitou, 2010). Real wages were 65.7 from 1850 to 1859 and 47.9 from 1861 to 1868 for construction workers in Kyoto, taking real wages from 1801 to 1804 as 100. Hyperinflation benefited large employers who hired wage laborers, resulting in economic growth, but it also made life extremely difficult for the lower class of urban residents and peasants who performed wage labor, widening the economic gap. Society became unstable.

8.2. The Xinghai Revolution in China

In addition to reparations for the Opium War, European and Japanese intervention in and suppression of the Qing civil war (the Yihe Dan Rebellion) led to the Qing's expansion into China, costing the Qing 450

million ryos in reparations. However, the government was running a deficit every year with expenditures of 270 million ryos (Doi, 2014). Several military factories and state-owned enterprises were also created through the Western Affairs Movement. Even though tariffs were the main source of funding, the defeat in the Sino-Japanese War made it difficult for existing government-owned enterprises to survive. Subsequently, the handling of foreign loans for railroad construction became a challenge. The number of banks was 115 in 1910, as a result of the need to create a financial market centered on banks in Shanghai. The relationship between domestic banks, foreign banks, and the railroads was also important, and by 1910, short-term loans from foreign banks to Shanghai banks had reached 20 million carats. However, in 1910 Shanghai experienced a financial crisis, and after the Xinhai Revolution, the number of banks plummeted to 28.

Heavy rains in 1909-1910 caused severe food shortages in the south of Qing due to flooding, and the food shortage led to a financial crisis that caused many banks to fail. Rent and rice prices also rose dramatically, resulting in inflation.

8.3. The conflict between the Chinese Nationalist Party and the Chinese Communist Party in China

In China, the authority to issue money was also held by the provinces, but in 1935 the government of Chiang Kai-shek of the Republic of China issued fiat money based on state credit to replace the silver yen under the silver standard, and only banknotes issued by the issuing bank were allowed to circulate, while banknotes issued by other banks were collected after a specified period. As a currency reform, it was a progressive monetary reform in that it was fiat money issued by the central bank. It is said that the issuance of legal tender was effective in unifying China's domestic currency, concentrating the authority to issue currency in the government, and attributing domestic silver and other coins to the government to maintain wartime system finances during the Sino-Japanese War, but there was much confusion in the provinces because silver circulation was suspended and the process of monetary credit was lengthy, so legal tender It was believed that the issuance forced the government to collect the wealth of the private sector.

Prior to the outbreak of the Sino-Japanese War in 1937, the total amount of money (legal tender) issued amounted to 1,444 million yuan, and during the war period from 1937 to 1941, the Nationalist government borrowed 10 million pounds and 50 million dollars from the United Kingdom and the United States to maintain the credit of the legal tender, but the value continued to decline and in 1940 the government decided to withdraw the legal tender. A limit was set on the amount that could be exchanged for foreign currency, and this triggered a sharp decline in the value of the Hohonin. During the Sino-Japanese War, large amounts of banknotes were issued to supplement the ever-increasing fiscal expenditure, and by the end

of the war in 1945, the outstanding amount of banknotes was 556.9 billion yuan, 400 times the prewar amount. In just three years, the amount had increased 1,000-fold, resulting in hyperinflation. In August 1948, the government issued gold yuan notes. However, the value of the gold yuan note dropped to one-fifth within three months, and credit for the gold yuan note continued to plummet, leading to its suspension. However, with the advance of the Chinese Communist Party, the silver-yen note also lost credibility, and with the declaration of the founding of the People's Republic of China in October 1949, the silver-yen note was withdrawn from circulation and the currency was unified into the renminbi, the currency of the People's Republic of China.

8.4. Change in the support base

8.4.1. China: Xinhai Revolution

In the late Qing Dynasty, trade between the Qing and European countries was triggered by the British presence in China. Opium flowed into China through trade, so opium was banned in 1796. However, opium continued to flow into China, and the Qing, fearing the further spread of opium, appointed Lin Zexu as minister plenipotentiary to confiscate and burn opium. War broke out between the Qing and the British, who were angered, and the Qing fought two wars against the British and French after 1840 (the Opium Wars), but were defeated.

The Western Affairs Movement, which aimed to fuse Chinese culture and institutions with Western technology, was promoted by Li Hongzhang, a Qing general who helped pacify a civil war (the Taiping Tianyuan Rebellion). The defeat of the North Sea Fleet in the Sino-Japanese War and the defeat in the Sino-Japanese War led to its failure, and furthermore, the Hen Pao Jiqiang movement led by Kang Youwei and the suppression by Empress Dowager Cixi (Boshin Rebellion) led many revolutionaries to believe that change from within was impossible and to seek the overthrow of the Qing dynasty. Flooding caused severe food shortages, and food shortages led to a financial crisis that bankrupted many banks. Rent and rice prices also rose substantially, resulting in inflation. The country also fell into financial difficulties. There was also a civil war (the Yihe Dan Rebellion), which resulted in foreign invasion and the partition of the Qing Dynasty. Nationalist capitalists campaigned to regain the concessions lost to foreign powers as a result of the partition of China. After two foreign wars, two civil wars, and two failed attempts at internal reform, the constitutional monarchists, who reformed from above, and the popular revolutionaries, who reformed from below, became unified in their efforts to overthrow the Qing dynasty. On the other hand, the Qing government had borrowed money from foreign countries to secure the right to build a railroad. The Sun Yat-sen Revolutionary Faction repeatedly staged armed uprisings in the wake of the firing on the people who went on strike to protect the Sichuan railroad. After several failed revolutions, the Qing dynasty was overthrown in 1911 (Xinhai Revolution) by a series of

proclamations of independence in southern China's provinces, including an armed uprising in Wuhan. In order to avoid a civil war between the two major Qing warlords, Yuan Shikai in the north and Sun Yat-sen in the south, Sun Yat-sen made Yuan Shikai the provisional president of the Republic of China, which Sun Yat-sen agreed to. After becoming Provisional Grand President, however, Yuan Shikai proceeded to abolish the National Assembly and strengthen the powers of the Provisional Grand President, finally abolishing the republic in 1915. In 1916, Yuan Shikai died, and a civil war (Beiting) broke out between the Kuomintang in the south and Yuan Shikai's subordinate warlords in the north. The first two were carried out by Sun Yat-sen, and after his death in 1925, Chiang Kai-shek carried out the third Northern Expedition, which led to the unification of China by the Kuomintang in 1928. After the Northern Expedition, some local military forces remained in power, and civil war continued. In 1929, the Soviet invasion of Manchuria and the defeat of the Kuomintang, along with the expansion of the Communist Party of China (CPC), caused political instability.

8.4.2. China: The Communist Party's Civil War

The Second World War ended with Japan's acceptance of the Potsdam Declaration in August 1945, which decisively resulted in Japan's defeat; in May 1945, the Kuomintang held a National Congress, the results of which the Communist Party expressed its disagreement. After Japan's defeat, Chiang Kai-shek, a representative of the Kuomintang, and Mao Zedong of the Communist Party of China held talks on domestic peace and unification (Chongqing talks) from August 30 to October 10, but both sides only confirmed their efforts to avoid a civil war. The civil war began. At the time of the civil war, the Chinese Nationalist Party was dominant. In some respects, the Communist forces were one-third of the KMT forces. The Communist forces numbered 1.2 million and the Kuomintang 4.3 million. The area of the districts was 2,285,800 square kilometers and 7,317,720 square kilometers, with 464 cities and 1,545 towns. The population was 136,060,000 and 338,993,000. In 1947, one year after the civil war, the number of party members had jumped from 1.36 million to 2.76 million, the number of troops had expanded from 1.2 million to 1.95 million, and the KMT military force had decreased from 4.3 million to 3.73 million. The reason for this was inflation caused by KMT rule and the Communist Party's method of distributing land confiscated from landowners to the rural population. In June 1948, the first of the three battles, the KMT had 3.65 million soldiers and the Communists 2.8 million; by April 1949, the KMT had 2.04 million and the Communists 3.57 million, a reversal of forces.

8.4.3. Japan

The *Edo* Shogunate, established in 1603, was a government of samurai. The feudal system was based on the *Tokugawa* family headquartered in *Edo* (Tokyo). It was a decentralization system comprising about 300 clans. The

amount of rice produced by each clan was an indicator of productivity. The national production at the end of the *Edo* period was 30.55 million kokus of rice, while the *Tokugawa* family's stone height was 4.19 million kokus of rice and the imperial family was 40.000. The *Choshu* clan reported to the shogunate that there was 370,000 koku of rice, but at the end of the *Edo* period, it was about 1 million. The *Satsuma* clan was about 900,000 (Katsu, 1927). The Japan-US Treaty of Peace and Amity was signed, in 1858. Since 1854, many Japanese were afraid to invade foreign countries. In 1864, the *Choshu* clan, which was one of the domains that favored rule by an Emperor, planned to put an end to shogunate politics. At the time, the shogunate army was 150,000 strong, from 35 clans. No other clan sided with *Choshu*, which was defeated in this early civil war. Sometime later, however, the *Satsuma* clan became an ally of the *Choshu* clan, and the two clans together defeated the shogunate forces. In 1868, a civil war, known as the *Boshin* War, occurred between Imperial forces and the shogunate, which was the enemy of the *Satsuma* and *Choshu* clans. Most of the clans were neutral or became allies of the *Satsuma* and *Choshu* clans, except for a few clans in the Tohoku region.

After the *Boshin* War, the *Satsuma* Clan and *Choshu* Clan took the place of the shogunate and eventually took control of the country. Their victory proved that the military power of the *Choshu* clan and the *Satsuma* clan together was superior to that of the shogunate. The two clans imported a good deal of military technology and weapons from Britain and the US, but they did not have much money to purchase the weapons. The shogunate side also imported weapons, in this case from France, but they also did not have the money to purchase the weapons. After the victory in the first battle of Kyoto in the Boshin War, the opposition to the *Satsuma* and *Choshu* clans declined sharply. In the early stages of the Boshin War, almost all regions except the Tohoku region and the Hokuriku region (Nagaoka City) were in obedience to the *Satsuma* and *Choshu* clan that declared the Emperor's army. This situation is consistent with the assertion in this study that the larger the state capacity of the challenger, the more that opportunistic third parties will cooperate with the challenger. The opportunist's confirmation of the superiority of the challenger is thought to have encouraged cooperation with the challenger.

8.5. Civil War between Myanmar and Syria

Large-scale civil wars that are continuing as of 2020 include the Syrian Civil War and the Mexican Drug War. In this study, the 8888 democratization movement of Myanmar in 1988 and the saffron revolution in 2007 are treated because they are conflicts that originated in demonstrations. Conflicts that originate in demonstrations also can be explained by the analysis of this study, and as of June 2020, we believe that the democratization demonstrations in Hong Kong can be treated similarly.

8.5.1. Civil War in Myanmar: The 8888 Democratization Movement

The 8888 Democratization Movement is a national movement that took place in Burma (now Myanmar) in 1988. At that time, Burma was a military dictatorship with the Burmese Socialist Program Party (BSPP) headed by General *Ne Win*. In September 1987, the announcement of that high-value banknotes would no longer be circulated led to the dissatisfaction of the people who lost their property. On March 12, 1988, a quarrel between a student and the son of a powerful person at the Yangon Institute of Technology expanded into a collision between student demonstrators and security forces, in which one student was killed by the security forces. This led to anti-establishment and anti-dictatorship movements that demanded democratization, and the movements spread to the rural areas. The All-Burma Student Federation sought to break the one-party dictatorship and conducted a large-scale demonstration in the entire country in August. The military fired indiscriminately and suppressed the demonstration. On April 2, Aung San Suu Kyi, who was conducting research in Oxford while caring for her mother, gave a speech at a meeting and became a symbol of the democratization movement. Then, in September, General *Saw Maung* seized control of the democratic movement through military coups. He suppressed the democratization movement while promising to introduce a multi-party system and hold general elections. The National League for Democracy (NLD) was formed. It received an overwhelming 81% of the vote in the general election in 1990, defeating the ruling party, which was supported by the military. So, the military administration refused to call the National Assembly, banned the activities of the NLD, and jailed many executives and members of parliament. In 1992, General *Than Shwe*, the head of the military regime, was appointed prime minister. Since then he has become head of state for life and Myanmar has been a dictatorship. In 2001, the NLD was allowed to resume its activities and the government began to release NLD political prisoners. However, the NLD refused to cooperate with the constitutional national conference held by the military government in 2004. In 2011, General *Than Shwe* transferred the status of head of state to Prime Minister Thein Sein, also a military officer.

8.5.2. The Saffron Revolution

The Saffron Revolution was a large-scale protest that took place in 2007. The primary cause of the protest was an increase in fuel prices, which had risen more than 9 times in two years, by another 500%. Protests by students and anti-government activists began on August 15, but since September they have been held by thousands of monks. There were almost 100,000 demonstrators in Yangon, but security forces attacked monasteries throughout the country and arrested about 500 monks. Following the death of Prime Minister *Saw Win*, *Thein Sein* became prime minister in October 2007. *Thein Sein* was democratized by a referendum to the new constitution in May 2008. Shortly after a general election in 2010, the house arrest of

Aung San Suu Kyi was lifted, but. *Thein Sein* took office as president, based on a congressional vote in March 2011.

8.5.3. Movement to the democratic government by NLD in 2015

In another general election in November 2015, *Aung San Suu Kyi* was elected president and the NLD won overwhelmingly. However, due to provisions in the Constitution of the Union of Myanmar and because of the opposition of the armed forces, *Aung San Suu Kyi*'s aide, *Hting Kyaw* was appointed and elected president by Congress in March 2016. *Aung San Suu Kyi* became a national adviser.

8.5.4. Price changes in Myanmar

Before 1988, prices were in the single-digit range, but since the military government was established, prices have risen sharply, and inflation has continued to rise by 20% to 30% each year. The Yangon Consumer Price Index, based on with 100 in 1986, jumped to 301.8 in 1992, 603.7 in 1995, and 1182.1 in 1997. Myanmar's currency, the kyat, has fallen sharply during that period, results that are closely linked to inflation. A more fundamental cause of inflation has been the loose fiscal and monetary policy of the military leaders. The deficit of government finances increased significantly from Kyat 198.6 million in 1987/1988 to Kyat 25,185.4 million in 1996/1997. Growth in military and capital spending, in particular, has increased (Mya Maung). Capital expenditures increased by 17.3 times between 1987/1988 and 1996/1997 due to the infrastructure development by the military government, which had switched from the traditional Burmese-style socialism to a market economy. Revenue remained 6.4 times higher during this period.

8.6. The Syrian conflict

Since 2011, the Syrian Civil War, which continues as of June 2020, began as one of the Arab springs, a wave of democratization that spread across Arab countries. Initially, this was a civil movement such as a demonstrative march. However, the free Syrian army was formed to carry out an armed uprising, but those rebels split internally. A civil war broke out between the Assad government armed forces, the rebel army, and the Islamic nation, and despite the collapse of the Islamic nation, the civil war between the government armed forces and the rebel army has continued. A British surveillance group estimated that more than 370,000 people were killed since the civil war began in March 2019, about 13 million people were forced to evacuate and go into exile, and the total damage amounted to billions of dollars. (AFPBB News). The main conflict was between the Syrian army of the Assad regime and the militia of the opposition groups. However, but after the battle and because of confusion among the opposition groups, the movement became radical, including participation by militants such as ISIL. The Assad regime has been supported by Russia and Iran, which intervened in the civil war on the side of the Syrian army.

As of 2017, internally displaced persons numbered more than 6.6 million, and more than 7 million refugees are in many countries, including Turkey, Uganda, Pakistan, and Greece. This is said to be the biggest humanitarian crisis of the 21st century. The burned suicide that took place as a protest against the Syrian government on January 26, 2011, began, and the protest movement spreads on March 15 in major cities all over Syria. On March 20, opposition to the 48-year-old law of emergency, release of political prisoners, trial of those who killed protesters. A demand for a demonstration took place in Daura, and on March 25, it became a protest by 100,000 or more people. Meanwhile, more than 20 people were killed. In April, the Emergency Situation Law was abolished, and a court called the National Supreme Security Court, which punishes political prisoners, was abolished. Demonstrations continued to expand, and in July the government tried to talk with the people, but many opposition parties were absent from negotiations with the government because the suppression of protests was stopped and political prisoners were not released. However, the Free Syrian Army is organized to fight security forces that slaughter civilians. In September, the Syrian National Council was formed by dissidents demanding the retirement of President Assad. In November, President Assad announced his intention not to retire, after which the Free Syrian Army fired rockets at the ruling branch, and a statement by the Free Syrian Army was issued. In March 2012, while Homs, the largest base of dissidents, was conquered, in July, a fight between dissidents and the government group broke out in the capital, and the dissidents dominated eastern Aleppo.

8.6.1. Price changes in Syria

Syria suffered a civil war in 2011, and in the early part of the civil war it was part of the Arab spring aiming for democratization, but because armed groups were included in the organization to defeat the Assad regime, the civil war began in earnest. Also, participation in both camps of developed countries such as the United States and Russia, the participation of the IS in the civil war and the fighting of IS by the multinational army led by the United States and the collapse of IS, the intensification of the civil war between the Assad administration and the armed forces after that And the situation of the civil war is changing to the rehabilitation of the Assad administration. Prices continued to rise in the Syrian economy before 2011, with prices rising 74% since 2000. Prices continued to triple each year as the Syrian currency, the Syrian pound (Lira), kept declining in value because of the Syrian civil war.

In Syria, prices more than doubled in the two years after the civil war broke out, but in 2014, prices dropped more than 150% in 2014 due to a sharp decline of 150% or more. The economy has been confused since the civil war, with sharp swings between inflation and deflation. The inflation rate rose by more than 50% in 2015 and then declined by nearly 50% in 2017. Thus, in Syria, large fluctuations in prices have repeatedly occurred

before and after the civil war. At the beginning of their civil wars, Myanmar and Syria both brought inflation with the aim of seeking democratization and affecting the outcome of the civil wars by avoiding the defeat of the challengers. However, in Syria, the internal divisions of the challengers helped to prolong the civil war. The Assad administration, which once dropped to 30% of the domestic power, but has revived to 70% as of 2020 and remains in control of Syria. In charge of the administration, the civil war has not ended. By contrast, the democratization movement in Myanmar has continued to show strength. Since 1988, the NDL has won many general elections, but those election results have not been reflected by changes in leadership, and the military administration continues. finally, the election results are reflected in 2015. Was done. Civil wars occur in many countries, but democratic states do not always last. Coups in many countries lead to governance by military personnel because of economic inactivity and military power. However, the inflation rate in many countries is like that in Myanmar. It rises because of increases in military spending and the cost of inflation rate.

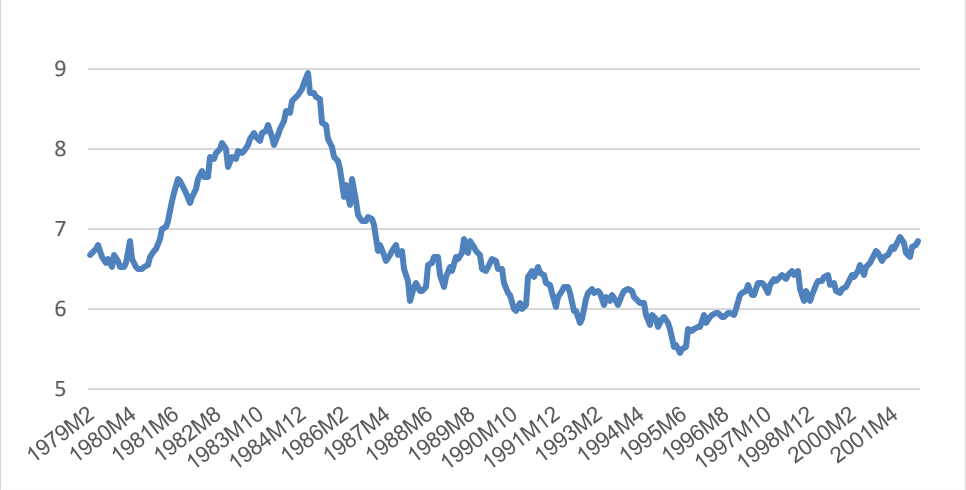

Figure 13. *Exchange rate(chat - dollars) in Myanmar*
*Created by the author from International Financial Statistics (IFS).

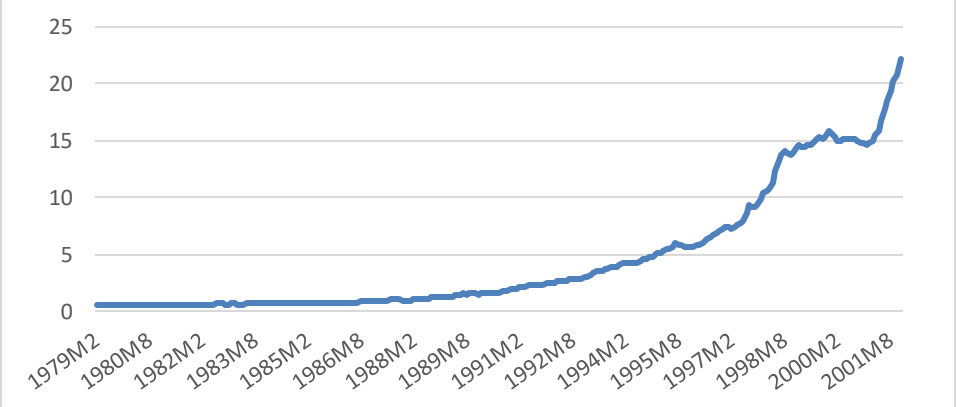

Figure 14. *CPI in Myanmar*
*1987M3=1 *Created by the author from IFS

Table 4. *Finances for state-owned entreprises in Myanmar*

(million chat)

	1994-95	1995-96	1996-97	1997-98
Revenue	319.1	393	545.8	715
Tax Revenue	201	226.4	313.6	388.5
State-owned enterprise payment	81.9	105.1	116.4	254.5
Others	36.1	61.5	65.8	72.1
Ordinary Expenditure	277.3	328.9	370.1	479.7
Foreign Borrowing	5.8	7.8	4.2	7.7
Financial Account	-3.4	-5.2	-2.6	3.7
Investment	201.4	318.2	429.2	447.6
Fiscal Balance	157.3	-251.6	-251.9	-208.3

*amyo:da: simankein hnin si:pwa:ye: phunphyo:tothemu unji:thana, 1997-98 bandaye: si:pwa:ye:lhumuye: acheanemya ((Ministry of National Planning and Economic Development"1997-98 financial, economic, social report")

(million chat)

	1994-95	1995-96	1996-97	1997-98
Income	725.1	872.2	1086.1	2131.5
Ordinary Income	722	871.9	1085.6	2131
Others	1.2	0.4	0.5	1
Ordinary Expenditure	805.8	916.2	1199.4	2374.4
Foreign Borrowing	6.5	6.4	3.5	13.1
Financial Account	-4.8	-7	-12.3	-10.9
Investment	56.4	92.1	143.5	204.5
Fiscal Balance	-139.3	-116.7	-270	-444.7

*amyo:da: simankein hnin si:pwa:ye: phunphyo:tothemu unji:thana, 1997-98 bandaye: si:pwa:ye:lhumuye: acheanemya ((Ministry of National Planning and Economic Development"1997-98 financial, economic, social report")

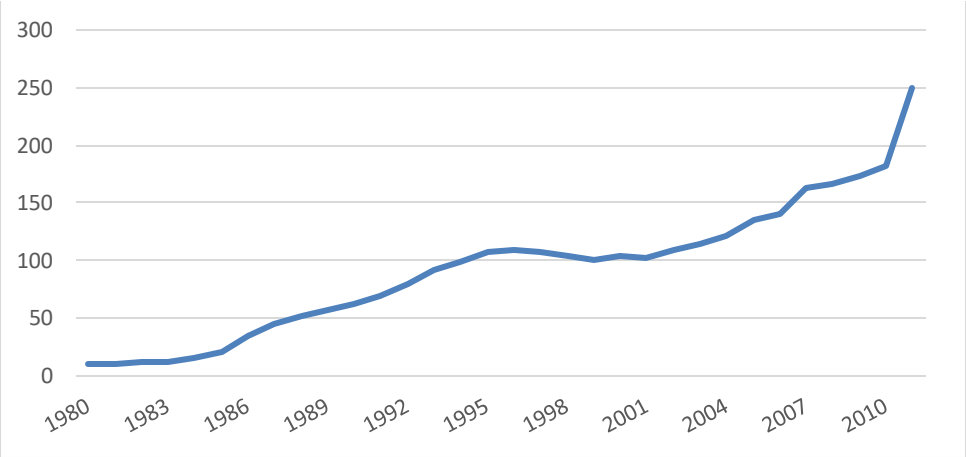

Figure 15. *Myanmar exchange rate*
※2000year=100 *Created by the author from IFS

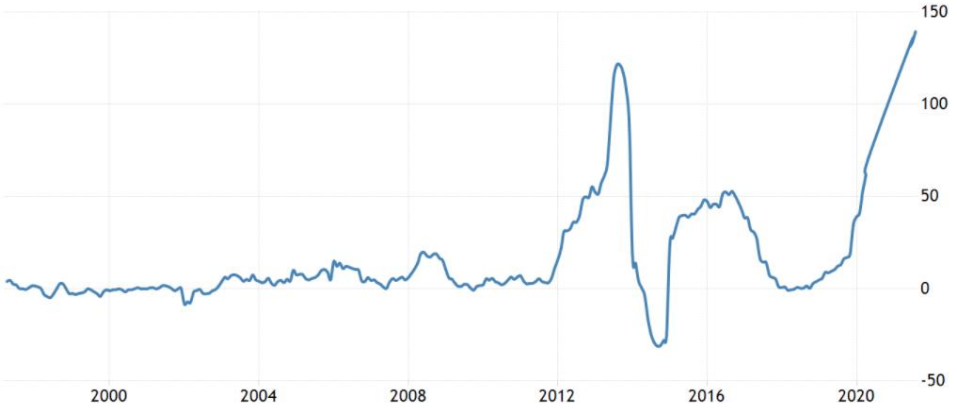

Figure16. *Annual Inflation rates in Syria*
※Central Bureau of Statistics [Retrieved from].

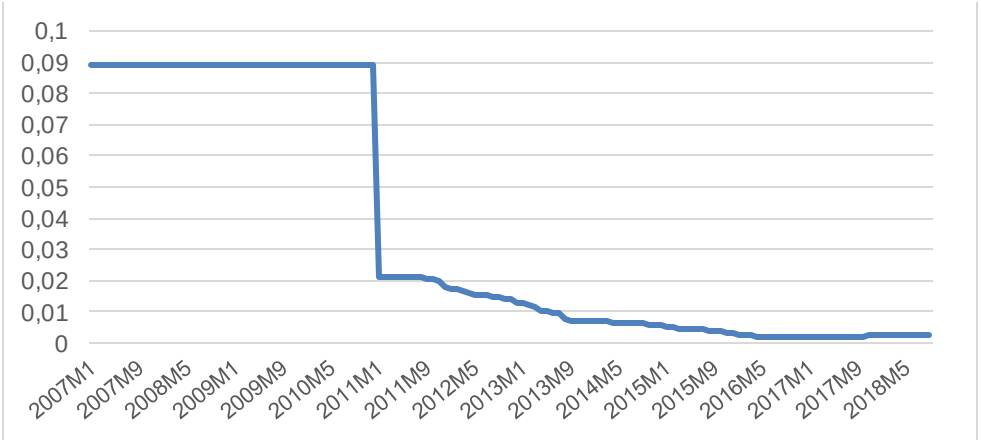

Figure 17. *Exchange rates in Syria (US dollar per Domestic Currency)*
*Created by the author from IFS.

8.7. Summary Case Study

In Japan, the challenger Choshu was defeated in the first conquest of Choshu, but after the second conquest of Choshu, the Choshu clan would win. Since then, many opportunists have sided with the Satsuma-Choshu clan to defeat the Shogunate.

In China's National Communist Civil War, hyperinflation caused by the ROC's failed monetary policy led to the expansion of the poor and a decline in the value of public and private property, which lowered the ROC's ability to take charge of the government. The lack of ability to govern expanded the support base of the challenger, the CCP, because of the proximity of the local population, mainly the poor peasants, to the ideology of the Communist Party rather than to the ROC.194 In 1948, the ROC, which was three times more powerful than the Communist Party in 196, reversed its power ratio. The impetus for this was the Communist Party's victory in the early civil war. It was important for the Communists to distribute land during the civil war.

8.8. Federalism, centralization and democratic institutions

One way to sustain peace was through a high degree of federalism. However, when the momentum to overthrow a regime arose in preparation for foreign aggression, civil war could not be avoided even if the government advocated a shift to a federal system, which is a weaker method of resource mobilization than a centralized system. When the perception of an enemy with more powerful military forces abroad than at home and the difficulty of victory over a foreign enemy justifies a centralized system over a federal system, the challenger has introduced a centralized system through civil war.

In this study's model, a centralized system is likely to be chosen when a challenger creates a government alone after two civil wars, or when a militant challenger who does not have the support of the population but has strong military power creates a government alone. On the other hand, we believe that a federal system is more likely to be introduced if a larger proportion of opportunists cooperate with the challenger in the early stages of the civil war.

Although our model can explain whether a government becomes a coalition or a single government after a civil war, it cannot indicate whether a centralized system or a federal system will be introduced. For this reason, we considered case studies from several countries.

In strong governments such as Myanmar and Syria, a substantive democratic system that allows for regime change is desired, and as a result, a federal system is chosen.

In the cases of China and Japan, the collapse of the traditional system was seen as essential because the rise in military and economic power due to the concentration of domestic resources was considered essential. Japan's transition to a centralized system of government during the Meiji period enabled a change in the taxation system from one based on land to one based on money. With the central government taking the lead mainly in industrial development and education, the government strengthened the military by selecting the necessary sectors and investing capital in them in a concentrated manner. After World War II, Japan took two similar paths in that the government selected the necessary sectors and strengthened the economic side of the economy.

This study accepts that civil wars can occur due to the magnitude of the obstacles, such as when transitioning from federalism to centralization. When major changes are needed in the political economy and the traditional institutions are unable to implement the changes, i.e., when there is a threat of colonization or domination, or when the rights to life and property as an ethnic or resident population are threatened, major criticism of the local population and third parties arises against the government. In order to achieve peace, a country must have (1) a system in which the ruling party can actually be replaced and (2) a backup bureaucracy that is strong enough to destroy the current system and regenerate it under a different system, without violence. We believe that

this is the case. (3) Furthermore, we believe that it is especially important to educate the military personnel for civilian governance of the nation's military power. The above three are necessary to balance the trade-off between a strong government that implements powerful resource mobilization and democratization.

Japan and China both adopted centralized government after civil wars. In Japan, the government was a coalition of Satsuma and Chosun, while in China the government was a one-party dictatorship.

After the Xinhai Revolution, a federal system was also oriented for a time, but it became a centralized system, and it remained a centralized system after the National Communist Civil War. Japan and China became centralized systems as strong governments were oriented due to the magnitude of external pressure. However, Japan introduced a democratic system and experienced a change of government through elections, while China does not allow a change of government. It may be more appropriate to consider Japan's democratic system as an exception because its purpose was to revise the unequal treaties it had at the time with the West, and because the government introduced a parliamentary cabinet system and the military had a strong influence on government decision making, rather than the people winning the introduction of a democratic system.

Myanmar has a bicameral legislature and a multi-party system. There is also a large number of forces other than the ruling party. However, 25% of the seats in both houses of parliament are allocated to the military, regardless of the election results. A certain percentage is also allocated to ethnic minorities. There are also three vice presidents, at least one for each ethnic minority and one for the military. In other words, there is a pre-determined quota for Congress. Currently, there is no alternative party to the NDL. It has a multi-party system and the executive branch can be considered a coalition government. The democratic system is introduced because democratic parties have continued to win elections. It is a federal system that allows for autonomy for ethnic minorities.

Syria remains under the Assad regime and is a single-party government.

It may be said that countries with centralized regimes do not actively introduce democratic systems. In addition, states with coalition governments have either adopted a federal system in which authority is decentralized to the regions, as in Myanmar, or a democratic system in which power rotates, as in Japan during the Meiji period. From the examples of Japan and China, it can be said that a single government tends to choose a centralized system. The Myanmar example shows that if the proportion of opportunist support is large compared to the size of the challenger's support base, it will tend to move toward a federal system.

8.9. Extremist

The Choshu clan in Japan was a radical faction and did not have the support of many clans, but it had a coalition government because of the cooperation between Satsuma and Choshu and their military strength. Ten

years after the first civil war, Satsuma launched a civil war against the government, but the government won.

After the Xinhai Revolution, Sun Yat-sen wanted to establish a republic or federal system in China, but Yuan Shikai established a government and called himself emperor, which caused confusion. Also, after Yuan's death, China became a one-party dictatorship government by the Chinese Nationalist Party as it overthrew warlords in various regions. Sun Yat-sen and the Chinese Kuomintang he created could be considered extremists because they had been involved in civil wars in various parts of China before the Xinhai Revolution.

After the Xinhai Revolution, China became the People's Republic of China, a one-party dictatorship with a centralized government that did not adopt a democratic system. The Communist Party and Mao Zedong in the early days were extremists because they were engaged in a prolonged struggle for power with the Kuomintang through military force. However, the CCP won the civil war by gaining the support of the population and increasing the number of military personnel. However, the CCP won the civil war by gaining the support of the population and increasing the number of soldiers. The two Chinese case studies above show that either there were no opportunists with significant power, or there were opportunists, but they were all destroyed.

Aung San Suu Kyi in Myanmar cannot be called an extremist because she did not act on the back of military force. The political party to which Aung San Suu Kyi belongs has significant support from the population and opportunists.

Syria can be called extremist because there are many armed forces, including the Free Syrian Army, and they are expanding their power on the back of military force. They have little support from the population, and their inability to coordinate with other armed groups confirms their inability to coordinate with opportunists and challengers.

The above multiple cases confirm the following. If the challenger is an extremist, he or she has strong military power, little support from the population, or small support from opportunists, and high political instability even after forming a government.

9. Discussion

In this study, we analyzed civil wars in order to examine the juncture of institutional change.

By endogenizing political, economic, and military factors in the model, we have clarified the mechanisms by which civil wars occur. The robustness of the model is evident from simulation analysis and real-life cases. We showed that the weaker the initial challenger to the government, the greater the contribution of cooperation from the population and a third force to the challenger in the process of civil war, and thus the challenger cannot create a new autocratic government with a single group after winning the civil war.

The challenger also has the advantage of prolonging the civil war. For the challenger, the probability of winning the civil war increases with the proximity of the challenger's political ideology to the population, and the probability of the challenger winning the civil war is also higher when the government loses the maintenance of the population's property and public goods and the stability of the price level.

The weaker the challenger is in the early stages of the civil war, the more likely it is to be a coalition government in the post-civil war period, and the more likely peace will be sustained. However, if the challenger is an extremist group, the extremist group will not cooperate with other groups, so peace will not be sustained after the civil war victory and a new civil war is likely to occur with other groups that should cooperate under a coalition government.

We have shown that the challenger is motivated to repeat the civil war by the government's inability to take charge of the government. In addition to showing the complementarity of institutions, we showed that even if the challenger is defeated as a result of the civil war, if the government is not powerful enough to destroy the challenger, there is an advantage for the challenger to repeat the civil war, resulting in the expansion of the challenger's power and the dispersion of power, which in turn destabilizes the political situation.

9.1. Factors contributing to civil war and political instability

Political instability in this study refers primarily to the transition to a popularly supported polity through civil war, whereby the people support challengers to the government. These situations have been common in developed countries since the French Revolution, and in many developing countries for about 70 years since World War II, and are still a widespread phenomenon in many parts of the world.

In this study, three cases of political instability factors are assumed.

The first is the case in which the ruling power (or the power or government in power) borrows from foreign countries and buys weapons in order to militarily overthrow its challengers. When Japan's Meiji government and the People's Republic of China were formed, the former governments of the Republic of China and the Edo Shogunate provided foreign loans, resulting in hyperinflation several years before the change of government.

In addition to the above two countries, many other countries have experienced hyperinflation as a result of large foreign loans to purchase weapons. Hyperinflation lowers the value of money, and the economy and people become confused as they lose confidence in money. The loss of confidence in money reduces the value of public goods, destroying the provision of public services and the guarantee of property rights, both of which are considered important missions of government. It diminishes the utility that citizens can gain through the diminution in the value of private property of all citizens. The utility gained by supporting the government is

reduced, and the expected utility is increased when the opposing party becomes the ruling party relative to the government.

Second, the challenger's military technology modernizes and becomes more powerful. In the post-WWII civil war between the People's Republic of China (PRC) and the Republic of China (ROC), weapons provided by the United States and other countries to fight Japan during World War II, as well as weapons from the Soviet Union, were also provided to the challenger, the Chinese Communist Party. The Choshu and Satsuma clans, which established the Meiji government, imported weapons from Britain. Both countries were able to secure more modernized weapons than the ruling party.

Third, they expanded their support base. In this study, local residents can change their support from the government forces in charge of the administration to the challengers, the rival forces. We also assumed the existence of opportunists outside the areas controlled by the forces in charge of the regime, thereby making the situation closer to that of an actual civil war. The support of a third force expands the challenger's base of support. The change in the support base is endogenously determined by introducing ideological differences between the government and challenger forces. The population is divided into urban and rural residents, with the urban residents' ideology being capitalist and the rural residents' ideology being egalitarian. It is assumed that regions (either urban or rural) with ideologies closer to those of each power will have a more shifting base of support.

The decrease in the value of public and private goods of the population due to the hyperinflation described above will lower the utility of both urban and rural residents. Also, by assuming that the longer a civil war lasts, the greater the opportunity for shifting the support base, we assume that even a victory by the opposing forces in the first half of the civil war will result in more of the support base shifting to the opposing forces.

In the case of the establishment of the People's Republic of China (PRC), the hyperinflation triggered by the Republic of China (ROC) since World War II has triggered an increase in support for the Chinese Communist Party (CCP). In addition, the CCP's victories in several civil wars led to an increase in the number of regions expressing support for the CCP as the victor in the early stages of the civil wars.

Similar to the above, at the time of the establishment of the Meiji government, the Edo shogunate brought about hyperinflation, and the victory of Choshu in the second conquest of Choshu and the victory of the combined forces of Satsuma and Choshu in the Boshin War led to subsequent expressions of support for Satsuma and Choshu.

In China, the prolonged civil war brought impoverishment to rural workers in the countryside, which led to demands to correct the disparity with urban areas and opposition to urban residents, and concentrated rural support on the Chinese Communist Party, which upheld egalitarianism and land distribution to the peasantry. In Japan, the shift to a centralized

system of government as a modern state centered on the emperor, rather than a decentralized system centered on the shogun to avoid foreign domination, was called for.

The dispersion of power is caused by the existence of rival forces backed by military power, the second of the above, and in addition to this, hyperinflation, which makes the people aware of their lack of ability to take charge of government, can be historically confirmed as a situation where the popularity and presence of the challenger increases, leading to an expansion of its support base. If the challenger wins the civil war, or if the civil war is prolonged, the support base expands further. The opportunistic third force assumes a short-term defeat of the challenger, but only a prolonged civil war will cause potential opponents to the government to support the challengers, or the challenger will become a symbolic presence of potential opponents, encouraging the denunciation of the challengers and increasing the probability of victory in the civil war.

The situation described above was a time when colonial rule prior to World War II was widely recognized and armed rule was justified. In Myanmar and Syria, where student demonstrations triggered the country's plunge into civil war, the rapid price fluctuations before or during the civil war were confirmed, and the political and economic turmoil probably contributed to a decline in the ability of the regime to take charge.

In Syria, despite starting from a student movement, the civil war has been protracted due to the emergence of armed groups as challengers and the lack of coordination among the challengers. During this period, the emergence of IS and the intervention of multinational forces, as well as the collapse of IS, resulted in a significant loss of livelihood for the population. The lack of coordination among challengers to effectively shift the support base to the challengers was, in our view, not envisioned by the challengers as a strategy in the early stages of the civil war.

In Myanmar, on the other hand, general elections were held through student demonstrations, but the military who seized power through a military coup ignored the results of the general elections. Aung San Suu Kyi of the NDL, who won the general election, failed to achieve a transition of power and democratization as a challenger, but the military who launched the military coup d'état took up the challenge of a coup and seized power. Both the military, which possesses military power, and the NDL, which does not, have a base of support in the form of the military and the people. Our model is consistent with both the Syrian and Myanmar civil wars in that military forces are influential in regime change and the maintenance of power, regardless of the presence or absence of armed conflict. In addition, when the defeat of a civil war can avoid a decisive reduction in the challenger's power, as was the case with Aung San Suu Kyi and the student demonstrators in Syria, or when the loss of life of the challenger cannot be implemented due to world conditions and other factors, the civil war will be repeated and the probability of victory by the challenger will increase.

This study assumes that the two factors that bring about institutional change are the economic factor of the value of money and the political factor of ideology. As groups, we introduced not only the government and the challengers but also the forces that determine who supports the challengers and the utility of the citizens, both urban and rural residents. These situations are elements considered historically necessary to explain real regime change. Their inclusion clarified the political economy and the relationship between individual citizens and the forces that support the opposing forces.

9.2. Extremist

The relationship with extremists can also be confirmed by applying the model.

Civil wars occur mostly when a particular group decides that the policies sought by the challenger will not be implemented as long as the current regime remains in power, and when they believe that the current regime will continue for a very long time.

Myanmar was a nonviolent democracy movement that started as a student movement, but as a result, it was the military that used the power of the student movement to come to power. However, the democratization movement did not lead to a civil war, and discussions between the government and the political parties that were engaged in the democratization movement continued based on nonviolent principles.

Although the Syrian democratization movement (demonstration movement) started as a student movement, the rebel forces, receiving various kinds of support from neighboring countries, rose in arms and formed the Free Syrian Army, which is believed to be the reason why the civil war arose. The Free Syrian Army subsequently split. The participation of Hezbollah, a Shiite militant group, on the government side with support from Russia and Iran, and the entry of the Islamic State (ISIS), a Sunni militant group based in Iraq, has prolonged the civil war due to the participation of militant groups from both sides and the split in the rebel side. Unlike Myanmar, Syria's civil war began with a student movement that led to a democratic movement that was eventually led by the Free Syrian Army, an armed force. Armed challengers also invaded from outside the country, and the civil war became a quagmire. Myanmar, realizing that the military in power lacked popular support, gradually introduced democratic policies, but the Syrian regime of Bashar al-Assad still opposed the democratic movement, even with the help of foreign military forces. The military size of the challenger militants and the ideological centripetal force of the challenger can both be considered elements of the challenger's success.

Furthermore, extremists may participate in civil wars to influence the post-civil war regime, which differs from the objectives of the initial democratization movement, making it important to build relationships between extremists and other forces.

In the model of this study, this can be considered by assuming that the challenger is a case of extremists.

The weaker the challenger is in the early stages of the civil war, the more likely it is to become a coalition government after the civil war, and the more likely peace will be sustained. However, when the challenger is an extremist group, the result is that the extremist group does not cooperate with other groups, so peace does not persist after the civil war is won and a new civil war is more likely to occur with other groups that should cooperate under a coalition government.

Extremists often do not accept ideological compromise and are often not willing to resolve issues through debate. If these extremist groups participate in the civil war and play a major role but are not a decisive enough force to win the civil war, the civil war will be protracted and the regime will become tyrannical and the politics insecure because the organization does not have a democratic culture, even if it comes to power. If the main group of challengers is extremist, it will be difficult for the coalition to sustain itself after the civil war is won. The civil war tends to become a quagmire as new civil wars arise between groups in the coalition and the civil war becomes protracted. On the other hand, as long as a coalition government is maintained, dictatorial behavior by certain groups is discouraged, and democratic institutions tend to be introduced.

Just as the state and the military are governed by civilian officials, it is necessary to create an environment in which extremists can be controlled by moderates. This is not limited to the military or other forces. It is important to have a high level of bureaucracy and thorough democratic education so that extremists do not gain electoral support and can overcome national challenges moderately. In other words, it is necessary to work for coordination between extremists and moderates and public understanding of a middle-of-the-road policy.

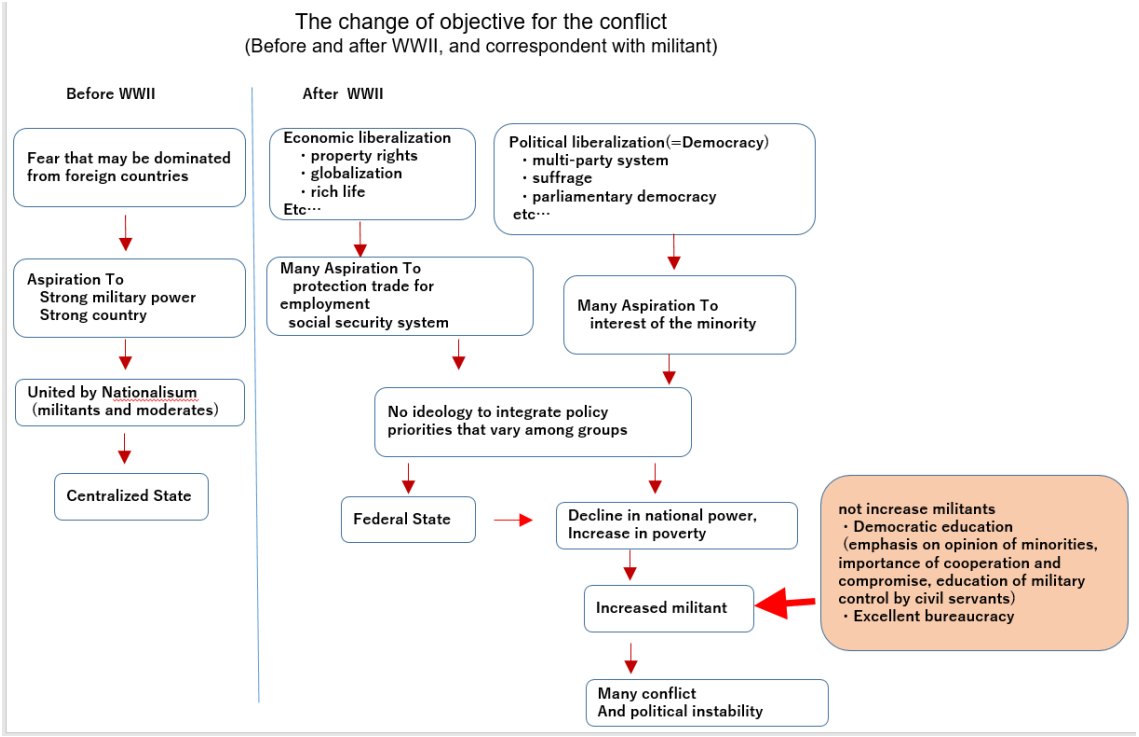

Figure 18. *The change of objective for the conflict*

In the past, as represented by China and Japan, nationalism was able to unite nations before World War II, but today it is difficult to unite various forces through nationalism. Before World War II, when nationalism functioned effectively, extremists and moderates were able to unite. Today, the policies of globalization have created both domestic gainers and losers, and conflicts exist. For example, when economic and political liberalization takes away jobs, the line of international cooperation and the principle of prioritizing one's own country is in conflict. The former is opposed as a moderate and the latter as an extremist. When moderate policies cause economic hardship for many people, the extremists gain the upper hand in elections and want to establish an economic system that does not depend on foreign demand or foreign workers through coercive policies. People demand that the government and domestic businesses hire domestic workers.

When a is an extremist case and the ideology is far from that of B, who is an opportunist (including after civil war and with the prospect of no long-term coalition government), it is more likely that a and b will not work together and will choose to remain neutral. Even if they align with extremists, they are more likely to align with extremists if there is a high likelihood of a post-civil war civil war with extremists and a high likelihood of winning the fight against the extremists.

9.3. Institutional Choice through Civil War

States are subject to either external or internal pressures, and institutions are often changed.

When a nation is under strong military pressure from abroad, the creation of a government by a force with high military power that has won a civil war is justified. There is a need to strongly mobilize domestic resources to develop a domestic environment that is resistant to external pressures. In such cases, some states tend to choose a centralized system that can concentrate domestic resources at the center, rather than a federal system that delegates authority to the regions. Many are small countries.

Where economic pressures from abroad exist, e.g., loss of domestic industry and domestic employment due to globalization, it may be a large as well as a small country. Nations can choose between globalization and protectionism. Centralization is often chosen because protectionism requires a strong centralized authority to protect the country's industries. However, in the case of large countries that can change their systems democratically, even if they do not choose a centralized system, the central government has the financial resources to revitalize the regions at the same time by delegating authority to the regions. Therefore, a federal system may be selected if the country is large and democratic.

Presidential and parliamentary cabinet systems are also considered in the same way as above. In the case of small countries, a presidential system, which gives stronger authority to the top, tends to be chosen in environments where domestic resources need to be mobilized. Therefore, both presidential and centralized systems tend to be introduced. In a parliamentary cabinet system, the government is often not strong enough because the boundaries between executive and parliamentary authority are blurred and because parliamentary authority is strong. After poverty is reduced and people's lives are stabilized, people generally seek freedom and autonomy. Because the parliamentary system is better suited than the presidential system to reflect freedom and autonomy, and because it is more common in large countries, the parliamentary system tends to be introduced along with the federal system.

As for the choice between capitalism and socialism, socialism is more likely to be realized with the support of the poor population when there is great economic inequality and a fairly large population of poor people. Capitalism, on the other hand, is chosen when it is supported by the wealthy who fund civil wars or by those who seek the opportunities and economic benefits associated with institutional change.

Most civil wars occur in small countries. Therefore, after civil wars, many small countries adopt centralization, presidential systems, and a certain level of protectionism. In the case of non-small countries, federalism is chosen if the center can afford to distribute domestic resources to the regions. In the case of non-small countries, the government tends to choose a parliamentary cabinet system if the people of that country are afraid of concentrating power in the hands of individuals because of past history, or if they want to emphasize freedom and autonomy for minority opinions.

As for globalization, if the disadvantages, such as reduced employment due to the decline of some domestic industries, are greater than the

advantages of increasing the demand of domestic consumers through the inflow of inexpensive goods, the government of the country, most of which are small, will tend to choose protectionism. Even in large countries, if the number of domestic industrial workers in decline is greater than a certain value, the government will choose protectionism.

This study found that governments established through civil wars tend to form centralized institutions. A coalition government, as in Japan during the Meiji period, may also introduce centralized institutions. The cases of China, Myanmar, Japan in the Meiji period, and Syria were treated as examples of governments established through civil wars that introduced a centralized system, similar to a presidential system in the sense that strong authority is concentrated in the hands of the leader. There are exceptions depending on the objectives of the challenger, as in the case of Myanmar, which introduced a federal system when it advocated democratization and emphasis on minority opinion in the process of regime transition. When extremists are in power, domestic forces and the population do not sufficiently support the extremists, and institutions with a particularly strong centralized element are introduced to stabilize the political system.

Institutional Complementarity and Equilibrium

By modeling a partial game equilibrium, we analyzed how the following four changes would move the equilibrium.

(1) Prolonged civil war (2) Expansion of foreign loans by the regime (3) A third force with ideological proximity to the rival force (4) Strengthening of military technology by the rival force.

Analytical analysis confirms that all of the above will expand Sp and increase the likelihood of entering civil war.

We examined the relationship between an increase in the probability of civil war victory due to an increase in military technology through foreign loans by government forces and a decrease in the probability of civil war victory due to a shift of the support base to the challenger due to a decrease in the value of a private property and public services of the people through increased foreign loans.

The impact on post-civil war institutions not only through civil war victories and defeats but also through the balance of power among affiliated groups after the civil war. It was observed that after the initial civil war, power differentials and ideological differences can lead to a weakening of the new government's support base.

On the other hand, an increase in the military technology of the opposing group increases the probability of victory in the civil war for the opposing group.

In addition, if the ideology of the opposing force is the ideology desired by the rural and urban residents, the challenger's support base will expand more significantly through the civil war, and even if the opposing force is weaker than the ruling group in the early stages of the civil war, as long as the civil war is prolonged, the opposing force will expand its support base, and in the long run, it will likely win the civil war The report also noted

that the number of people in power is high and that regime change can be achieved.

Although the political systems and economic systems and cultural backgrounds of the countries addressed in the case studies complement the institutions, detailed identification of individual institutions and the relationships among them is beyond the model of this study.

As an occasion for the loss of the political context of regime competence, this study considers the economic dimension of price instability and the financial condition of the state that brings about this instability. When the majority of the people's political ideology is expected to correspond to the ideology espoused by the challenger during the challenger's civil war, the challenger is more likely to be determined to challenge the civil war. Furthermore, the idea that repeated civil wars will lead to successful civil wars is apt to influence subsequent civil war victories of the challenger, as one success of the challenger on the military front is viewed by opportunists as the challenger's ability to take charge of the government. Also, if the challenger and ideology are close, local residents and opportunists are more likely to align with the challenger.

While Aoki (2017) showed the importance of the existence of institutional complementarities besides the description of the game, this study is also unique in that it shows institutional complementarities by endogenizing important elements in the political, economic, cultural, military, and other aspects of the game in the model. Through politics, economics, culture, and military, the multiple equilibria may change to one or status quo changes. The decline in the capacity of the government to take charge also lowers the cost of civil war as a challenger, and also creates a predisposition for decentralization. After the civil war, despite the gradual increase in state capacity and allies, there is a difference between cases where the civil war itself is lost due to military defeat in the early stages of the civil war and cases where the civil war is ultimately won, which is due to the expansion of the local population and the third force's support base for a long-term civil war The model confirms that it depends on the presence or absence of the ability to carry out the war, the increased likelihood of winning the civil war due to the relative weakening of the governing party R's ability to take charge of the government, and the size of j, the sanction in the event of civil war defeat. China and Japan, the two countries given in this study, can be examined in terms of the relationship between the economic gains from continued peace and the expected economic gains that would increase the quality and productivity of future public goods through civil war.

The state must 1) foster healthy extremism that society can tolerate and defend the various rights of its citizens; 2) the state must be able to combine a centralized system with strong state resource mobilization to become a prosperous country and a diverse 2) The government must choose the appropriate system between a decentralized system composed of a decentralized society. 3) It is necessary to develop, through education, a

flexible system and bureaucrats and citizens who will operate the system so that civil war will not occur every time a change in policy priorities is demanded by the people. 4) The local Internalize the expansion of power as an institution of federalism and decentralization. Alternatively, local power needs to be internalized as an institution so that it can be treated as a powerful party in the central government and a democratic transition of power between that party and the ruling party can take place. In our view, the realization of the above four will strengthen the complementarity of institutions.

Appendix

Appendix 1

Proof of Lemma 1

If $S_{(t)}$=(s1,100],

S1 is the condition for being peaceful when working with A, which is (2-4) ≥ (2-5). On the other hand, S1 chooses to work with A if (2-4) ≥ (2-1), since the condition for peace in working with R is (2-1) ≥ (2-2).

As long as (2-4) ≥ (2-6) and (2-5) ≥ (2-6) are obvious, as long as (2-4) ≥ (2-6) and (2-5) ≥ (2-6) are assumed to be zero or positive gains only, then peace is realized by linking with A if (2-4) ≥ (2-5).

As long as we assume only zero or positive gain, (2-1) ≥ (2-3) and (2-2) ≥ (2-3) are obvious, so if (2-1) ≥ (2-2), then peace is realized in conjunction with R.

In the case where $S_{(t)}$ exists between (s2,s1], the following inequality holds.

$$V_B^{\overline{AB}}(p) < V_B^{\overline{RB}}(c) = V_B^{\overline{AB}}(c) < V_B^{\overline{RB}}(p)$$

・Team with A to defeat R and peace < team with R and then civil war with R < team with R to defeat A and peace

$$\delta\beta[S_{B(t)} + k(\alpha_{u(t)}S_{u(t)} + \alpha_{r(t)}S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)})]$$
$$<\delta^2\beta\{S_{B(t+1)} + (\alpha_u S_{u(t+1)} + \alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{B(t+1)})\}$$
$$< (1\text{-i})\delta\beta[S_{B(t)} + k(\alpha_{u(t)}S_{u(t)} + \alpha_{r(t)}S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)})]$$

When you look at whether you get an A or an R, you see

$$\delta^2\beta\{S_{B(t+1)} + (\alpha_u S_{u(t+1)} + \alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{B(t+1)})\}$$
$$<V_B^R< (1\text{-i})\text{delta beta}[S_{B(t)} + k(\alpha_{u(t)}S_{u(t)} + \alpha_{r(t)}S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)})]$$

If $1-\delta < i^*$, then it will be on R

If s2 is between (0,1), then the left inequality holds when $S_{(t)}$=s2. Thus, if (2-5) ≥ (2-2), then B pairs with A

Proof of Lemma2

If $S_{(t)} \leq s1$, then Civil war ensues.

If (2-7) ≥ (2-5), then s3={min{s3*,s1}

If (2-7) ≤(2-5), then s3=0

S3 is a weakly decreasing function of iB

(a) if $S_{(t)}$=(s3,s1], B choose neutrality.

(b) If $S_{(t)} \leq$ s3, choose the partnership with A

Appendix 2

A2. Equilibrium Analysis

Considering the second period, after winning the civil war in the first period, the following is the case when working with R

The case of cooperation with R: a) if (2-1)>(2-2) and (2-1)>(2-3), then peace with R after cooperation with R. b) if only one of a) is true, then after cooperation with R, in the second period, the player fights a civil war with R. c) if (2-1)>(2-3), then peace with R after cooperation with R.

Considering the second term, the case of cooperation with A is as follows.

In the case of cooperation with A: a) If (2-4)>(2-5) and (2-4)>(2-6), then peace with A after cooperation with A. b) If only one of a) is true, then civil war with A in the second period after cooperation with A.

For B, there are three possible strategies: cooperation with A, neutrality, and cooperation with R. The following six types of sequential relationships among the three strategies are possible.

(1) Cooperation with A > Neutral > Cooperation with R
If t=2 and Sa>Sb and SR>Sb, then (2-4)>(2-7)>(2-1)
If Sa<Sb and SR>Sb, then (2-5)>(2-7)>(2-1)
(2) Cooperation with A > Cooperation with R > Neutral
If t=2 and Sa>Sb and SR>Sb, then (2-4)>(2-1)>(2-7)
If Sa<Sb and SR>Sb, (2-5)>(2-1)>(2-7)
(3) Neutrality > Cooperation with A > Cooperation with R
If t=2 and Sa>Sb and SR>Sb, then (2-7)>(2-4)>(2-1)
If Sa<Sb and SR>Sb, then (2-7)>(2-5)>(2-1)
(4) Neutrality > Cooperation with R > Cooperation with A
If t=2 and Sa>Sb and SR>Sb, then (2-7)>(2-1)>(2-4)
If Sa<Sb and SR>Sb, then (2-7)>(2-1)>(2-5)
(5) Cooperation with R > Cooperation with A > Neutral
If t=2 and Sa>Sb and SR>Sb, then (2-1)>(2-4)>(2-7)
If Sa<Sb and SR>Sb, then (2-1)>(2-5)>(2-7)
(6) Cooperate with R > Neutral > Cooperate with A
If t=2 and Sa>Sb and SR>Sb, then (2-1)>(2-7)>(2-4)
If Sa<Sb and SR>Sb, then (2-1)>(2-7)>(2-5)

A2.1 Conditions for peace in conjunction with A S_1
(peace in conjunction with A vs. civil war with A after conjunction with A)

S_1 is derived using (2-4)>(2-6).

$S_{B(t+1)}$ >(2-j) $\delta^2\beta[k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})$
$+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})]/\delta\beta[(2\text{-i})\text{-}\delta(2\text{-j})\,(1\text{-}\lambda)]$

S_1 is located on the right side of the diagram more than S_2 and S_3, which raises B's gain more than neutrality and cooperation with R. After the regime change from R to A, supporting A's regime maintains B's gain and peace is built.

$S_{1(t+1)} = S_{B(t+1)}$>

Molecule

$$\frac{\theta_b b}{\theta_a a+\theta_b b}(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$$
$$+(1-\frac{\theta_b b}{\theta_a a+\theta_b b})\quad(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$$

Denominator

$$[\delta\beta+(1\text{-i})\delta\beta-\frac{\theta_b b}{\theta_a a+\theta_b b}(1-j)\delta^2\beta\,(1\text{-}\lambda)-(1-\frac{\theta_b b}{\theta_a a+\theta_b b})\,(1-j)\delta^2\beta\,(1\text{-}\lambda)]\,S_{B(t)}(1\text{-}\lambda)$$
$$+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$

$S_{1(t+1)}$>0 is the case where the denominator is positive: 1+ (1-i)>(1-j)δ(1-λ), but $S_{1(t+1)}$>0 is guaranteed because j, δ, and λ are less than 1, so the left side is less than 1.

$S_{B(t+1)} = S_{B(t)} + k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$
$=S_{B(t)}(1-\lambda)+ k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$より、

$S_{B(t)}>$

Molecule

$\frac{\theta_b b}{\theta_a a + \theta_b b}(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}\}$

$+(1- \frac{\theta_b b}{\theta_a a+\theta_b b}) (1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}\}-k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) - \lambda(S_{(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$

Denominator

$[\delta\beta+ (1-i)\delta\beta-\frac{\theta_b b}{\theta_a a+\theta_b b}(1-j)\delta^2\beta (1-\lambda)- (1-\frac{\theta_b b}{\theta_a a+\theta_b b}) (1-j)\delta^2\beta (1-\lambda)] (1-\lambda)$

There are two conditions for $S_{1(t)}>0$. The first is that the denominator is positive.

$1+ (1-i)>(1-j)\delta(1-\lambda)$ and $j\leq 1$, $\delta\leq 1, \lambda\leq 1$. Therefore, since the left side is 1 or less, $S_{1(t)}>0$ is guaranteed. The second is that the numerator is positive, but since it is negative by definition, $S_{1(t)}=0$.

$$(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}\} > k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$$

A2.2 R Condition S_2 for peace in conjunction with R
(peace in conjunction with R vs. civil war with R after cooperation with R)

S_2 is derived using (2-1)>(2-3), where we analyzed whether B would challenge R to a civil war if it chose to work with R. It is theoretically clear that B would not challenge R.

$S_{B(t+1)} >(2-j)\ \delta^2\beta[k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})$
$+\lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})]/\delta\beta[(2(1-i)-\delta(2-j)(1-\lambda)]$

S_2 has a smaller numerator than S_1, which means that $S_2>S_1$, implying that cooperation with A is a loss for B over cooperation with R.

In addition, S_2 is located in the middle of S_1 and S_3, which means that B maintains B's gain by supporting R's regime and peace is built.

$S_{B(t+1)}\ [(1-i)\delta\beta-\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta(1-\lambda)-(1-\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)\delta^2\beta(1-\lambda)]$
$>\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}$
$+(1- \frac{\theta_b b}{\theta_r r+\theta_b b}) (1-j)[\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}]]$

$S_{2(t+1)} = S_{B(t+1)}>$

Molecule

$\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}$
$+(1- \frac{\theta_b b}{\theta_r r+\theta_b b}) (1-j)[\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}]]$

Denominator

$(1-i)\delta\beta-\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta(1-\lambda)-(1-\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)\delta^2\beta(1-\lambda)$

There are two conditions for $S_{2(t+1)}>0$. The first is that the denominator is positive.

$(1-i) >\delta(1-\lambda)[\frac{\theta_b b}{\theta_r r+\theta_b b}+(1-\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)]$

If the above does not hold, then $S_{2(t+1)}=0$.

$S_{B(t+1)} = S_{B(t)} + k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{B(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$
$=S_{B(t)}(1-\lambda)+ k(\alpha_u S_{u(t)} + \alpha_r S_{r(t)}) + \lambda(S_{(t)} - S_{A(t)} - S_{r(t)} - S_{u(t)})$

From the above equation,

$S_{2(t)} = S_{B(t)} >$

Molecule

$\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)}) + \lambda(S_{(t+1)} - S_{A(t+1)} - S_{r(t+1)} - S_{u(t+1)})\}[\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta$
$+(1-\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)[\delta^2\beta]\}-1]$

Denominator

$[(1\text{-i})\delta\beta—\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta(1\text{-}\lambda)—(1\text{-}\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)\delta^2\beta(1\text{-}\lambda)]\ (1\text{-}\lambda)$

The condition for $S_{2(t)}$>0 is that both the denominator and the numerator are positive.

$(1\text{-i}) >\delta(1-\lambda)[\frac{\theta_b b}{\theta_r r+\theta_b b}+(1\text{-}\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)]$

$\delta^2\beta[\frac{\theta_b b}{\theta_r r+\theta_b b}+(1\text{-}\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)]>1$

Or both are negative.

$(1\text{-i}) <\delta(1-\lambda)[\frac{\theta_b b}{\theta_r r+\theta_b b}+(1\text{-}\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)]\delta^2\beta[\frac{\theta_b b}{\theta_r r+\theta_b b}+(1\text{-}\frac{\theta_b b}{\theta_r r+\theta_b b})(1-j)]<1$

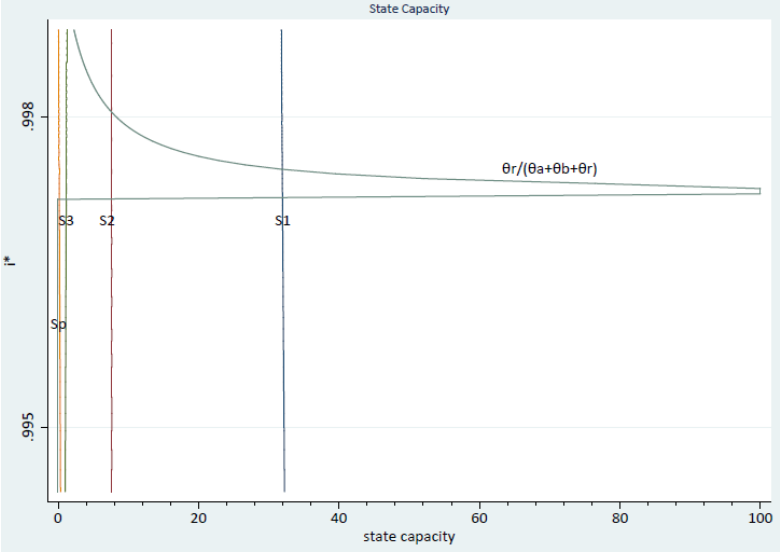

Figure A1. *State capacity after coalition with R*

Appendix 3

A3.1 Conditions for choosing neutrality S_3 (neutral vs. working with A)

S_3 is derived using (2-7)>(2-5). When the gain from a neutral strategy (2-7) exceeds the gain from a strategy that works with A (2-5), B does not work with A and chooses neutrality. The right side of S_3 in Figure 7 means that B chooses to coordinate with A. Since S_3 is close to 0, the neutral strategy does not lead to an increase in state capacity for B and does not lead to an increase in gain.

$S_{B(t+1)}>$

Molecule

$$— \frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}—\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta(1-\lambda)-\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}]—(\theta_r r+\theta_a a-1)S_{B(t)}$$

Denominator

$$[1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})\delta\beta]$$
$$-[\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)]$$

$S_{3(t+1)}>$There are two conditions under which the value is 0.

A3.2 The denominator and numerator are both positive and negative.

$$1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})>\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[(1-\frac{\theta_a a}{\theta_a a+\theta_b b})\delta(1-\lambda)—\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})—\frac{\theta_b b}{\theta_a a+\theta_b b}]$$

And

$$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}]<(\theta_r r+\theta_a a-1)S_{B(t)}$$

or

$$1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})<\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[(1-\frac{\theta_a a}{\theta_a a+\theta_b b})\delta(1-\lambda)—\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})—\frac{\theta_b b}{\theta_a a+\theta_b b}]$$

And

$$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}]$$
$$>(\theta_r r+\theta_a a-1)S_{B(t)}$$

$$S_{B(t+1)}=S_{B(t)}+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{B(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$
$$=S_{B(t)}(1\text{-}\lambda)+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$

From above,

$S_{3(t)}>$

Molecule

$$-\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}—\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta(1-\lambda)-\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}]—(\theta_r r+\theta_a a-1)S_{B(t)}—k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})—\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$

Denominator

$$[1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})\delta\beta]$$
$$-[\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)](1-\lambda)$$

There are two conditions for $S_{3(t)}>0$.

Both denominator and numerator are positive and negative cases.

The positive case is

$$[1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})\delta\beta]$$
$$>[\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)](1-\lambda)$$

and

$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}+$
$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ (1- $\frac{\theta_b b}{\theta_a a+\theta_b b}$) $(1-j)\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ (1- $\frac{\theta_b b}{\theta_a a+\theta_b b}$) (1 −
$j)\ \delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$]< $(\theta_r r+\theta_a a-$
$1)S_{B(t)}k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$

Negative cases are

$[1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1\text{-j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1\text{-i})\delta\beta]$
$<[\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)]\ (1-\lambda)$

and

$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$
$+$ $\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ (1- $\frac{\theta_b b}{\theta_a a+\theta_b b}$) $(1-j)\delta^2\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ (1- $\frac{\theta_b b}{\theta_a a+\theta_b b}$) (1 −
$j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\ \lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$] > $(\theta_r r+\theta_a a-$
$1)S_{B(t)}k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})\lambda(S_{(t)}-\ S_{A(t)}-S_{r(t)}-S_{u(t)})$

A3.4 A Conditions for choosing linkage with S_p Linkage with A vs. linkage with R

S_p is derived using (2-5)>(2-1) We analyzed whether B would adopt a strategy of cooperation with A or with R. It is theoretically clear that B would cooperate with R. The results of the analysis show that B is more likely to cooperate with A than with R. The results of the analysis show that B is more likely to cooperate with A than with R. The results of the analysis show that B is more likely to cooperate with A than with R.

Sp

$S_{B(t+1)}$>

Molecule

— $\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-$
$S_{u(t+1)})\}\}$ — $\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$ (1- $\frac{\theta_b b}{\theta_a a+\theta_b b}$) $(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-$
$S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$

Denominator

$[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1-\text{i})\delta\beta$
$+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})\ (1-j)\delta^2\beta(1-\lambda)]$
—$[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1\text{-i})\delta\beta]$

The condition for $S_{p(t+1)}$>0 is when both the denominator and the numerator are positive.

$[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}$
$(1-\text{i})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})\ (1-j)\delta^2\beta(1-\lambda)]$
$>[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1\text{-i})\delta\beta]$

And $\frac{\theta_b b}{\theta_a a+\theta_b b}$> $(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)$

Or both are negative cases.

$[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1-$
$\text{i})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\frac{\theta_b b}{\theta_a a+\theta_b b})\ (1-\ \ j)\delta^2\beta(1-$
$\lambda)]<[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\text{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1\text{-i})\delta\beta]$

and

$\frac{\theta_b b}{\theta_a a+\theta_b b}<(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)$

$S_{B(t+1)}=S_{B(t)}+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{B(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})=$
$S_{B(t)}(1\text{-}\lambda)+k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})+\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$

From above,

$S_{p(t)}$>

Molecule

$$\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}$$

$$-\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\left(1-\frac{\theta_b b}{\theta_a a+\theta_b b}\right)(1-j)\delta^2\beta\{k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})\}\}-k(\alpha_u S_{u(t)}+\alpha_r S_{r(t)})-\lambda(S_{(t)}-S_{A(t)}-S_{r(t)}-S_{u(t)})$$

Denominator

$$(1-\lambda)[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1-\mathrm{i})\delta\beta$$
$$+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\left(1-\frac{\theta_b b}{\theta_a a+\theta_b b}\right)(1-j)\delta^2\beta(1-\lambda)]$$
$$-[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{i})\delta\beta](1-\lambda)$$

The condition for $S_{p(t)}>0$ is whether both the numerator and denominator are positive or negative. If positive,

$$[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1-\mathrm{i})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$$
$$\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\left(1-\frac{\theta_b b}{\theta_a a+\theta_b b}\right)(1-j)\delta^2\beta(1-\lambda)]$$
$$>[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{i})\delta\beta]$$

and

$$\delta^2\beta\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}+(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)]<-1$$

If both are negative, it is as follows.

$$[\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_b b}{\theta_a a+\theta_b b}\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\frac{\theta_a a}{\theta_a a+\theta_b b}(1-\mathrm{i})\delta\beta+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}$$
$$\frac{\theta_b b}{\theta_a a+\theta_b b}\delta^2\beta(1-\lambda)+\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}\left(1-\frac{\theta_b b}{\theta_a a+\theta_b b}\right)(1-j)\delta^2\beta(1-\lambda)]$$
$$<[\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta+\frac{\theta_r r+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{i})\delta\beta]$$

and

$$\delta^2\beta\frac{\theta_a a+\theta_b b}{\theta_a a+\theta_b b+\theta_r r}[\frac{\theta_b b}{\theta_a a+\theta_b b}+(1-\frac{\theta_b b}{\theta_a a+\theta_b b})(1-j)]>-1$$

A3.5 R Work with A, then civil war with R vs. Work with A, then civil war with A

i^* is derived using (2-2)>(2-4), where B works with R and then remains at peace with R (2-2) exceeds A and then remains at peace with A (2-4), indicating a condition under which R's gain exceeds A's gain.

$$i^*>1+\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta S_{B(t+1)}+(1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r})\delta\beta S_{B(t+1)}-\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}(1-\mathrm{j})\delta\beta S_{B(t+1)}-(1-\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r})[\frac{\theta_b b}{\theta_r r+\theta_b b}\delta^2\beta F+(1-\frac{\theta_b b}{\theta_r r+\theta_b b})\delta^2\beta F]/\left(1-\frac{\theta_a a}{\theta_a a+\theta_b b+\theta_r r}\right)\delta\beta S_{B(t+1)}-(1-\frac{\theta_r r}{\theta_a a+\theta_b b+\theta_r r})\delta\beta S_{B(t+1)}]$$

$$F=[S_{B(t+1)}+k(\alpha_u S_{u(t+1)}+\alpha_r S_{r(t+1)})+\lambda(S_{(t+1)}-S_{B(t+1)}-S_{A(t+1)}-S_{r(t+1)}-S_{u(t+1)})]$$

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