The London School of Economics and Political Science

Essays on Policy-Making Incentives of Government

Yukihiro Yazaki

A thesis submitted to the Department of Economics of the London School of Economics for the degree of Doctor of Philosophy, London, March 2013

Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it).

I declare that my thesis consists of 30676 words.

Abstract

This thesis is a collection of three independent essays on policy-making incentives of government.

The first essay examines whether citizens can indirectly control bureaucrats. If voters and bureaucrats prefer different types of politicians, i.e., they have a conflict of interest, incumbents need to increase the budget to prevent bureaucrats from information manipulation, which leads to an oversized government. If, instead, voters and bureaucrats prefer the same type of politicians, i.e., they have an alignment of interests, bureaucrats can send to voters a credible signal about the type of incumbents, which enhances the selection effect of election. Although political appointees enable politicians to implement the first-best policy in the case of the conflict of interests, they lead to the persistence of inefficient government in the case of the alignment of interests.

The second and third essays study how autocrats commit not to confiscate private property. The second essay argues that the potential of economic growth would help the ruler to make a credible commitment. Since a predatory policy reduces the citizens' income, it would reduce capital accumulation because of the income effect. Then, the ruler faces a trade-off between the current consumption with the predatory policy and the larger future consumption with the moderate policy, which would lead to economic growth.

The third essay models endogenous judicial independence (JI) as a com-

mitment device in the political commitment game. If information on JI is transmitted to citizens with positive probability, the ruler creates JI and does not renege on an announcement. Even if not, the ruler still can guarantee property rights by granting human rights as a signal on JI if the cost of the signal is low.

Acknowledgement

First and foremost, I would like to thank Gerard Padró i Miquel for his constant support and encouragement throughout my doctoral study at LSE. It was a great opportunity for me to learn from his profound insights into both economics and politics. I have learnt from him intuitive explanation of mathematical model, and mathematical explanation of complicated real world.

This thesis benefited from valuable comments from and discussions with numerous individuals. I would like to thank especially Tim Besley, Frank Cowell, Martin Cripps, Akifumi Ishihara, Yasushi Iwamoto, Henrik Kleven, Yu-Hsiang Lei, Mattias Polborn, Motohiro Sato, Johannes Spinnewijn. I would also like to thank several seminar and conference participants, and anonymous referees of journals.

In my doctoral study, I had several opportunities of co-working with researchers of about the same age, Akifumi Ishihara, Yu-Hsiang Lei and Saori Ihara. I have been motivated by their intelligence, knowledge and enthusiasm about economics. I am grateful to them for ongoing projects and would like to apologize to them for the incompletion at the present moment due to only my lack of competence.

I would like to acknowledge the generous funding from Ministry of Education, Culture, Sports, Science and Technology of Japan and Hitotsubashi University.

Finally, I am especially grateful to my parents and my sister for their encouragement and widespread support for my MRes/PhD study in London.

Contents

List of Figures

Chapter 1

Introduction

How do political system and social and economic environments affect the government's policy-making incentives and implemented economic policy? This question is one of the main questions in political economy and is the central theme of this thesis. Politicians (and bureaucrats) have their own interests that would not correspond with social welfare. Then, the implemented policy would not agree with socially optimal policy. Hence, it is important to study what improves the government's policy-making incentives in terms of social welfare. However, even though we can identify the political institution, which gives the government most appropriate incentives for social welfare, we cannot assure that the government establish the institution. Thus, we also need to answer the question whether the government has an incentive to establish the socially optimal institution. The last chapter of this thesis focuses on this question.

Chapter 2 studies how bureaucrats' policy-making discretion affects political accountability and implemented policies. Japanese politics in the last decade has delivered several features of bureaucracy. Firstly, political control over bureaucracy has been one of main issues in national elections. This fact

illustrates difficulties of politically controlling bureaucracy and of reducing inefficiently high public spending caused by bureaucrats. Secondly, mismanagement of bureaucracy led ruling incumbents to lose their offices. This fact exemplifies a possibility that mismanagement of bureaucracy becomes a signal of incumbents' incompetence. Thirdly, a former prime minister, Junichiro Koizumi, successfully used political appointees so that he could improve fiscal consolidation and promote structural reform. This fact illustrate a possibility of political appointment being successfully controlling bureaucracy.

To study above features of bureaucracy, I develop a three-tier model of voters, politicians and administrative bureaucrats. In the hierarchy, politicians, as the agent of voters, are constrained by electoral accountability, while bureaucrats, as the agent of politicians, are controlled by the administrative budget. Politicians are one of two types; the competent (informed) type and the incompetent (uninformed) type.

I analyse the model like a step-by-step process. First, as a benchmark, I study non-hierarchical government such that politicians choose both tax and public goods, and bureaucrats just implement policy, i.e., bureaucrats do not have policy-making discretion. In equilibrium, the incompetent incumbent can always mimic the competent type so that voters cannot identify the type of the incumbent. Thus, in this benchmark, since voters always re-elect any incumbents, political selection does not work at all.

Next, I introduce honest bureaucrats who would like to maximise public goods provision at every period. The equilibrium dramatically differs from that of the benchmark. Now, voters can detect the incompetent incumbent at some state, since the incompetent incumbent mistakenly leads bureaucrats to produce too high or too low a level of public goods compared to the first-best level. This result shows that mismanagement of bureaucracy becomes a signal

of incompetence of the incumbent.

Third, I introduce strategic bureaucrats who take account of the effect of public goods provision on election outcome. The strategic bureaucrats have an incentive to re-elect preferred and not to re-elect unpreferred incumbents. Suppose that voters and the bureaucrats prefer different types of politicians, i.e., the bureaucrats prefer incompetent politicians to competent politicians since the incompetent politicians will offer larger budgets to the bureaucrat future; a case of "conflict of interests." In equilibrium, incumbents need to increase the budget to prevent bureaucrats from manipulating information available to voters, which leads to an oversized government. This result explains the first feature of Japanese bureaucracy and shows that voters have to bear the cost of bureaucracy. If, instead, voters and bureaucrats prefer the same type of politicians, i.e., they have an "alignment of interests," bureaucrats can send to voters a credible signal about the type of incumbents, which enhances the selection effect of election.

Finally, the extended model shows that the political appointment system can mitigate bureaucrats' political power. In equilibrium although political appointees enable politicians to implement the first-best policy in the case of the conflict of interests, they lead to the persistence of inefficient government in the case of the alignment of interests.

Chapter 3 studies autocratic rulers' policy-making incentives. The central question is why some autocrats have adopted a successful policy for economic growth, while others have applied a predatory policy. The political science literature stresses the lack of state capacity in African countries as a reason for underdevelopment. In this view, the African states do not have a sufficient capacity to collect taxes, which is a problem of the weak state. East Asian states, in contrast, have successfully adopted market-friendly policies, such

as property rights protection and sound macroeconomic policies, and have intervened in the market to direct investment to specific industrial sectors and avoid coordination failure.

Chapter 3 focuses on a ruler's commitment problem as the key to economic development. While the literature proposes the reputation equilibrium as a solution to the problem, I use the Markov perfect equilibrium and argue that the potential of economic growth and possibility of the revolution helps the ruler to make a credible commitment. Since a predatory policy reduces the citizens' income, it reduces capital accumulation because of the income effect. Then, the ruler faces a trade-off between the current consumption with the predatory policy, and the larger future consumption with the moderate policy, which leads to economic growth.

I show that if the potential for economic growth is high, the ruler rationally refrains from confiscation today to promote economic growth, and then expropriates the grown resources in the future. One interpretation of this is that an East Asian ruler who expected large economic growth based on high education attainment could restrain from confiscation and commit to market-friendly policies for attaining economic growth. High educational attainment would increase economic growth, not only through high productivity, but also by constraining the ruler's predatory actions.

An extended model studies two effects of revolution on the ruler's policy-making incentives. First, revolution leads to high political accountability, since the ruler engaged in expropriation can be likely replaced during a revolution, and so the ruler hesitates to impose a high tax. In a state with high fractionalisation, e.g., sub-Saharan African countries, the cost of revolution, such as the cost of the successful coordination and management of an organization, would be high. Thus, those countries have an impediment to commitment and

economic development. Second, if the probability of replacement is high for any situation, political instability becomes a problem for commitment. With a high probability of replacement, a ruler chooses present consumption over future consumption.

Furthermore, the model shows potential multiple equilibria due to coordination failure among the private sectors. With the case of multiple equilibria, the ruler needs the cooperation of the citizens to attain the Pareto-superior equilibrium. The *deliberation councils* created by the governments in some Asian countries made coordination possible and led to high-economic growth equilibrium. High fractionalisation in African countries, however, would cause coordination failure.

Chapter 4 studies why some rulers establish and support political institutions, such as independent judiciaries, which constrain rulers' behaviour. It also studies why some rulers protect property rights and human rights, even if it is costly. Figuring out a ruler's incentive to establish institutions and to protect various rights is a key to shedding light on the mechanism of economic development.

An important role of judicial independence (JI) is a commitment device. Research in economic history shows that, in 17th-century England, the government under the Stuarts' reign could not borrow enough money due to their inability to honor contractual agreements. After the Glorious Revolution of 1688, an advanced role of Parliament and the independent judiciary enabled the government to keep their credible commitments. After the Cold War, a number of competitive authoritarian governments came into the world. For the purpose of the states' survival, the Asian authoritarian regimes established high-quality courts. The judiciaries in these countries promote foreign investment and enhance financial credibility in the regimes, which are crucial for

such small states to survive.

An independent judiciary is necessary for credibility, but is not sufficient. A government strong enough to create institutions is also strong enough to abolish the institutions to renege on a promise of property rights protection. Thus, the government must commit to keep the judiciary independent.

Chapter 4 models JI as a commitment device in a political commitment game between a ruler and citizens. In the game, the ruler creates the endogenous level of JI and announces the tax rate. After citizens produce output, the ruler has the opportunity to renege on the announced tax rate. If the ruler tries to renege, he must pay the reneging cost, which is positively proportional to the level of JI

I show that if citizens can observe an established level of JI with some positive probability, the ruler creates an independent judiciary and credibly commits to an announced tax rate. Thus, in equilibrium, the ruler can credibly protects private property rights. The equilibrium tax rate, however, inefficiently high in the sense that the tax rate is on the inefficient side of the Laffer curve. The inefficiently high tax reflects the cost of credible commitment.

In the extended model, I analytically argue the positive role of human rights under the commitment problem. Even though citizens never observe the degree of JI, the ruler still can guarantee property rights by granting human rights as a signal of JI if the cost of the signal is low. In this equilibrium, however, in addition to the inefficiently high tax rate, another source of inefficiency arises. Equilibrium JI is inefficiently high in the sense that JI is not fully used for credible commitment to the lower tax rate. The inefficiently high JI represents the cost of credible signaling.

Chapter 2

The Political Power of Bureaucracy

2.1 Introduction

Japanese politics in the last decade has delivered several features of bureaucracy. First, political control over bureaucracy has been one of main issues in national elections. For instance, the Democratic Party of Japan (DPJ) won the Lower House election in 2009 with a campaign promise of "from government delegated to bureaucracy to politician-led government." Suffering from huge deficits, politicians have attempted to curtail wasteful public spending that has been caused by bureaucrats.[1] Despite administrative reforms, politicians, however, have not succeed in politically controlling bureaucracy. The example shows difficulties of politically controlling bureaucracy and of reducing inefficiently high public spending. Second, mismanagement of bureaucracy could lead ruling incumbents to political defeat. The DPJ lost the Lower House election in 2012, one of the reasons of which was that the DPJ failed in resolving a political conflict with bureaucrats and establishing political leadership. Citizens found the DPJ's incompetence about policy making. The example shows

[1] Niskanen (1971) examines bureaucracy as the primary cause of increases in the size of government.

a possibility that mismanagement of bureaucracy becomes a signal of incumbents' incompetence. Third, a former prime minister, Junichiro Koizumi, used the Council on Economic and Fiscal Policy (CEFP), four members of which were politically appointees from the business sector and from academia. The CEFP made a basic design of an annual budget and helped improving fiscal consolidation and promoting structural reform. In addition to the CEFP members, Mr. Koizumi appointed the increased numbers of junior ministers, state secretaries and parliamentary secretaries, which curbed the influence of bureaucrats on policy making. The example shows a possibility of political appointment being successfully controlling bureaucracy. Although these features are special to Japanese politics, the countries that suffers from bureaucracy seem to have similar features.

By using a three-tier model in which the top principals are voters, the supervisors are politicians and the agents are administrative bureaucrats, this chapter studies how bureaucracy affects political accountability and implemented policies. The above several features of bureaucracy will be explained.

In the governance relationship between politicians and bureaucrats, this chapter focuses on budgetary control as a device of political discipline, and uses a simple model of public finance such that government taxes citizens to produce public goods. While politicians have real authority to choose taxes so as to control the administrative budget, bureaucrats possess policymaking discretion over producing public goods because of complexity of public services and imperfect monitoring by politicians.[2] Then, I will discus the possibility of oversized government due to imperfect control over bureaucracy.

In the accountability relationship between constituents and politicians, this

[2]Politicians would incur excessive costs to write the complete contract about implementation of policies to bureaucrats.

chapter builds on a simple two-period political agency model with two types of politicians; the informed type who observes the cost of public goods, and the uninformed type who does not. Voters never observe the type of incumbents. The main issue is a political selection. Since the informed type can implement the efficient policy in the last period, voters would like to re-elect only the informed type. I will study the selection effect of the election, which is defined as the probability that voters can dismiss their unpreferred type of politicians.

Bureaucrats' policymaking discretion and voters' unobservability of the type of incumbents gives bureaucrats political power. Since voters evaluate incumbents based on public goods produced by bureaucrats as well as taxes imposed by incumbents, bureaucrats may manipulate the information available to voters about incumbents by reducing production of public goods, i.e., sabotage. Then, bureaucrats may try to re-elect their preferred incumbent and to not re-elect their unpreferred.[3]

A main result of the three-tier model is that bureaucrats' political power could cause an inefficiently oversized government when bureaucrats and voters have a "conflict of interests" about the type of politicians; i.e., bureaucrat prefer the uninformed politician while voters prefer the informed politician. Since bureaucrats have an incentive to not re-elect their unpreferred politician, they could try to disguise her as the uninformed type by reducing public goods. The politician needs to increase an administrative budget to prevent bureaucrats from manipulating information since the large budget makes information manipulation costly to bureaucrats.

Another major finding concerns the selection mechanism of elections. In the two-tier model of voters and politicians, the political selection does not

[3]One example is 37th President in the U.S., Richard Nixon, who was worried about sabotage by federal bureaucrats who would be opposed to his conservative policies (Wilson, 1989).

work at all since the uninformed politician can mimic the informed type without any cost. Then, all equilibria are pooling equilibria, in which both types of politicians are always re-elected. However, in the three-tier model with bureaucrats' discretion, since public goods produced by bureaucrats convey information about incumbents to voters, the uninformed politicians cannot always mimic the informed type. Then, voters benefits from the selection effect of semi-separating equilibrium. Furthermore, when both voters and bureaucrats prefer the informed politician, referred to as an "alignment of interests," the bureaucrats' political power enhances the selection effect. For example, suppose that the incumbent is the uninformed type. If bureaucrats produce public goods slightly less than they produce when the incumbent is the informed type, voters can perfectly identify the type of incumbents. Thus, bureaucrats can send a credible signal to voters at a small cost to remove their unpreferred incumbent from office.

This chapter also explores the costs and benefits of the political appointment system. Extended models show that political appointees can prevent bureaucrats from exercising the political power to dismiss the incumbents. In the case of conflict of interests, informed politicians can implement the first-best policy when they can observe the type of bureaucrats with perfect accuracy, or when appointees have a valuable outside option when the appointing incumbent is not re-elected. In the case of alignment of interests, the political appointment system, however, leads to persistence of the inefficient government since the selection effect of the election becomes limited.

This chapter concerns several areas of research. Research on bureaucracies has been developed since the seminal work of Niskanen (1971). Moe (in press) provides an excellent survey on legislative control and delegation. Brehm and Gates (1997) discuss the phenomenon of bureaucratic sabotage preventing

political authorities from implementing their preferred policies. Tirole (1994) and Dixit (2002) study the design of incentives of bureaucrats who engage in the multiple tasks and pursue multiple missions.

This chapter also relates to the research on political accountability initiated by Barro (1973) and Ferejohn (1986). Persson and Tabellini (2002) and Besley (2006) apply the political accountability model to the public finance problem and discuss the size of government. Alesina and Tabellini (2007) study the allocation of policy tasks between politicians motivated by re-election and bureaucrats motivated by career concern.

Bureaucrats' political power is discussed by Moe (2006) and Greif (2008) without any theoretical models.[4] Moe (2006) conjectures that politicians worrying about bureaucrats' political power may relax the control of bureaucracies and choose policies more preferable to bureaucrats. This chapter confirms his conjecture at the case of conflict of interests. The survey by Moe (in press) points out that, although analysis of bureaucrats' political power is important, it is completely missing from the literature.

The three-tier hierarchical model (principal-supervisor-agent) is originally created by Tirole (1986).[5] One main difference between this chapter and Tirole's is as follows. In his model, the top principal is a constitutional designer who can offer complete contracts with monetary transfers both to the supervisor and the agent. In my model, the top principal is a voter who can only select a politician in an election, which implies that abilities of the top principal are quite limited.[6]

[4]Political power defined by Moe (2006) is the extent to which bureaucrats take part in the election directly and choose their supervisors. Greif (2008) discusses political power from a historical perspectives and argues that constitutionalism evolved to facilitate cooperation among the powerful.

[5]Laffont (2000) applies this model to the theory of regulation and studies the normative analysis of constitutional design.

[6]Another difference is the possibility of a side contract between the supervisor and the agent. Although I ignore the possibility of outright collusion, the bureaucrat's political power may generate implicit collusion. Bureaucrats may reduce public goods to hide information and

Finally, although they do not discuss the political power of bureaucracies, two recent papers, Drometer (in press) and Vlaicu and Whalley (2011), study the three-tier hierarchical model with voters as the top principal. They show that a hierarchy has potential advantages for voters since policymakers implement less distorted policies.

The chapter is organised like a step-by-step process. Section 2.2 studies non-hierarchical government. Section 2.3 introduces honest bureaucrats who do not have political power. Section 2.4 introduces strategic bureaucrats who have political power. Section 2.5 analyses political appointments. Section 2.6 provides the conclusion. Proofs are contained in the Appendix.

2.2 Non-Hierarchical Government

This section studies the simplest non-hierarchical model with a two-period horizon, indexed by $t = 1, 2$. The economy is populated by two types of players: identical voters (referred to as "they") and a politician (referred to as "she"). The role of a bureaucrat (referred to as "he") is just to implement the policy which an incumbent orders.

Voters have a per-period quasi-linear utility function over public goods, g, and tax, τ, shown by $u(g) - \tau$.[7] Function u satisfies $u_g > 0$, $u_{gg} < 0$, $u_{ggg} \geq 0$, $\lim_{g \to 0} u_g = +\infty$ and $\lim_{g \to \infty} u_g = 0$. A set of public goods, g, and tax, τ, is referred to as a policy.

The cost of producing public goods, g, is θg, where θ is a stochastic state taking two values, $\overline{\theta}$, with probability $p > 1/2$, and $\underline{\theta}$, with probability $1 - p$,

to re-elect their preferred politicians, which can be interpreted as implicit collusion between supervisors and agents.

[7] Voters would discount their future utility at some positive rate. Since the discount factor of voters does not affect any of the decisions of any of the players, it is omitted from analysis.

where $\overline{\theta} > \underline{\theta} > 0$. The assumption of $p > 1/2$ is just for simplification.[8] At each period, the cost is independently realised. Voters never observe the realised value of θ. The amount of provided public goods needs to satisfy government budget constraints for each period, so that $\tau - \theta g \geq 0$. Let $\hat{g}(\tau; \theta)$ be the maximal amount of public goods the government can produce given tax, τ, and cost, θ, i.e., $\hat{g}(\tau; \theta) = \tau/\theta$.

Politicians are one of two types, $i_t \in \{I, U\}$. While type I politicians, representing "informed" politicians, can observe state θ when it is realised, type U politicians, representing "uninformed" politicians, observes it after taxation is collected. The prior probability of the incumbent being type I is μ. At the end of the first period, incumbent i_1 and a challenger contest the election. Before the election, nature chooses the challenger based on prior probability μ. Politicians know their own type, but voters cannot observe it.

Voters vote after observing implemented policy (g_1, τ_1). Let σ denote the indicator function, which is equal to 1 when voters re-elect the incumbent and to 0 when they elect the challenger. For simplicity, when voters are indifferent about both the incumbent and the challenger, voters re-elect the incumbent.[9]

Politicians have a lexicographic preference. As a first objective, the incumbent maximises the probability of winning an election. If there exist several policies that maximise the probability of winning, as a second objective, the incumbent chooses the policy that maximises voters' utility.[10] Since the election does not take place at the second period, the second-period incumbent chooses

[8] When $p < 1/2$, only the equilibrium strategy of the type U incumbent are changed.

[9] In the mixed-strategy equilibrium such that voters use mix strategies when they are indifferent between the incumbent and the challenger, type U also uses mixed strategy.

[10] The lexicographic preference implies that both types of politicians enjoy some exogenous ego rents from holding the office. Furthermore, the value of the rents is considerably outweighs the payoff derived from the implemented policy. Characteristics of equilibrium does not change, even if politicians' payoff is positively additive of political rents and policy payoffs when political rents are sufficiently large.

the policy that maximises voters' utility.

The timing of events within each period is as follows. Given the incumbent politician i_t:

1. The cost of public goods, θ_t, is realised, and the incumbent observes it only if she is type I.
2. The incumbent politician sets tax, τ_t, and taxation is collected.
3. The incumbent observes the cost if she is type U and produces public goods, g_t.

The election takes place only at the end of the first period.

2.2.1 First-best policies

This section shows the first-best policy, $(g^{fb}(\theta), \tau^{fb}(\theta))$, which maximises voters' utility given cost θ. Since government budget constraint should bind under the first-best policy, the first-best tax is

$$\tau^{fb}(\theta) = \arg\max_{\tau} u(\hat{g}(\tau;\theta)) - \tau, \tag{2.1}$$

and the first-best public goods is $g^{fb}(\theta) = \hat{g}(\tau^{fb}(\theta);\theta)$. Although $g^{fb}(\underline{\theta})$ is greater than $g^{fb}(\overline{\theta})$, the relationship between $\tau^{fb}(\overline{\theta})$ and $\tau^{fb}(\underline{\theta})$ is undetermined under general functional form u.

To make the analysis interesting, assume that function u satisfies the following condition:

$$\tau^{fb}(\overline{\theta}) \neq \tau^{fb}(\underline{\theta}). \tag{A1}$$

Assumption (A1) implies that an information disadvantage does not enable

type U always to impose the first-best tax because she cannot set the tax dependent on cost θ.[11]

2.2.2 Equilibrium

The game is solved with the concept of perfect Bayesian equilibrium (PBE). Let a set of strategies $\{\{\tau_{it}^N, g_{it}^N\}_{i\in\{I,U\},t\in\{1,2\}}, \sigma^N\}$ be the profile of PBE strategies. As shown later, there exists a continuum of PBE. To focus on unique reasonable equilibrium, I define political equilibrium (PE) which the type I politician prefers most among all PBE.[12]

PE makes sense for two reasons. The first reason is based on the timing and information structure of the game. After realisation of the type of incumbents and the cost of public goods, the next player to make a decision is the incumbent. Because of the information disadvantage, type U would like to mimic type I. Thus, type I would have the initiative. The second reason is that the incumbent's second objective is to maximise voters' welfare. Given the result that type I is always re-elected in any PBE, voters should follow the equilibrium policies that type I prefers most.

Before characterising the equilibrium policy, I define three types of potential equilibria on the basis of the first-period tax. Note that while the strategy of type I depends on the cost of public goods, the strategy of type U is independent from it. The separating equilibrium is such that type I and type U choose different taxes for any cost, i.e., $\tau_{I1}^N(\theta_1) \neq \tau_{U1}^N$ for any θ_1. Next, the semi-separating equilibrium is such that type I chooses the different taxes dependent on the cost, and type U chooses the same tax as type I at some state, i.e.,

[11] If condition (A1) does not hold, both types of politicians choose the first-best policy and can always get re-elected.

[12] Although this game can apply the intuitive criterion for choice of public goods, it cannot reduce the number of equilibria.

$\tau_{I1}^N(\theta_1) \neq \tau_{I1}^N(\theta_1') = \tau_{U1}^N$ for any $\theta_1 \neq \theta_1'$. Finally, the pooling equilibrium is defined such that both politicians choose the same taxes for any cost, i.e., $\tau_{I1}^N(\theta_1) = \tau_{U1}^N$ for any θ_1. The later sections will also use this classification.

Strategies at the second period

Both types of politicians maximise voters' welfare at the second period. First, both types produce the maximum amount of public goods given tax τ_2 and cost θ_2,[13]

$$g_{I2}^N(\tau_2; \theta_2) = g_{U2}^N(\tau_2; \theta_2) = \hat{g}(\tau_2; \theta_2). \tag{2.2}$$

Second, type I implements the first-best tax; $\tau_{I2}^N(\theta_2) = \tau^{fb}(\theta_2)$. Since type U does not know the cost of public goods, she maximises voters' expected welfare at the information set.

$$\tau_{U2}^N = \tau^e \equiv \arg\max_{\tau} pu(\hat{g}(\tau; \overline{\theta})) + (1-p)u(\hat{g}(\tau; \underline{\theta})) - \tau. \tag{2.3}$$

Strategies at the first period

First, consider voters' strategy. Since only the type I politician will implement the first-best policy at the second period, voters would like to re-elect only her. Let $\tilde{\mu}(g_1, \tau_1)$ denote the posterior belief that the first-period incumbent is type I given implemented policy (g_1, τ_1). Then, the voting strategy is

$$\sigma^N(g_1, \tau_1) = \left\{ \begin{array}{c} 1 \\ 0 \end{array} \right\} \quad \text{if} \quad \tilde{\mu}(g_1, \tau_1) \left\{ \begin{array}{c} \geq \\ < \end{array} \right\} \mu. \tag{2.4}$$

[13]Note that the equilibrium strategy at the second period does not depend on the history of the game of the first period. The result would also hold in the model of later sections.

From the assumption of the tie-break rule, voters re-elect the incumbent when the updated belief is equal to the prior belief.

Next, consider the equilibrium policies. Politician i_1 chooses public goods such that $g^N_{i_1 1}(\tau_1;\theta_1) \in \arg\max_{g\le\hat{g}(\tau_1;\theta_1)} \sigma^N(g,\tau_1)$ given τ_1 and θ_1. Notice that since both types of politicians have same preference and observe the cost of public goods when choosing public goods, it is satisfied that $g^N_{I1}(\tau_1;\theta_1) = g^N_{U1}(\tau_1;\theta_1)$. Type I sets the tax such that $\tau^N_{I1}(\theta_1) \in \arg\max_\tau \sigma^N(g^N_{I1}(\tau;\theta_1),\tau)$ while type U sets the tax such that $\tau^N_{U1} \in \arg\max_\tau\{p\sigma^N(g^N_{U1}(\tau;\overline{\theta}),\tau) + (1-p)\sigma^N(g^N_{U1}(\tau;\underline{\theta}),\tau)\}$. Since the incumbent can get re-elected if she is identified as type I, type U tries to mimic type I. The following proposition shows that all equilibria are pooling equilibria, in which type U can always mimic type I and get re-elected.

Proposition 2.1. *Consider the game of a non-hierarchical government. All of PBE are a pooling equilibrium, which supports any level of first-period taxes. Both types of politicians choose the same amount of public goods, and PBE supports any size of public goods implementable given the tax and the cost. On the equilibrium path, both types are re-elected at any state.*

Intuition of the proof that there exists no semi-separating equilibrium is as follows. Even if type I chooses different taxes based on the cost, type U can mimic type I by choosing the tax that type I chooses at cost $\overline{\theta}$. Then, type U can always implement policy $(g^N_{I1}(\tau^N_{I1}(\overline{\theta});\overline{\theta}),\tau^N_{I1}(\overline{\theta}))$ even at cost $\underline{\theta}$. However, this strategy is not equilibrium. Since the updated belief of voters observing $(g^N_{I1}(\tau^N_{I1}(\overline{\theta});\overline{\theta}),\tau^N_{I1}(\overline{\theta}))$ is $p\mu/(p\mu+1-\mu) < \mu$, voters do not re-elect the incumbent. Thus, the above strategy of type U is not best response, and any strategy of type U for semi-separating equilibrium is not consistent with Bayesian updated beliefs.

Without hierarchy in government, the selection mechanism of election does

not work. Under the pooling PBE, voters cannot fire the type U politician. The result is compatible with literature that points out that the incentive to establish a good reputation leads to the inefficient equilibrium (Morris, 2001). The politician's lexicographic preference implies that she infinitely weights her reputation in comparison to the policy preference.

There exists a continuum of PBE supported by voters' pessimistic beliefs. Since the incumbent's main concern is re-election, if the probability of re-election is maximised only at the extreme tax, the incumbent chooses that tax at the sacrifice of voters' utility.

Finally, I characterise PE. Since PBE supports any level of taxes which are independent from the cost of public goods, the first-period PE tax is to maximise the voters' "expected" welfare. The PE size of public goods is the maximum able to be produced.

Proposition 2.2. *Consider the game of a non-hierarchical government. In PE, both types implement same tax τ^e, and same public goods $\hat{g}(\tau^e; \theta_1)$.*

Since the type I incumbent knows the current cost, she would like to deviate from the PE tax, τ^e, to the first-best tax, $\tau^{fb}(\theta_1)$, if voters identify her as type I. Even if the first-best policy is implemented, voters cannot believe that the incumbent is type I. Thus, type I does not choose the first-best tax.

2.3 Hierarchical Government without Bureaucrats' Political Power

This section explicitly introduces the third player, a bureaucrat, to study the simple model of hierarchical government. Although the incumbent politician has the right to decide the size of the budget, she needs the bureaucrat to

produce public goods. Because of the complexity of public services and the imperfect monitoring by politicians, the bureaucrat has discretionary power to choose the size of public goods. In sum, the incumbent sets tax, and the bureaucrat sets public goods at each period.

The bureaucrat in this section is called an honest type, denoted by H, and does not take the result of the election into account. The type H bureaucrat's utility is the size of public goods g_t and then his objective is simply to maximise public goods provision given the budget. Type H is assumed to discount the future payoff completely. The assumption implies that the bureaucrat does not evaluate the effect of public goods on the result of the election when choosing public goods. The next section introduces another type of bureaucrats who has a positive discount factor.

The bureaucrat observes the cost of public goods when the cost is realised. The third event of the timing of the game is changed as follows:

3. Given the budget, τ_t, the bureaucrat produces and provides public goods, g_t.

The modified timing of the event implies that the incumbent would control the bureaucrat through the budget size.

2.3.1 Equilibrium

As in the previous section, there exists a continuum of PBE for this game. Thus, again after characterising PBE, I will discuss about PE. Let a set of strategies $\{\{\tau_{it}^H\}_{i\in\{I,UI\},t\in\{1,2\}}, \{g_{Ht}^H\}_{t\in\{1,2\}}, \sigma^H\}$ denote a profile of the PBE strategies.

Notice that, given τ_t and θ_t, the strategy of the type H bureaucrat is $g_{Ht}^H(\tau_t;\theta_t) = \hat{g}(\tau_t;\theta_t)$ for any $t \in \{1,2\}$.

Equilibrium second-period taxes are the same as those in the last section, that is, (2.3), since the equilibrium strategy of public goods at the second period is the same.

At the time of the election, as in the previous section, voters would like to elect only the informed politician. Although the incumbent sets only the tax in the first period, voters use public goods produced by the bureaucrat as well as the tax, so as to identify the type of the incumbent. Thus, the voting strategy is also the same as (2.4).

Politicians take into account not only the direct effect of the tax on his reputation but also the indirect effect through public goods provided by bureaucrats. Type I chooses the tax such as $\tau_{I1}^H(\theta_1) \in \arg\max_\tau \sigma^H(\hat{g}(\tau;\theta_1),\tau)$, while type U chooses $\tau_{U1}^H = \arg\max_\tau p\sigma^H(\hat{g}(\tau;\overline{\theta}),\tau) + (1-p)\sigma^H(\hat{g}(\tau;\underline{\theta}),\tau)$. Again, type U tries to mimic type I so as to increase her re-election probability.

For the type U politician, loss of the right to choose public goods means loss of the ability to manipulate information. Now, Type U may fail to mimic type I. Suppose that type I chooses different taxes in different states, i.e., $\tau_{I1}^H(\overline{\theta}) \neq \tau_{I1}^H(\underline{\theta})$, and also suppose that type U sets $\tau_{U1}^H = \tau_{U1}^H(\overline{\theta})$. Type U can imitate type I only when $\theta = \overline{\theta}$. Then, both types of politicians implement policy $(\hat{g}(\tau_{I1}^H(\overline{\theta});\overline{\theta}), \tau_{I1}^H(\overline{\theta}))$. However, voters can identify the type of the incumbent at $\underline{\theta}$ because the bureaucrat working with type U sets $\hat{g}(\tau_{I1}^H(\overline{\theta});\underline{\theta})$ at $\underline{\theta}$ rather than $\hat{g}(\tau_{I1}^H(\overline{\theta});\overline{\theta})$.

Semi-separating PBE now becomes attainable. In semi-separating PBE, type U sets tax that is more likely to be imposed by type I, so as to mimic type I with a higher probability. An assumption of $p > 1/2$ implies type I more frequently sets $\tau_{I1}^H(\overline{\theta})$ than $\tau_{I1}^H(\underline{\theta})$. Hence, type U optimally chooses $\tau_{I1}^H(\overline{\theta})$. At the less frequent event, $\underline{\theta}$, voters can identify the type of incumbent. Notice that although the politician who sets $\tau_{I1}^H(\underline{\theta})$ is only type I, voters should have off-

equilibrium belief that $\tilde{\mu}^H(\hat{g}(\tau_{I1}^H(\underline{\theta}); \overline{\theta}), \tau_{I1}^H(\underline{\theta})) < \mu$. If otherwise, type U prefers to choose $\tau_{I1}^H(\underline{\theta})$ rather than $\tau_{I1}^H(\overline{\theta})$, which is not consistent to voters' belief.

The following proposition summarises the above discussion.[14]

Proposition 2.3. *Consider the game without the bureaucrat's political power. Semi-separating PBE support any level of taxes type I chooses at first period. The tax type U chooses is* $\tau_{U1}^H = \tau_{I1}^H(\overline{\theta})$. *On the equilibrium path, while type I is always re-elected at any state, type U is re-elected only at* $\overline{\theta}$.

Proposition 2.3 shows the positive role of bureaucracy on the electoral mechanism. The last section shows that if the politician can choose both tax and public goods, voters cannot fire the type U politician. The hierarchical government under which the politician and the bureaucrat have different levels of decision-making authority achieves the selection effect. Intuitively, the hierarchical government can transmit information to voters more than the non-hierarchical government, which helps to avoid the pooling equilibria.

Politicians' mismanagement of bureaucracy becomes a signal of the incumbent being incompetent. In Japan, voters at the Lower House election in 2012 did not support the DPJ, which conflicted with bureaucrats and failed to control them.

Next, I discuss PE in this game. Since the first-best policy is implementable by type I in the semi-separating PBE, it is the PE.

Proposition 2.4. *Consider the game without the bureaucrat's political power. PE is a semi-separating PBE in which the tax type I chooses at the first period is the first-best tax, and the tax type U chooses is* $\tau^{fb}(\overline{\theta})$.

Compared with the PE in the non-hierarchy model represented in Proposition 2.2, voters derive two advantages and incur one disadvantage from the

[14] There also exist pooling PBE which support any level of first-period taxes.

hierarchical government. The first advantage is from the semi-separating equilibrium since it gives voters a chance to fire the type U incumbents. The second advantage is that type I can implement the first-best policy. The disadvantage is that, since type U tries to mimic type I, she mistakenly implements an unpreferred policy, $(\hat{g}(\tau_{I1}^{fb}(\overline{\theta}); \underline{\theta}), \tau_{I1}^{fb}(\overline{\theta}))$, with probability $1-p$. Although the total effect is ambiguous, the disadvantage is negligible under high p and/or high μ since the probability of type U's mistake is small.[15]

2.4 Hierarchical Government with Bureaucrats' Political Power

This section introduces another type of bureaucrats, called the strategic bureaucrat and denoted by S. Let $j_t \in \{H, S\}$ denote the type of bureaucrats at period t. The probability of the type of bureaucrats being type H is η, and only the bureaucrat knows his own type. Furthermore, while the bureaucrat knows the type of the incumbent, he does not know the type of challenger in the election.

The strategic type takes account of the future payoffs as well as the current payoffs. His total payoff is $g_1 + \beta_S g_2$, where $\beta_S \in (0, 1)$ is his discount factor. For future concerns, the strategic type may try to affect the result of the election by manipulating information available to voters.

At the beginning of the first period, nature chooses the type of the bureaucrat, who then chooses the first-period and second-period public goods, i.e., $j_1 = j_2$. Section 2.5 modifies the assumption of $j_1 = j_2$ to study the political appointment system.

Furthermore, for existence of the equilibrium, I assume that public goods,

[15] There exists a semi-separating PBE in the hierarchical model in which "voters' utility" is higher than that in any PBE in the non-hierarchical model.

g, take discrete values. The difference between the n-th and $n-1$-th large public goods is infinitesimally small ϵ. Thus, public goods can still be regarded as the continuous variable except in the equilibrium analysis of the case of alignment of interests in Section 2.4.3.

2.4.1 Equilibrium

This section focuses on the PBE that satisfies the intuitive criterion for voters' off-equilibrium beliefs about the type of the incumbent. After the incumbent chooses tax, the game is a type of signaling games in which the sender is the bureaucrat and receivers are voters. Voters use public goods provided by the bureaucrat to identify the type of the incumbent while the type S bureaucrat strategically sends information to voters. A formal definition of the intuitive criterion is shown in Appendix 2.8.[16] Furthermore, voters' off-equilibrium beliefs about the type of bureaucrats are restricted as follows: Voters believe the bureaucrat to be type S, if off-equilibrium public goods are implemented after off-equilibrium tax is imposed. The off-equilibrium beliefs are reasonable since only the type S bureaucrat may have an incentive to change public goods from $\hat{g}(\tau_1, \theta_1)$.[17] The intuitive criterion reduces the number of PBE only at a case of alignment of interests, as discussed later. Let $\{\{\tau_{it}^S\}_{i\in\{I,U\},t\in\{1,2\}}, \{g_{jt}^S\}_{j\in\{H,S\},t\in\{1,2\}}, \sigma^S\}$ denote a profile of the PBE strategies of this game, which satisfies the intuitive criterion.

[16] Although the tax chosen by the incumbent is a signal showing her type, the usual forward-induction refinements (i.e., intuitive criterion and divinity) for choice of the tax cannot be defined.

[17] Suppose that the incumbent implement an off-equilibrium tax. Then, the off-equilibrium beliefs are compatible to any types of forward-induction restriction since, for the type H bureaucrat, any public goods in $[0, \hat{g}(\tau_1, \theta_1))$ is equilibrium dominated.

Strategies at the second period

Both types of bureaucrats at the second period maximise the size of public goods within a budget. Thus, the strategy of bureaucrats does not change from the previous sections, i.e., (2.2). Furthermore, the equilibrium tax at the second period is also the same as in the previous sections, i.e., (2.3).

The bureaucrat prefers the higher tax given the realised cost since he can produce more public goods. Given the equilibrium policy at the second period, let $G_2(i_2)$ denote the continuation value for the bureaucrat:

$$G_2(i_2) = \begin{cases} p\hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) + (1-p)\hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta}) & \text{if } i_2 = I, \\ p\hat{g}(\tau^{e}; \overline{\theta}) + (1-p)\hat{g}(\tau^{e}; \underline{\theta}) & \text{if } i_2 = U. \end{cases} \tag{2.5}$$

Furthermore, let $\tilde{G}_2 = \mu G_2(I) + (1-\mu)G_2(U)$, which is interpreted as the continuation value for the bureaucrat when the challenger wins election.

I formally define conflict of interests and alignment of interests, the terms discussed in the introduction. Since voters prefer the type I politician to the type U, conflict of interests is defined as $G_2(I) < G_2(U)$. On the contrary, alignment of interests is defined as $G_2(I) > G_2(U)$. The next lemma makes the following analysis simple.

Lemma 2.1. *It holds that* $G_2(U) > G_2(I)$ *when* $\tau^{fb}(\overline{\theta}) > \tau^{fb}(\underline{\theta})$*, and* $G_2(U) < G_2(I)$ *when* $\tau^{fb}(\overline{\theta}) < \tau^{fb}(\underline{\theta})$.

Note that the negative second derivative of utility $u(\cdot)$ implies that voters have motive for consumption-smoothing across state θ while the bureaucrat is neutral in terms of smoothing. Since voters with strong motive for consumption-smoothing prefer higher tax at the high cost state, it holds that $\tau^{fb}(\overline{\theta}) > \tau^{fb}(\underline{\theta})$. Thus, the first-best tax type I chooses is aimed for more smooth-

ing than the taxes type U chooses, which indicates that bureaucrats prefers type U to type I.

Strategies at the first period

First, voters still follow the same voting strategy as (2.4) in the previous sections.

Second, since the type H bureaucrat simply maximises public goods, his strategy is also the same as in the last section, $g^S_{H1}(\tau_1;\theta_1) = \hat{g}(\tau_1;\theta_1)$.

The type S bureaucrat takes the effect of public goods on the voting strategy into account. Then, the strategy depends on the type of incumbents, as follows:

$$g^S_{S1}(\tau_1;\theta_1,i_1) = \arg\max_{g:\ \tau-\theta g\geq 0} g + \beta_S\left\{\sigma^S(g,\tau_1)G_2(i_1) + [1-\sigma^S(g,\tau_1)]\tilde{G}_2\right\}. \quad (2.6)$$

To explain type S's strategy, consider the following example of conflict of interests. Suppose that the incumbent at the first period is type I. Now, the type S bureaucrat has an incentive to fire the incumbent. Given the tax the incumbent chose, if the voting strategy satisfies $\sigma^S(\hat{g}(\tau_1;\theta_1),\tau_1) = 0$, type S optimally chooses $\hat{g}(\tau_1;\theta_1)$. Choice of $\hat{g}(\tau_1;\theta_1)$ attains both the maximisation of public goods provision and the dismissal of the incumbent. Suppose, instead, that $\sigma^S(\hat{g}(\tau_1;\theta_1),\tau_1) = 1$. Then, type S faces a trade-off between maximising public goods and firing the incumbent. If the current payoff is attractive to type S, he chooses $\hat{g}(\tau_1;\theta_1)$ although the incumbent would be re-elected. If otherwise, he chooses the largest public goods in $[0,\hat{g}(\tau_1;\theta_1)]$, which satisfies $\sigma^S(g,\tau_1) = 0$.

The strategies of politicians are defined as follows. The type I politician sets the tax such that $\tau^S_{I1}(\theta_1) \in \arg\max_\tau \eta\sigma^S(\hat{g}(\tau;\theta_1),\tau) + (1-\eta)\sigma^S(g^S_{S1}(\tau;\theta_1,I),\tau)$. Type U chooses $\tau^S_{U1} \in \arg\max_\tau \mathbb{E}\{\eta\sigma^S(\hat{g}(\tau;\theta),\tau)+(1-\eta)\sigma^S(g^S_{S1}(\tau;\theta,U),\tau)\}$, where the expectation operator is over θ_1. Since the incumbent does not observe

the type of the bureaucrat, she maximises the expected payoffs over types of bureaucrats.

PBE has quite different characters between Case (I) conflict of interests and Case (II) alignment of interests, since type S has distinct incentives at the election between them. Thus, I classify the following discussion into two cases.

2.4.2 Case (I): Conflict of Interests

This section considers a case of conflict of interests by assuming that $\tau^{fb}(\overline{\theta}) > \tau^{fb}(\underline{\theta})$. The assumption means that the type S bureaucrat has incentives to re-elect the type U incumbent and to fire type I in the election.

At first, to simplify the following analyses, I define the incentive compatibility of type S's strategy.

Definition 2.1. *The PBE strategy of the type S bureaucrat is incentive compatible if* $g_{S1}(\tau_1; \theta_1, i_1) = \hat{g}(\tau_1; \theta_1)$ *on the equilibrium path.*

If the type S bureaucrat chooses the incentive comparable strategy, he does not differentiate the action between the types of incumbents and he does not try to affect the election. Notice that Definition 2.1 permits type S not to act truthfully when the incumbent sets the out-of-equilibrium tax. The next lemma will allow the analysis to focus on the incentive comparable strategy to characterise the PBE.

Lemma 2.2. *Consider the game with the bureaucrat's political power and a case of conflict of interests. In any PBE, type S's strategy satisfies incentive compatibility.*

Intuition of the proof is as follows. If type S's strategy is not incentive compatible, she tries to affect the election by manipulating information available to voters. However, the condition that voters' updated beliefs should be consistent with the equilibrium strategies implies that voters detect type S's attempt

on the equilibrium path. Thus, only the incentive compatible strategies are consistent with the Bayes' update.

Lemma 2.2 implies that, in any PBE, the type S bureaucrat cannot manipulate information about the type of the incumbent. On the equilibrium path, the type S bureaucrat uses all taxation to produce the maximal size of public goods.

Note that from Lemma 2.2, in any PBE, the type U politician still chooses the tax that type I chooses at cost $\overline{\theta}$, i.e., $\tau^S_{U1} = \tau^S_{I1}(\overline{\theta})$.

The next lemma shows the incentive compatible strategy can be written as two conditions.

Lemma 2.3. *Consider the game with the bureaucrat's political power and a case of conflict of interests. The type S bureaucrat's strategy is incentive compatible if and only if PBE taxes the type I politician chooses, $\tau^S_{I1}(\overline{\theta})$ and $\tau^S_{I1}(\underline{\theta})$, satisfy the following two conditions:*

$$\hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}) + \beta_S G_2(I) \geq \hat{g}(\tau^S_{I1}(\underline{\theta}); \overline{\theta}) + \beta_S \tilde{G}_2, \tag{2.7}$$

and

$$\hat{g}(\tau^S_{I1}(\overline{\theta}); \underline{\theta}) + \beta_S \tilde{G}_2 \geq \hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}) + \beta_S G_2(U). \tag{2.8}$$

Intuition of the proof is as follows. At $\underline{\theta}$, type S can disguise the current cost as $\overline{\theta}$. Suppose that $\underline{\theta}$ is realised and the incumbent is type I. Notice that, from Lemma 2.2 and an equilibrium condition, the equilibrium voting strategy satisfies $\sigma^S(\hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}), \tau^S_{I1}(\underline{\theta})) = 1$ and $\sigma^S(\hat{g}(\tau^S_{I1}(\underline{\theta}); \overline{\theta}), \tau^S_{I1}(\underline{\theta})) = 0$. If the type S bureaucrat chooses full production to satisfy incentive compatibility, he then gets $\hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}) + \beta_S G_2(I)$. However, the type S bureaucrat may try not to re-

elect the incumbent by choosing $\hat{g}(\tau^S_{I1}(\underline{\theta}); \overline{\theta})$ rather than $\hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta})$.[18] Voters, in this case, are deceived into believing that the incumbent is type U, and they dismiss the incumbent. Then, the type S bureaucrat gets $\hat{g}(\tau^S_{I1}(\underline{\theta}); \overline{\theta}) + \beta_S \tilde{G}_2$. Thus, the incentive compatible strategy must satisfy condition (2.7). Note that to dismiss the incumbent, the bureaucrat must abandon the extra taxation, $\tau^S_{I1}(\underline{\theta}) - \underline{\theta}\hat{g}(\tau^{fb}(\underline{\theta}); \overline{\theta}) > 0$, which is economically inefficient. The one-period deviation from the the incentive compatible strategy is not profitable for the current payoff while it is profitable for the future rent.

Condition (2.7) can be rewritten as

$$\tau^S_{I1}(\underline{\theta}) \geq \underline{\tau} \equiv \beta_S(1-\mu)(\overline{\theta} - \underline{\theta})(G_2(U) - G_2(I))/\underline{\theta}\overline{\theta}. \tag{2.9}$$

Under the assumption of the linear cost of producing public goods, if the incumbent sets the high tax, type S needs to abandon the large amount of taxation to manipulate the election. Then, the gain from manipulating the election does not cover the wasted taxation if the imposed tax is sufficiently high.

If, instead, the incumbent is type U, the type S bureaucrat has an incentive to re-elect the incumbent at $\underline{\theta}$. Similar reasoning to the above can be applied to obtain condition (2.8) for the incentive compatible strategy. The condition can be also rewritten as

$$\tau^S_{I1}(\overline{\theta}) \geq \overline{\tau} \equiv \beta_S\mu(\overline{\theta} - \underline{\theta})(G_2(U) - G_2(I))/\underline{\theta}\overline{\theta}. \tag{2.10}$$

From both conditions (2.9) and (2.10), the tax type I chooses is upwardly

[18] Notice that $\hat{g}(\tau^S_{I1}(\underline{\theta}); \overline{\theta})$ may not be the minimum level of public goods to be required for firing the incumbent. The minimum level should depend on the voter's off-equilibrium beliefs. However, proof of Lemma 2.3 in Appendix shows that checking deviation to $\hat{g}(\tau^{fb}(\underline{\theta}); \overline{\theta})$ is sufficient.

restricted, compared with the PBE tax without the bureaucrat's political power in Proposition 2.3. The next proposition summarises the discussion.[19]

Proposition 2.5. *Consider the game with the bureaucrat's political power and the case of conflict of interests. In the semi-separating PBE, the tax the type I politician chooses is anything satisfying* $\tau^S_{I1}(\overline{\theta}) \geq \overline{\tau}$ *and* $\tau^S_{I1}(\underline{\theta}) \geq \underline{\tau}$ *The tax type U chooses is* $\tau^S_{U1} = \tau^S_{I1}(\overline{\theta})$*. The type S bureaucrat chooses the incentive compatible strategy. On the equilibrium path, while type I is always re-elected at any state, type U is re-elected only at* $\overline{\theta}$*.*

I now characterise PE. It is not obvious that PE is a semi-separating equilibrium since the fist-best policies may not be implementable by type I. The next proposition shows that PE is a semi-separating PBE, and while the first-best tax at $\overline{\theta}$ is implementable, the first-best tax at $\underline{\theta}$ may not be implementable.

Proposition 2.6. *Consider the game with the bureaucrat's political power and the case of conflict of interests. PE is the semi-separating equilibrium such that type I chooses* $\tau^{fb}(\overline{\theta})$ *at* $\overline{\theta}$ *and* $\max\{\tau^{fb}(\underline{\theta}), \underline{\tau}\}$ *at* $\underline{\theta}$*, and type U chooses* $\tau^{fb}(\overline{\theta})$*. The first-best tax at* $\underline{\theta}$ *is implemented when* β_S *is low and/or* μ *is high.*

Proposition 2.6 shows that, at $\overline{\theta}$, type I can perfectly control the bureaucrat who tends to overproduce public goods. Intuitively, if type U chose $\tau^{fb}(\overline{\theta})$ at cost $\underline{\theta}$, the type S bureaucrat does not help type U to disguise herself as type I since the cost of information manipulation, $\hat{g}(\tau^{fb}(\overline{\theta}); \underline{\theta}) - \hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta})$, is huge. At $\underline{\theta}$, even type I cannot impose the first-best tax when $\tau^{fb}(\underline{\theta}) < \underline{\tau}$. In this case, if type I chooses the first-best tax, she cannot get re-elected in the election since the type S bureaucrat manipulates the information. Then, the PE tax at $\underline{\theta}$ is higher than the first-best to avoid the strategic bureaucrat's manipulation, so that public goods are overproduced.

[19] Similar to footnote 14, there also exist pooling PBE which support any level of first-period taxes.

The condition for the first-best tax at $\underline{\theta}$ is intuitive. If β_S is low, type S does not much care about the result of the election. High μ implies that even if type S successfully dismisses the type I incumbent, the probability of the challenger being type I is high.

Moe (2006) conjectures that if the bureaucrat has sufficient political power, the political authority would reduce control and choose the policies more favourable to the bureaucrat. The model confirms Moe's prediction if $\tau^{fb}(\underline{\theta}) < \underline{\tau}$. Furthermore, in this case, voters' expected payoffs in PE decreases compared with their payoffs in PE without the political power shown in Proposition 2.4. Thus, the implemented policies are favourable to the bureaucrat and unfavourable to voters.[20]

Japanese politics has not reduced wasteful public spending caused by bureaucrats, although politicians has recognised it. The wasteful public spending would have been a compromise between politicians and bureaucrats. In fact, before the Koizumi administration, the Liberal Democratic Party (LDP), which had ruled Japan for more than a half century, had established an "iron triangle" with bureaucrats and business, which was criticized as one of the causes of the wasteful public spending.

Finally, in spite of the inefficiency of bureaucracies, the model with the bureaucrat's political power still maintains the role of the bureaucrat to enhance the selection mechanism of the election. The semi-separating PE in this section still has an advantage for selecting politicians compared with pooling PE in the non-hierarchical government in Proposition 2.2.

[20] Although bureaucracies lead to oversized governments, bureaucracies are not totally inefficient, as shown by Niskanen (1971). While the model in Niskanen (1971) predicts that governments can become oversized at any time, this chapter shows that, at $\overline{\theta}$, the type I politician still can appropriately control the size of government.

2.4.3 Case (II): Alignment of Interests

Consider a case of alignment of interests by assuming $\tau^{fb}(\overline{\theta}) < \tau^{fb}(\underline{\theta})$. Voters' preference over types of incumbents is the same as the strategic bureaucrat's preference.

In PBE satisfying intuitive criterion, the type S bureaucrat can send a credible signal about the type of the incumbent to voters. Since voters and the type S bureaucrat would like to re-elect the type I incumbent and dismiss type U, the type S bureaucrat have an incentive to perfectly inform voters of the type of the incumbent. Hence, voters should believe the signal type S sends.

Consider the example that type U chooses $\tau^S_{U1} = \tau^S_{I1}(\overline{\theta})$. The intuitive criterion says that when policy $(\hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}) - \epsilon, \tau^S_{G1}(\overline{\theta}))$ is implemented, voters should believe that the type of the incumbent is U with a probability of one. This is because only the type S bureaucrat working with the type U incumbent would like to deviate from full production to $\hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) - \epsilon$ if voters fire the incumbent. Note that, since the portion of type H is strictly positive, the type U politician still chooses the tax that type I chooses at cost $\overline{\theta}$.

The following proposition characterises semi-separating PBE.[21]

Proposition 2.7. *Consider the game with the bureaucrat's political power and a case of alignment of interests. Semi-separating PBE supports any level of taxes type I chooses in the first period. Type U chooses $\tau^S_{U1} = \tau^S_{I1}(\overline{\theta})$. On the equilibrium path, when the first-period incumbent is type I, or is type U and the cost of public goods is $\underline{\theta}$, the type S bureaucrat chooses full production. When the incumbent is type U and the cost is $\overline{\theta}$, type S chooses $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta}) - \epsilon$. While type I is always re-elected, type U is re-elected only when the bureaucrat is type H and the cost is $\overline{\theta}$.*

[21] Again, there also exist pooling PBE which support any level of taxes. When the incumbent is type U, type S chooses $g^S_{S1}(\tau^S_{U1}; \theta_1, U) = \hat{g}(\tau^S_{U1}; \theta_1) - \epsilon$ as in the semi-separating PBE. There also exists pooling PBE such that type S chooses the incentive compatible strategy under type U and chooses $g^S_{S1}(\tau^S_{I1}; \theta_1, I) = \hat{g}(\tau^S_{I1}; \theta_1) - \epsilon$ under type I.

A main implication of the proposition, which will be also discussed in detail below, is that the type U politician cannot get re-elected when the bureaucrat is type S.

Since there exists a PBE such that the type I politician implements the first-best policy, it is the PE.

Proposition 2.8. *Consider the game with the bureaucrat's political power and a case of alignment of interests. PE is the semi-separating equilibrium such that type I chooses the first-best tax and type U chooses* $\tau^{fb}(\overline{\theta})$. *Type S chooses equilibrium action denoted by Proposition 2.7.*

The main point of PE is that political selection works better than in the game without the political power shown in Proposition 2.4. Even though type U can successfully choose the first-best tax, the type S bureaucrat exercises the political power to dismiss her. The type U incumbent can get re-elected only under the type H bureaucrat and the high cost of public goods. The equilibrium probability of type U being re-elected is $p\eta$, while that in the game without political power is p, which is strictly larger than $p\eta$. When the probability of type S approaches 1 i.e., when η approaches 0, the selection mechanism of the election would become perfect.

Tullock (2002) descriptively argues that the bureaucrat would leak information unpleasant to the incumbent without any cost to harm her reputation. The equilibrium in this section presents the theoretical foundation of the bureaucrat's information-leak strategy. Notice that the information-leak strategy works in equilibrium only when the environment fits an alignment of interests. In the case of a conflict of interests, the strategic bureaucrat has an incentive to hide information concerning the type of incumbents.

2.5 Political Appointees

This section studies whether the political appointment system can eliminate bureaucrats' political power. Muller (2008) argues that the spoils system is the one to mitigate bureaucrats' incentive to sabotage.[22] Since the top of the executive branch, the president or the prime minister, appoints her preferred top bureaucrats, preference of the ruling politicians and the bureaucrats would be expected to be similar.

The following sections focus on the two kinds of characteristics of political appointees. Section 2.5.1 examines which type of bureaucrats the incumbent would appoint (the appointment problem). Section 2.5.2 considers the non-guaranteed status of the politically appointed bureaucrat. In the U.S., after the incumbent loses an election, the politically appointed bureaucrats also resign. Section 2.5.3 evaluates the political appointment system.

2.5.1 Appointment problem

This section studies the incumbent's appointment problem among civil servants. In France, the members of the *grands corps* are appointed to high-ranking positions in ministerial cabinets, and the political appointees from outside of the government are relatively few in number.[23] Even if the incumbent loses an election, it is guaranteed that politically appointed bureaucrats can return to their positions in the *grands corps*.

The model is modified as follows. Before the cost of public goods is realised, the incumbent appoints a public servant as a top bureaucrat. There exist two types of candidates for appointment, $\{\tilde{H}, \tilde{S}\}$, where $\tilde{H}$ denotes an honest servant

[22] Suleiman (2003) argues for a growing trend of politicization of bureaucracies in U.S., France, Japan, U.K., Germany and Spain.

[23] See Suleiman (2003) and Rouban (2004)

and $\tilde{S}$ denotes a strategic servant. The incumbent observes the type of servants when appointing. Voters do not observe the incumbent's choice of servants. An appointed servant turns out to be either a type H bureaucrat or a type S with the following probability: $\Pr\{H|\tilde{H}\} = \overline{\eta} \in (\eta, 1)$ and $\Pr\{H|\tilde{S}\} = \underline{\eta} \in (0, \eta)$. The probability implies that if the incumbent appoints the type $\tilde{H}$ candidate, then the candidate is more likely to be the type H bureaucrat than in the last section. Furthermore, even if the incumbent loses an election, the appointed bureaucrat can still keep a position as a public servant and obtain the same second-period payoffs as in the previous sections, although he loses the right to choose public goods. After political appointment, the game follows the same timing as the game of hierarchical government.[24]

Consider, first, a case of conflict of interests. Since voters do not observe the type of the appointed servant, choice of political appointees does not become a signal about the type of the incumbent. Remember that type S's incentive compatible condition (2.7) in the last section was independent of η. Thus, due to the uncertainty of the type of appointed bureaucrat, represented by $\overline{\eta} < 1$, political appointment does not help to mitigate the incentive compatible condition, so that the semi-separating PBE policies and the PE policy are the same as in the last section.[25] Furthermore, since, in the last section, the re-election probability of the type I politician was 1 and that of the type U politician was p, both of which were also independent of η, political appointment does not affect both politicians' PBE payoffs.

Next, consider a case of alignment of interests. In this case, by the same reason as in the case of conflict of interests, the semi-separating PBE policies

[24]Political appointment at the second period does not affect politicians' second-period payoff since both types of bureaucrats chooses full production. Thus, it does not matter for the analysis whether the position of bureaucrats as political appointees is secured when the incumbent wins the election

[25]Pooling PBE policies also do not change.

and the PE policy are the same as in the last section. However, in any PBE, the type U incumbent appoints the type $\tilde{H}$ servant since the incumbent can get re-elected with the higher probability when appointing type $\tilde{H}$ than when appointing type $\tilde{S}$.[26] Then, in semi-separating PBE, the probability of her re-election becomes $p\overline{\eta}$, which is higher than $p\eta$, the re-election probability without political appointees. Thus, political appointees only contribute to the persistence of the inefficient government.

The next proposition summarises the above discussion.

Proposition 2.9. *Consider the game of the appointment problem. The set of the semi-separating PBE policies is the same as that in the game with bureaucrats' political power denoted by Proposition 2.5 and 2.7. PE policy is also the same as in Proposition 2.6 and 2.7. In the case of the conflict of interests, both types of politicians are indifferent between appointing type $\tilde{H}$ and type $\tilde{S}$. In the case of alignment of interests, type U always appoints the type $\tilde{H}$ servant, and she can get re-elected with a higher probability than that without political appointees.*

Since the only difference from PE without political appointees is the persistence of the inefficient government, evaluation of political appointees from this analysis is negative.

Next, consider the case of perfect accuracy of the bureaucrat's type, i.e., $\overline{\eta} = \underline{\eta} = 1$. In the case of the conflict of interests, by appointing type $\tilde{H}$, the type I incumbent can implement the first-best policies at $\underline{\theta}$, even though the condition $\tau^{fb}(\underline{\theta}) \geq \underline{\tau}$ does not hold. This is because the type I politician is no longer worried about the bureaucrat's sabotage to dismiss her. The implementable taxes at high cost $\overline{\theta}$ are, however, still restricted as in (2.10)

[26] Notice that if type U appoints the type $\tilde{S}$ servant, then type U can get re-elected only with probability of $p\underline{\eta}$.

since type U cooperates with the type S bureaucrat who may try to manipulate information.

In the case of alignment of interests, type U appoints the type $\tilde{H}$ servant to prevent the type S bureaucrat from sending information about her type to voters. Then, by imposing the tax that type I chooses at $\overline{\theta}$, type U can get re-elected with probability p. If, instead, type U appoints the type $\tilde{S}$ servant, then her re-election probability would be 0.

Finally, since PBE supports the first-best policy by the type I incumbent, it is the PE.[27] The following proposition summarises the above argument.

Proposition 2.10. *Consider the game of the appointment problem with perfect accuracy. Suppose that it is the conflict of interests case. In the semi-separating PBE, the tax type I sets can be any level at $\underline{\theta}$ and any level higher than $\overline{\tau}$ at $\overline{\theta}$. To implement tax less than $\underline{\tau}$, type I should appoint type $\tilde{H}$. Type S, if appointed, chooses incentive compatible strategy. In PE, which is a semi-separating PBE, type I appoints type $\tilde{H}$ and can implement the first-best policy. Suppose, instead, that it is the alignment of interests case. In the semi-separating PBE, type U appoints type $\tilde{H}$. Then, the equilibrium policies are the same as in the game without political power shown in Proposition 2.3. The PE policies are also same as in Proposition 2.4.*

Propositions 2.9 and 2.10 imply that voters obtain the positive effect of the political appointees only when politicians have perfectly accurate information on the type of bureaucrats. In many countries, to reduce the uncertainty of the type of appointed bureaucrats, the incumbent appoints people personally

[27] There exists separating PBE. Suppose that type I appoints type $\tilde{S}$ and implements policies such as $(\hat{g}(\tau^{fb}(\theta_1);\theta_1)-\epsilon, \tau^{fb}(\theta_1))$ for any θ_1. Further suppose that voters re-elect the incumbent only when policies $(\hat{g}(\tau^{fb}(\theta_1);\theta_1)-\epsilon, \tau^{fb}(\theta_1))$ for any θ are implemented. In this case, type U cannot get re-elected whoever she appoints. Thus, type U imposes τ^e to maximise her second objective. The update belief is consistent with equilibrium actions and satisfies intuitive criterion. However, since type I would like to implement the first-best policy, this separating PBE is not PE.

well acquainted. In France, although the majority members of the *grands corps* does not show obvious political affiliations, they become involved in politics by participating in political circles and showing their loyalty and competence (Suleiman, 2003). Such activity would be not only for the high civil servants to be promoted, but also for the politicians to distinguish the type of civil servants.

2.5.2 Non-guaranteed status of political appointees

Although a position of public servants, who are employed based on a merit system, regarding tenure is generally guaranteed in many countries, the political appointees would not be tenured. For example, in the U.S., the president politically appoints from outside of the government, and, after she loses the presidential election, the all political appointees also resign. This section studies the case in which the politically appointed bureaucrat shares his fate with the incumbent appointing him.

The model in section 2.4 is modified as follows. If the incumbent loses the election, the appointed bureaucrat is also replaced and gets exogenous payoff G at the second period. The outside option is less attractive than keeping the position, i.e., $G < \min\{G_2(I), G_2(U)\}$. Then, at the beginning of the second period, nature chooses the new bureaucrat. Note that the incumbent does not choose the bureaucrat. Politicians, again, do not know the bureaucrat's type.[28]

Let $\{\{\tau^R_{it}\}_{i\in\{I,U\},t\in\{1,2\}}, \{g^R_{jt}\}_{j\in\{H,S\},t\in\{1,2\}}, \sigma^R\}$ denote a profile of the PBE strategies of the game with replacement of bureaucrats. The main difference is the strategy of the type S bureaucrat at the first period. Since the bureaucrat resigns if the

[28]The assumption is irrelevant to get the following results.

incumbent loses the election, his strategy is, instead of (2.6),

$$g^R_{S1}(\tau_1;\theta_1,i_1)=\arg\max_{g:\ \tau-\theta_1 g\geq 0} g+\beta_S\left\{\sigma^R(g,\tau_1)G_2(i_1)+[1-\sigma^R(g,\tau_1)]G\right\}. \quad (2.11)$$

Since $G<\tilde{G}_2$, the type S bureaucrat more likely swears allegiance to the incumbent when appointed than when having a tenured position. The separate analysis into conflict of interests and alignment of interests is not appropriate since the appointed bureaucrat does not have an incentive to fire the incumbent.

Even in this game, Lemma 2.2 still holds in any semi-separating PBE.[29] The incentive compatible condition such that the type S bureaucrat does not try to re-elect the type U incumbent at $\underline{\theta}$ is changed from (2.8) to

$$\hat{g}(\tau^R_{I1}(\overline{\theta});\underline{\theta})+\beta_S G\geq \hat{g}(\tau^R_{I1}(\overline{\theta});\overline{\theta})+\beta_S G_2(U). \quad (2.12)$$

Then (2.10) is also replaced with

$$\tau^R_{I1}(\overline{\theta})\geq \tilde{\overline{\tau}}\equiv \beta_S\overline{\theta}\underline{\theta}(G_2(U)-G)/(\overline{\theta}-\underline{\theta}). \quad (2.13)$$

Since $G<\tilde{G}_2$, it holds that $\tilde{\overline{\tau}}>\overline{\tau}$. Thus, the higher tax is needed to make the strategic bureaucrat truthful. Notice that threshold tax $\tilde{\overline{\tau}}$ decreases in outside option G. Thus, if the outside option becomes more attractive to the bureaucrat, then the smaller tax becomes implementable at state $\overline{\theta}$.

The following proposition characterises semi-separating PBE.[30]

[29] See proof of Proposition 2.11 in Appendix 2.7.

[30] There also exist pooling PBE which support any level of taxes and full production of public goods. Furthermore, in the case of alignment of interests, there exist pooling PBE such that the type S bureaucrat does not choose the incentive compatible strategy. Under the PBE tax larger than $\beta_S\overline{\theta}(G_2(U)-G)$, type S working under type I at $\overline{\theta}$ chooses $g^R_{S1}(\tau^R_{I1};\overline{\theta},G)=\hat{g}(\tau^R_{I1};\overline{\theta})-\beta_S(G_2(U)-G)$. Type S working under type I at $\underline{\theta}$ and working under type U at any cost chooses full production.

Proposition 2.11. *Consider the game with replacement of the bureaucrat. In the semi-separating PBE, the tax type I chooses can be any level at $\underline{\theta}$, and any level higher than $\tilde{\overline{\tau}}$ at $\overline{\theta}$. Type U chooses $\tau^R_{U1} = \tau^R_{I1}(\overline{\theta})$. The type S bureaucrat chooses full production on the equilibrium path. While type I is always re-elected at any cost, type U is re-elected only at $\overline{\theta}$.*

Notice that the first-best tax at $\underline{\theta}$ is implementable by type I, even if the condition $\tau^{fb}(\underline{\theta}) \geq \underline{\tau}$ does not hold. This is because the type S bureaucrat prefers to help the type I incumbent win rather than dismiss her even at the case of conflict of interests. However, since the bias toward a high budget at state $\overline{\theta}$, shown by (2.13), becomes larger in this case than in the model without political appointment, shown by (2.10), it may not be assured that the first-best tax at $\overline{\theta}$ is implementable.

Let $\overline{\tau}_{max} = \max\{\tau^{fb}(\overline{\theta}), \tilde{\overline{\tau}}\}$. The next proposition characterises the PE.

Proposition 2.12. *Consider the game with replacement of the bureaucrat. In PE, the type S bureaucrat uses the incentive compatible strategy. Suppose that $p[u(\hat{g}(\overline{\tau}_{max}; \overline{\theta})) - \overline{\tau}_{max}] + (1-p)[u(\hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta})) - \tau^{fb}(\underline{\theta})] \geq \mathbb{E}u(\hat{g}(\tau^e; \theta)) - \tau^e$. PE is a semi-separating PBE such that type I chooses $\overline{\tau}_{max}$ at $\overline{\theta}$ and $\tau^{fb}(\underline{\theta})$ at $\underline{\theta}$ and type U chooses $\overline{\tau}_{max}$. Then, while type I is always re-elected at any cost, type U is re-elected only at $\overline{\theta}$. Suppose that the above inequality does not hold. PE is a pooling PBE such that the equilibrium tax is τ^e. Then, both types of politicians are always re-elected.*

In the pooling PE case, the strong loyalties of the appointed bureaucrat to type U force voters to bear the burden such that political selection does not work. In this case, the bureaucrat has strong incentive for manipulating information so as to re-elect type U, i.e., $\tilde{\overline{\tau}}$ is quite high. Since $\tilde{\overline{\tau}}$ decreases in outside option G, if the replaced bureaucrat can obtain a sufficiently high payoff at the second period, then political appointment may assure the semi-

separating PE with the first-best tax. In the U.S., the president usually appoints politicians and advisors in her political party, and professors and intellectuals well known in their fields. Their outside options might be high enough to obtain a positive effect from the political appointment system.

2.5.3 Evaluation of the political appointment system

The last two subsections have analysed how the two different characteristics of political appointees affect the bureaucrat's political power. The key assumptions to implement the first-best policy are that the incumbent needs to know perfectly the characteristics of the candidates, or that the appointed bureaucrat needs to have the high value of outside option.

To discuss further the advantages and disadvantages of the political appointment system, consider the case where, using political appointees, type I can implement the first-best policy in PE. Suppose, first, that it is the conflict of interests case. If the condition $\tau^{fb}(\underline{\theta}) \geq \underline{\tau}$ holds, the political appointees are irrelevant. Suppose, instead, the condition does not hold. Then, political appointees benefit voters since the first-best policy now becomes implementable.

Next, consider the case of alignment of interests. Notice that political appointees weaken the selection effect of election since the type U incumbent is more likely to get re-elected under the political appointment system than without it. Persistence of the inefficient government under political appointees decreases voters' expected payoff. Therefore, the political appointment system is effective only in the case of the conflict of interests.

In Japan, a former prime minister, Junichiro Koizumi, actively used the CEFP, which consisted of political appointees, and furthermore increased the number of political appointees in government. A cause of wasteful public

spending has been said to be bureaucrats' huge discretion over policy making. The CEFP designed an annual budget which contributed for improving fiscal consolidation and promoting structural reform. The increased number of political appointees helped implementing the policies and reforms that the CEFP outlined.

2.6 Conclusion

This chapter has studied how bureaucracy affects political accountability and implemented policies. Bureaucrats' policymaking discretion gives voters additional information about incumbents, which contributes to avoid pooling equilibrium. This is because mismanagement of bureaucracy becomes a signal of the incumbent being incompetence.

Bureaucrats' political power leads to the different conclusions in terms of bureaucrats' indirect preference over politicians. When voters and bureaucrats prefer the different types of politicians, the incumbent chooses larger budget than the first-best level so as to prevent bureaucrats from manipulating election. Thus, voters suffer a cost of the oversized government. Instead, when voters and bureaucrats have the same preferences, bureaucrats can always send a credible signal to voters to identify the type of the incumbent. Thus, voters gain a benefit of the enhanced selection mechanism of election. Furthermore, the political appointment system can mitigate bureaucrats' political power, which benefits voters only in the case of conflict of interests. In the case of alignment of interests, political appointees make incompetent government more persistent.

This chapter leaves some important extensions for future work. First, bureaucrats are motivated by the incentive of career concerns (Tirole, 1994; Dewatripont et al., 1999) and/or intrinsically motivated for public interests (Wilson,

1989; Besley and Ghatak, 2005). These can contribute to preventing bureaucrats from strategically using their political power. Second, based on this positive analysis, future work needs normative analysis which examines what kinds of institutions could effectively mitigate and use the bureaucrats' political power.

2.7 Appendix: Proofs

Proof of Proposition 2.1

At first, notice that, given τ_1 and θ_1, both types of politicians choose the same level of public goods, i.e., $g^N_{I1}(\tau_1;\theta_1) = g^N_{U1}(\tau_1;\theta_1)$. Furthermore, there exists no separating PBE. These are because, if any, voters can instantaneously identify the type of incumbents, which is not optimal for type U.

Now, I show that there exist only pooling PBE. Suppose that there exists a semi-separating equilibrium such that type I chooses $\tau^N_{I1}(\overline{\theta}) \neq \tau^N_{U1}(\underline{\theta})$ and type U chooses $\tau^N_{U1} = \tau^N_{I1}(\overline{\theta})$. Suppose that voters re-elect the incumbent if policy $(g^N_{I1}(\tau^N_{I1}(\overline{\theta});\overline{\theta}), \tau_{I1}(\overline{\theta}))$ is implemented. I derive a contradiction since voters' posterior belief about the incumbent is now $\tilde{\mu}(g^N_{I1}(\tau^N_{I1}(\overline{\theta});\overline{\theta}), \tau_{I1}(\overline{\theta})) = p\mu/(p\mu + 1-\mu) < \mu$, which implies that voters should dismiss the incumbent.

Then, suppose that voters do not re-elect the incumbent if the implemented policy is $(g^N_{I1}(\tau^N_{I1}(\overline{\theta});\overline{\theta}), \tau_{I1}(\overline{\theta}))$. Note that, since type U does not choose $\tau^N_{I1}(\underline{\theta})$, voters should re-elect if policy $(g^N_{I1}(\tau^N_{I1}(\underline{\theta});\underline{\theta}), \tau_{I1}(\underline{\theta}))$ is implemented. Then, type U optimally deviates from tax $\tau^N_{I1}(\overline{\theta})$ to tax $\tau^N_{I1}(\underline{\theta})$ since she can get re-elected with positive probability. Thus, the argument, again, derives contraction. Hence, there exists no semi-separating PBE such that type I chooses $\tau^N_{I1}(\overline{\theta}) \neq \tau^N_{I1}(\underline{\theta})$ and type U chooses $\tau^N_{U1} = \tau^N_{I1}(\overline{\theta})$.

A similar argument can be applied to prove that there exists no semi-

separating PBE such that type I chooses $\tau_{I1}^N(\overline{\theta}) \neq \tau_{I1}^N(\underline{\theta})$ and type U chooses $\tau_{U1}^N = \tau_{I1}^N(\underline{\theta})$.

Finally, I show that the pooling PBE supports any level of taxes and any implementable size of public goods. Suppose that voters re-elect the incumbent only when policy $(g(\theta_1), \tau)$ is implemented for any θ_1 where $g(\theta_1) \leq \hat{g}(\tau; \theta_1)$. Then, the both types of politicians optimally choose $(g(\theta_1), \tau)$ dependent on θ_1. Given this action, the voting strategy is optimal for voters.

Proof of Proposition 2.3

At first, consider the case where strategies of politicians are $\tau_{I1}^H(\underline{\theta}) \neq \tau_{I1}^H(\overline{\theta}) = \tau_{U1}^H$. The strategies can be supported by PBE if the off equilibrium belief $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\underline{\theta}); \overline{\theta}), \tau_{I1}^H(\underline{\theta}))$ is strictly less than μ. Then, voters' update beliefs on the equilibrium path satisfies $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\overline{\theta}); \overline{\theta}), \tau_{I1}^H(\overline{\theta})) = \mu$, $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\underline{\theta}); \underline{\theta}), \tau_{I1}^H(\underline{\theta})) = 1$, and $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\overline{\theta}); \underline{\theta}), \tau_{I1}^H(\overline{\theta})) = 0$. Thus, while type I is always re-elected at any states, type U is re-elected only at $\overline{\theta}$.

Next, I show that the above type of PBE is the only semi-separating PBE. Suppose that there exists a semi-separating PBE such that the first-period taxes are $\tau_{I1}^H(\overline{\theta}) \neq \tau_{I1}^H(\underline{\theta}) = \tau_{U1}^H$. The on-equilibrium updated beliefs are $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\underline{\theta}); \underline{\theta}), \tau_{I1}^H(\underline{\theta})) = \mu$, $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\overline{\theta}); \overline{\theta}), \tau_{I1}^H(\overline{\theta})) = 1$, and $\tilde{\mu}(\hat{g}(\tau_{I1}^H(\underline{\theta}); \overline{\theta}), \tau_{I1}^H(\underline{\theta})) = 0$. Then, the equilibrium probability of type U's re-election is $\Pr(\underline{\theta}) = 1 - p$. Now, consider the case where type U deviates her action from $\tau_{I1}^H(\underline{\theta})$ to $\tau_{I1}^H(\overline{\theta})$. In this case, given voters' strategy, the re-election probability of type U is at least greater than $\Pr(\overline{\theta}) = p$, which is greater than equilibrium probability of her re-election. Thus, it leads to a contradiction.

Proof of Lemma 2.1

At first, note that $\hat{g}(\tau^e;\overline{\theta}) < \hat{g}(\tau^{fb}(\overline{\theta});\overline{\theta}) < \hat{g}(\tau^{fb}(\underline{\theta});\underline{\theta}) < \hat{g}(\tau^e;\underline{\theta})$ when $\tau^{fb}(\underline{\theta}) < \tau^{fb}(\overline{\theta})$ and $\hat{g}(\tau^{fb}(\overline{\theta});\overline{\theta}) < \hat{g}(\tau^e;\overline{\theta}) < \hat{g}(\tau^e;\underline{\theta}) < \hat{g}(\tau^{fb}(\underline{\theta});\underline{\theta})$ when $\tau^{fb}(\overline{\theta}) < \tau^{fb}(\underline{\theta})$. Furthermore, from the first order condition, $u_g(\hat{g}(\tau^{fb}(\theta);\theta))/\theta = 1$, and then, $\hat{g}(\tau^{fb}(\theta);\theta) = {u_g}^{-1}(\theta)$.

Let $\overline{\kappa} \equiv u_g(\hat{g}(\tau^e;\overline{\theta}))/\overline{\theta}$ and $\underline{\kappa} \equiv u_g(\hat{g}(\tau^e;\underline{\theta}))/\underline{\theta}$. Note that $\overline{\kappa}$ and $\underline{\kappa}$ are unique because the second derivative of u is always negative. Thus, $\hat{g}(\tau^e;\overline{\theta}) = {u_g}^{-1}(\overline{\kappa}\overline{\theta})$ and $\hat{g}(\tau^e;\underline{\theta}) = {u_g}^{-1}(\underline{\kappa}\underline{\theta})$. Further, note that $\overline{\kappa} > 1$ and $\underline{\kappa} < 1$ when $\tau^{fb}(\overline{\theta}) > \tau^{fb}(\underline{\theta})$, and $\overline{\kappa} < 1$ and $\underline{\kappa} > 1$ when $\tau^{fb}(\overline{\theta}) < \tau^{fb}(\underline{\theta})$. From the first order condition with respect to τ^e, $pu_g(\hat{g}(\tau^e;\overline{\theta}))/\overline{\theta} + (1-p)u_g(\hat{g}(\tau^e;\underline{\theta}))/\underline{\theta} - 1 = 0$. Then, the above equation can be rewritten as $p\overline{\kappa} + (1-p)\underline{\kappa} = 1$.

Suppose that $\tau^{fb}(\overline{\theta}) > \tau^{fb}(\underline{\theta})$. Note that since the third derivative of u is non-negative, function ${u_g}^{-1}(\cdot)$ is convex. Thus, it holds that

$$\frac{{u_g}^{-1}(\underline{\theta}) - {u_g}^{-1}(\underline{\kappa}\underline{\theta})}{\underline{\theta}(1-\underline{\kappa})} \leq \frac{{u_g}^{-1}(\overline{\kappa}\overline{\theta}) - {u_g}^{-1}(\overline{\theta})}{\overline{\theta}(\overline{\kappa}-1)}.$$

Furthermore, since $p\overline{\theta} + (1-p)\underline{\theta} < p\overline{\kappa}\overline{\theta} + (1-p)\underline{\kappa}\underline{\theta}$, it holds that $(1-\underline{\kappa})\underline{\theta}/(\overline{\kappa}-1)\overline{\theta} < p/(1-p)$. Thus,

$$G_2(I) = p{u_g}^{-1}(\overline{\theta}) + (1-p){u_g}^{-1}(\underline{\theta}) < p{u_g}^{-1}(\overline{\kappa}\overline{\theta}) + (1-p){u_g}^{-1}(\underline{\kappa}\underline{\theta}) = G_2(U).$$

Further, by the similar arguments, if $\tau^{fb}(\overline{\theta}) < \tau^{fb}(\underline{\theta})$,

$$G_2(I) = p{u_g}^{-1}(\overline{\theta}) + (1-p){u_g}^{-1}(\underline{\theta}) > p{u_g}^{-1}(\overline{\kappa}\overline{\theta}) + (1-p){u_g}^{-1}(\underline{\kappa}\underline{\theta}) = G_2(U).$$

Proof of Lemma 2.2

I can divide possible equilibria into the three cases: The first two cases are for the semi-separating equilibria and the last is for the pooling equilibria. Note that there exists no separating equilibrium in this game.

(A): Suppose that, in PBE, $\tau^S_{I1}(\underline{\theta}) \neq \tau^S_{I1}(\overline{\theta}) = \tau^S_{U1}$. First, suppose that type S produces $g^S_{S1}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}, I) < \hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta})$. Since $\tilde{\mu}(g^S_{S1}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}, I), \tau_{I1}(\underline{\theta})) = 1$ from the Bayes rule, the type I incumbent working with the type S bureaucrat is re-elected at $\underline{\theta}$. Then, choosing $g^S_{S1}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}, I)$ is not best response to type S. Therefore, it holds that $g^S_{S1}(\tau^S_{I1}(\underline{\theta}); \underline{\theta}, I) = \hat{g}(\tau^S_{I1}(\underline{\theta}); \underline{\theta})$.

Next, suppose that $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U) < \hat{g}(\tau^S_{U1}; \underline{\theta})$. Notice that $\sigma^S(\hat{g}(\tau^S_{U1}; \underline{\theta}), \tau^S_{U1}) = 0$. Then, it should hold that $\sigma^S(g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U), \tau^S_{U1}) = 1$, i.e., the updated on-equilibrium belief should be $\tilde{\mu}(g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U), \tau^S_{U1}) \geq \mu$. Hence, in this case, it should hold that $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U) \leq \hat{g}(\tau^S_{U1}; \overline{\theta})$. Suppose, further, that $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta})$. However, since type S working under the type U incumbent chooses $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta})$, the updated belief is at most $p\mu/[p\mu + p(1-\mu) + (1-p)(1-\mu)(1-\eta)]$, which is strictly less than μ. Suppose, instead, that $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U) < \hat{g}(\tau^S_{U1}; \overline{\theta})$. Note that it holds that $\sigma^S(\hat{g}(\tau^S_{U1}; \overline{\theta}), \tau^S_{U1}) = 1$. Then, type S obtain the positive gain by deviating from $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U)$ to $\hat{g}(\tau^S_{U1}; \overline{\theta})$. Thus, it holds that $g^S_{S1}(\tau^S_{U1}; \underline{\theta}, U) = \hat{g}(\tau^S_{U1}; \underline{\theta})$.

Suppose that $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) < \hat{g}(\tau^S_{U1}; \overline{\theta})$. From the Bayes update, voters' belief $\sigma^S(\hat{g}(\tau^S_{U1}; \overline{\theta}), \tau^S_{U1})$ is equal to 1. Then, a deviation from $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U)$ to $\hat{g}(\tau^S_{U1}; \overline{\theta})$ is profitable to the type S bureaucrat. Thus, it holds that $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta})$.

Finally, suppose that $g^S_{S1}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}, I) < \hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta})$. From the above argument and the Bayes rule, it holds that $\sigma^S(\hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}), \tau^S_{I1}(\overline{\theta})) = 0$. Then, again, a deviation from $g^S_{S1}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}, I)$ to $\hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta})$ is profitable to the type S bureaucrat. Thus, it holds that $g^S_{S1}(\tau^S_{I1}(\overline{\theta}); \overline{\theta}, I) = \hat{g}(\tau^S_{I1}(\overline{\theta}); \overline{\theta})$.

(B): Suppose that in PBE, $\tau_{I1}^S(\overline{\theta}) \neq \tau_{I1}^S(\underline{\theta}) = \tau_{U1}^S$. Although, similarly to (A), it can be proved that type S chooses the incentive compatible strategy, this type of PBE does not exist. Type U would like to deviate from $\tau_{I1}^S(\underline{\theta})$ to $\tau_{I1}^S(\overline{\theta})$ since her probability of re-election increases from $1-p$ to p which is greater than $1/2$.

(C): Finally, suppose that in PBE, $\tau_{I1}^S(\overline{\theta}) = \tau_{I1}^S(\underline{\theta}) = \tau_{U1}^S$. Again, the similar proof to case (A) can be applied to prove the type S's incentive compatible strategy.

Proof of Lemma 2.3

First, consider the "if" part. From Lemma 2.2, if taxes, $\tau_{I1}^S(\overline{\theta})$ and $\tau_{I1}^S(\underline{\theta})$, are supported by some PBE, then the type S bureaucrat chooses the incentive compatible strategy.

Next, consider the "only if" part. Suppose that type S chooses the incentive compatible strategy. Notice that, from Lemma 2.2 and the Bayes rule, the equilibrium voting strategy satisfies $\sigma^S(\hat{g}(\tau_{I1}^S(\underline{\theta}); \underline{\theta}), \tau_{I1}^S(\underline{\theta})) = 1$ and $\sigma^S(\hat{g}(\tau_{I1}^S(\underline{\theta}); \overline{\theta}), \tau_{I1}^S(\underline{\theta})) = 0$. Consider the case where the incumbent is type I and the cost is $\underline{\theta}$. Then, if type S chooses the full production to satisfy incentive compatibility, he then gets $\hat{g}(\tau_{I1}^S(\underline{\theta}); \underline{\theta}) + \beta_S G_2(I)$. Let $\tilde{g} = \hat{g}(\tau_{I1}^S(\underline{\theta}); \underline{\theta}) - \beta_S[\tilde{G}_2 - G_2(I)]$. Condition that type S chooses the full production is such that for any $g \in (\tilde{g}, \hat{g}(\tau_{I1}^S(\underline{\theta}); \underline{\theta}))$, the voting strategy satisfies $\sigma^S(g, \tau_{I1}^S(\underline{\theta})) = 1$. Notice that the off-equilibrium beliefs do not violate the intuitive criterion. Thus, in PBE, it should hold that $\tilde{g} \geq \hat{g}(\tau_{I1}^S(\underline{\theta}); \overline{\theta})$, which is the same as condition (2.7). Finally, condition (2.8) can be obtained as the similar way to the above.

Proof of Proposition 2.5

From Lemma 2.2 and 2.3, in any PBE, taxes the type I politician chooses satisfy condition (2.9) and (2.10). Furthermore, since incentive compatibility is defined on the equilibrium, any taxes, which type I chooses at $\underline{\theta}$, larger than $\underline{\tau}$, and any taxes, which type I chooses at $\overline{\theta}$, larger than $\overline{\tau}$ are supported by some PBE.

Proof of Proposition 2.6

First, I show the following lemma.

Lemma 2.4. *Consider the game with the bureaucrat's political power and the case of the conflict of interests. It holds that $\tau^{fb}(\overline{\theta}) > \overline{\tau}$ and $\tau^{e} > \underline{\tau}$.*

Proof. First, I show the first inequality. Note that $G_2(U) < p\hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) + (1-p)\hat{g}(\tau^{fb}(\overline{\theta}); \underline{\theta})$. Then,

$$\begin{aligned}
&\hat{g}(\tau^{fb}(\overline{\theta}); \underline{\theta}) - \hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) - \beta_S \mu [G_2(U) - G_2(I)] \\
&> \hat{g}(\tau^{fb}(\overline{\theta}); \underline{\theta}) - \hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) - \beta_S \mu (1-p)[\hat{g}(\tau^{fb}(\overline{\theta}); \underline{\theta}) - \hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta})] > 0.
\end{aligned}$$

The last inequality holds because $\hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta}) > \hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta})$. Hence, it holds that $\tau^{fb}(\overline{\theta}) > \overline{\tau}$.

Next, I show the second inequality. Note that $G_2(U) < p\hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) + (1-p)\hat{g}(\tau^{e}; \underline{\theta})$. Then,

$$\begin{aligned}
&\hat{g}(\tau^{e}; \underline{\theta}) - \hat{g}(\tau^{e}; \overline{\theta}) - \beta_S \mu [G_2(U) - G_2(I)] \\
&\qquad > \hat{g}(\tau^{e}; \underline{\theta}) - \hat{g}(\tau^{e}; \overline{\theta}) - \beta_S \mu (1-p)[\hat{g}(\tau^{e}; \underline{\theta}) - \hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta})] > 0.
\end{aligned}$$

The last inequality holds because $\hat{g}(\tau^{fb}(\underline{\theta}); \underline{\theta}) > \hat{g}(\tau^{fb}(\overline{\theta}); \overline{\theta}) \geq \hat{g}(\tau^{e}; \overline{\theta})$. Hence, it hods that $\tau^{e} > \underline{\tau}$. □

From Lemma 2.4, the following inequality holds;

$$
\begin{aligned}
&p[u(\hat{g}(\tau^{fb}(\overline{\theta});\overline{\theta})) - \tau^{fb}(\overline{\theta})] + (1-p)[u(\hat{g}(\max\{\tau^{fb}(\underline{\theta}),\underline{\tau}\};\underline{\theta})) - \max\{\tau^{fb}(\underline{\theta}),\underline{\tau}\}] \\
&\quad > p[u(\hat{g}(\tau^{fb}(\overline{\theta});\overline{\theta})) - \tau^{fb}(\overline{\theta})] + (1-p)[u(\hat{g}(\tau^{e};\underline{\theta})) - \tau^{e}] \\
&\quad > p[u(\hat{g}(\tau^{e};\overline{\theta})) - \tau^{e}] + (1-p)[u(\hat{g}(\tau^{e};\underline{\theta})) - \tau^{e}]
\end{aligned}
$$

Then, the political equilibrium is a semi-separating equilibrium denoted in this proposition.

Finally, consider the condition $\tau^{fb}(\underline{\theta}) \geq \underline{\tau}$. If $\beta_S(1-\mu)(G_2(U)_2 - G_2(I))$ is sufficiently small, the condition holds. Then, if β_S is sufficiently small and/or μ is sufficiently high, the condition holds.

Proof of Proposition 2.7

Suppose that PBE taxes are $\tau^S_{I1}(\underline{\theta}) \neq \tau^S_{I1}(\overline{\theta}) = \tau^S_{U1}$. Notice that the type S bureaucrat working the type I incumbent chooses $g^S_{S1}(\tau^S_{I1}(\underline{\theta});\underline{\theta},I) = \hat{g}(\tau^S_{I1}(\underline{\theta});\underline{\theta})$ at $\underline{\theta}$. If otherwise, type S obtains a gain by deviating to full production since $\sigma^S(\hat{g}(\tau^S_{I1}(\underline{\theta});\underline{\theta}),\tau^S_{I1}(\underline{\theta}))$ is 1. Furthermore, it should hold that type S working with the type U incumbent chooses $g^S_{S1}(\tau^S_{U1};\underline{\theta},U) = \hat{g}(\tau^S_{U1};\underline{\theta})$ at $\underline{\theta}$.

Suppose that the type S bureaucrat working with the type I incumbent chooses the public goods $g^S_{S1}(\tau^S_{I1}(\overline{\theta});\overline{\theta},I) < \hat{g}(\tau^S_{I1}(\overline{\theta});\overline{\theta})$ at $\overline{\theta}$. In this case, it should hold that the voting strategy is $\sigma^S(\hat{g}(\tau^S_{I1}(\overline{\theta});\overline{\theta}),\tau^S_{I1}(\overline{\theta})) = 0$. Then, type S working with the type U incumbent chooses $g^S_{S1}(\tau^S_{I1}(\overline{\theta});\overline{\theta},U) = \hat{g}(\tau^S_{I1}(\overline{\theta});\overline{\theta})$ at $\overline{\theta}$. Hence, the equilibrium probability of re-election for type U is equal to 0. If type U chooses $\tau^S_{I1}(\underline{\theta})$ rather than $\tau^S_{I1}(\overline{\theta})$, then the probability of her re-election is $(1-p)\eta$. Thus, type U's strategy of $\tau^S_{U1} = \tau^S_{I1}(\overline{\theta})$ is not best response. Hence, it holds that $g^S_{S1}(\tau^S_{I1}(\overline{\theta});\overline{\theta},I) = \hat{g}(\tau^S_{I1}(\overline{\theta});\overline{\theta})$.

Now, suppose that the type S bureaucrat working with the type U incum-

bent chooses $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta})$ at $\overline{\theta}$. Notice that $\sigma^S(\hat{g}(\tau^S_{U1}; \overline{\theta}), \tau^S_{U1}) = 1$. However, those strategies violate the intuitive criterion. The PBE action of type S working with the type U incumbent should choose $g^S_{S1}(\tau^S_{U1}; \overline{\theta}, U) = \hat{g}(\tau^S_{U1}; \overline{\theta}) - \epsilon$ at $\overline{\theta}$.

Finally, notice that there exist no PBE such that $\tau^S_{I1}(\overline{\theta}) \neq \tau^S_{I1}(\underline{\theta}) = \tau^S_{U1}$. If it exits, the type U politician prefer to deviate from $\tau^S_{I1}(\underline{\theta})$ to $\tau^S_{I1}(\overline{\theta})$.

Proof of Proposition 2.10

First, consider a case of conflict of interests. I show that, in any PBE such that the type I politician appoints the type $\tilde{S}$ servant, the politician is indifferent between appointing type $\tilde{S}$ and type $\tilde{H}$. Suppose that the type I politician appoints the type $\tilde{S}$ servant. Notice that, on equilibrium path, type S's strategy should be incentive compatible, that is, type S chooses full production. Thus, even if type I appointed type $\tilde{H}$, type I can implement the same PBE policy by choosing the PBE tax. Hence, in this case, type I is indifferent about appointment. Then, the analysis can be restricted to the case where type I appoints the type $\tilde{H}$ incumbent. Furthermore, in any PBE, type U is indifferent about appointment by the same reason discussed above.

Thus, in any PBE, only incentive compatibility condition (2.10) should be satisfied. Then, the PBE policy is the one denoted in this proposition.

Next, consider a case of alignment of interests. Notice that in any PBE, type I is indifferent about appointment since she can always get re-elected whomever she appoints. Suppose that type U appoints type $\tilde{S}$. Then, the intuitive criterion implies that type U is never re-elected. However, by appointing type $\tilde{H}$ and imposing the tax that type I chooses at $\overline{\theta}$, type U can get re-elected with probability p. Thus, in any PBE, type U appoints type $\tilde{H}$, and then the equilibrium

policy is the same as in the game without political power.

Proof of Proposition 2.11

At first, I show that type S chooses the incentive compatible strategy in the semi-separating PBE. Consider the semi-separating equilibrium such that $\tau^R_{I1}(\underline{\theta}) \neq \tau^R_{I1}(\overline{\theta}) = \tau^R_{U1}$. Note that at $\underline{\theta}$, type S appointed by type I chooses full production. Suppose that $\sigma^R(\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta}), \tau^R_{I1}(\overline{\theta})) = 0$. If type S appointed by type U does not choose $\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta})$ for any θ_1, $\sigma^R(\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta}), \tau^R_{I1}(\overline{\theta}))$ should be 1. Thus, suppose that type S appointed by type U chooses $\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta})$ at some θ_1. If he chooses it at $\underline{\theta}$, then he would like to deviate to $\hat{g}(\tau^R_{I1}(\overline{\theta}); \underline{\theta})$. Then, suppose that type S appointed by type U chooses $\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta})$ at $\overline{\theta}$. Notice that type S appointed by type U chooses $\hat{g}(\tau^R_{I1}(\underline{\theta}); \underline{\theta})$ at $\underline{\theta}$. In this case since type U cannot get re-elected at $\underline{\theta}$, her expected probability of re-election is 0. If, instead, type U chooses $\tau^R_{I1}(\underline{\theta})$, her expected probability of re-election is $1 - p$.

Thus, suppose, instead, $\sigma^R(\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta}), \tau^R_{I1}(\overline{\theta})) = 1$. Then, type S chooses full production when the incumbent is type I and the cost is $\overline{\theta}$, and when the incumbent is type U and the cost is $\overline{\theta}$. Suppose that type S appointed by type U chooses $\hat{g}(\tau^R_{11}(\overline{\theta}); \overline{\theta})$ at $\underline{\theta}$. In this case, $\sigma^R(\hat{g}(\tau^R_{I1}(\overline{\theta}); \overline{\theta}), \tau^R_{I1}(\overline{\theta})) = 0$. Then, type S appointed by type U chooses $\hat{g}(\tau^R_{I1}(\underline{\theta}); \underline{\theta})$ at $\underline{\theta}$. Thus, the bureaucrat always chooses the incentive compatible strategy in semi-separating PBE.

Notice that, although it can be shown that the bureaucrat chooses the incentive compatible strategy in the semi-separating equilibrium such that $\tau^R_{I1}(\underline{\theta}) = \tau^R_{U1} \neq \tau^R_{I1}(\overline{\theta})$, type U would always like to deviate to $\tau^R_{I1}(\overline{\theta})$. Thus, such semi-separating equilibrium does not exist.

Then, the incentive compatible condition $\tau^R_{I1}(\overline{\theta}) \geq \tilde{\tilde{\tau}}$ needs to hold and the tax satisfying it can be supported by some belief in PBE.

Proof of Proposition 2.12

Among the semi-separating PBE, type I's most preferred equilibrium is such that she chooses $\overline{\tau}_{\max}$ at $\overline{\theta}$ and $\tau^{fb}(\underline{\theta})$ at $\underline{\theta}$. Then, her expected payoff at the first period is $p[u(\hat{g}(\overline{\tau}_{max};\overline{\theta})) - \overline{\tau}_{max}] + (1-p)[u(\hat{g}(\tau^{fb}(\underline{\theta});\underline{\theta})) - \tau^{fb}(\underline{\theta})]$. The pooling PBE such that the politicians choose τ^e and the strategic produces the maximum amount of public goods is the best for type I among any pooling PBE. Then, her expected payoff at the first period is $pu(\hat{g}(\tau^e;\overline{\theta})) + (1-p)u(\hat{g}(\tau^e;\underline{\theta})) - \tau^e$. Thus, the proposition holds.

2.8 Appendix: Intuitive Criterion

The intuitive criterion of the game with bureaucrats' political power in Section 2.4 is defined as follows. Given PBE tax, $\tau_1 \in \{\tau^S_{I1}(\overline{\theta}), \tau^S_{I1}(\underline{\theta}), \tau^S_{U1}\}$, the game is a signaling game between the bureaucrat (sender) and voters (receiver). Let $\Theta = \{\overline{\theta}, \underline{\theta}\} \times \{I, U\}$, the element of which is denoted by (θ_1, i_1). Furthermore, let $\Gamma(g_1, \tau_1)$ be the set equal to Θ if $g_1 \in [0, \hat{g}(\tau_1;\overline{\theta})]$, and equal to $\{\underline{\theta}\} \times \{I, U\}$ if $g_1 \in (\hat{g}(\tau_1;\overline{\theta}), \hat{g}(\tau_1;\underline{\theta})]$. Notice that $\Gamma(g_1, \tau_1)$ shows the set of the type of politicians and the cost of public goods, under which the bureaucrat can produce public goods, g_1, given tax τ_1. Let $\Upsilon(\Theta')$ be the set of beliefs over $\Theta' \subset \Theta$, where beliefs consist of independent probability.

Now, consider an off-equilibrium public goods g_1. Thus, from assumption of off-equilibrium beliefs on bureaucrats, voters believe that the bureaucrat is type S. Define the voters' best response to policy (g_1, τ_1), if they have posterior belief $\zeta(\theta_1, i_1)$ over $\Gamma(g_1, \tau_1)$, such that

$$BR(\zeta, g_1, \tau_1) = \arg\max_{\sigma \in \{0,1\}} \sum_{(\theta_1, i_1) \in \Gamma(g_1, \tau_1)} [\sigma G_2(i_1) + (1-\sigma)\tilde{G}_2]\zeta(\theta_1, i_1).$$

Furthermore, let

$$BR(\Theta', g_1, \tau_1) = \bigcup_{\zeta \in \Upsilon(\Theta')} BR(\zeta, g_1, \tau_1),$$

where $\Theta' \subset \Gamma(g_1, \tau_1)$. Notice that $BR(\Theta, g_1, \tau_1) = \{0, 1\}$.

Given $(\theta_1, i_1) \in \Theta$, and incumbent i_1's choice of τ_1, define the equilibrium payoff of the type S bureaucrat such that

$$\begin{aligned} G_1(\tau_1; \theta_1, i_1) &= g^S_{S1}(\tau_1; \theta_1, i_1) \\ &\quad + \beta_S \left\{ \sigma^S(g^S_{S1}(\tau_1; \theta_1, i_1), \tau_1) G_2(i_1) + [1 - \sigma^S(g^S_{S1}(\tau_1; \theta_1, i_1), \tau_1)] \tilde{G}_2 \right\}. \end{aligned}$$

It is said that action off-equilibrium action g_1 is equilibrium dominated for type (θ_1, i_1) and tax τ_1 in a PBE if $g_1 \in [0, \hat{g}(\tau_1; \theta_1)]$ and

$$G_1(\tau_1; \theta_1, i_1) > g_1 + \beta_S \max_{\sigma \in \{0,1\}} \left\{ \sigma G_2(i_1) + (1 - \sigma) \tilde{G}_2 \right\}.$$

For each action g_1, let

$$\Phi_S(g_1, \tau_1) = \{(\theta_1, i_1) \in \Gamma(g_1, \tau_1) : g_1 \text{ is equilibrium dominated for } (\theta_1, i_1) \text{ and } \tau_1\}.$$

Then, PBE is said to fail the intuitive criterion if, given τ_1, there exist $(i_1, \theta_1) \in \Theta$ and $g \in [0, \hat{g}(\tau_1; \theta_1)]$ such that

$$G_1(\tau_1; \theta_1, i_1) < g + \beta_S \min_{\sigma \in BR(\Gamma(g, \tau_1) \setminus \Phi_S(g, \tau_1), g, \tau_1)} \left\{ \sigma G_2(i_1) + (1 - \sigma) \tilde{G}_2 \right\}.$$

Chapter 3

Credible Commitment and Economic Growth in Autocracies

3.1 Introduction

Why have some autocrats adopted a successful policy for economic growth, while others have applied a predatory policy?[1] The aim of this chapter is to provide a theoretical model to show the mechanism and conditions under which a leader in an autocratic state implements a policy for economic growth. The question is important, since many autocratic countries, especially in sub-Saharan Africa, remain underdeveloped and suffer from a low quality of government (Collier, 2009).

The political science literature stresses the lack of state capacity in African countries as a reason for underdevelopment (Migdal, 1988; Herbst, 2000). In this view, since the African states do not have a sufficient capacity to collect taxes, they cannot provide public goods for economic development, which is a problem of the weak state. The literature also points out the low quality

[1] Rodrik (2000) and Besley and Kudamatsu (2008) observe that the variance of economic performance in autocracies is larger than in democracies.

of public services provided by African governments despite relatively high public expenditure (Collier and Gunning, 1999). Further, the governments have heavily regulated markets, which reduces the incentive of producers for production.[2] This kind of mismanagement of public services can cause an African growth tragedy (Easterly and Levine, 1997).

East Asian states, in contrast, have successfully adopted market-friendly policies, such as property rights protection and sound macroeconomic policies, and have intervened in the market to direct investment to specific industrial sectors and avoid coordination failure (World Bank, 1993). To establish their legitimacy, the leaders have deployed a shared-growth strategy, including the prevalence of general education, land reform for fair land ownership and housing assistance for low-income families. The rulers in South Korea and Malaysia have created a *deliberation council* to exchange information among the firms and the government, as well as to coordinate investment decisions. These polices are believed to have contributed to the East Asian growth miracle.

I focus on the state's lack of commitment as a main reason for underdevelopment. North and Weingast (1989) argue that for economic growth the state must make a credible commitment as well as guarantee relevant rights for citizens. The lack of commitment results from the coercive power of the state, which allows the state to confiscate property from the citizens. The typical story is that since citizens expect future expropriation or high taxes from the ruler, they underinvest today, which leads to underdevelopment and undertaxation (North and Weingast, 1989; Acemoglu, 2006).

The literature shows two types of solution to the commitment problem. The first solution is to establish a reputation in a repeated game (Grossman and

[2]The regulation is reflected by the low level of competition and the impediment of market transactions in the production market, the high market premium of exchange rates and the low level of financial intermediation in the financial market.

Noh, 1994; Acemoglu, 2006). If the players' discount factors are sufficiently high, cooperation is attainable. The problem of the reputation-based solution is that the ruler's position would be unstable, and so he would likely become myopic.[3] The second solution is to establish institutions, such as a parliament or independent judiciary, which can restrict the ruler's ability to renege (North and Weingast, 1989).[4] This approach, however, does not sufficiently answer the question of how the state can commit to the institutions.

Instead of the above solutions, I use the Markov perfect equilibrium (MPE) and argue that economic growth can help a ruler make a credible commitment to lower taxes. While imposing high taxes increase present taxation, it reduces the capital stock in the next period. If the potential for economic growth is high, it may be rational for the ruler to refrain from confiscation today to promote economic growth and then to expropriate the grown resources in the future. This result could explain the East Asian scenario. One of the main differences between East Asian countries and sub-Saharan African countries in 1960 was the education attainment (World Bank, 1993; Barro and Lee, 1993). One interpretation of this is that an East Asian ruler who expected large economic growth based on high education could restrain from confiscation and commit to market-friendly policies for attaining economic growth. High educational attainment would increase economic growth, not only through high productivity, but also by constraining the ruler's predatory actions.

Other factors also help prevent predation from the ruler. In particular, two of the effects of revolution are noteworthy. First, there is the high political accountability effect, since a ruler engaged in expropriation are likely replaced,

[3]During the Cold War, the leaders of South Korea feared of attack by North Korea. In small countries without natural resources, such as Singapore, which relies on Malaysia to provid water, the leaders always worry about national survival.

[4]Also see Chapter 4 of this thesis.

and so the ruler hesitates to impose a high tax.[5] The key parameter for political accountability is the cost of citizens joining the revolution. In a state with high fractionalisation, the cost of revolution, such as with the successful coordination and management of an organization, would be considered to be high. The high fractionalisation of sub-Saharan African countries would be an impediment to commitment and economic development. Second, if the probability of replacement is high for any situation, the political instability effect becomes a problem for commitment. With a high probability of replacement, a ruler chooses present consumption over future consumption.

Furthermore, the model shows potential multiple equilibria due to coordination failure among the private sectors. With the case of multiple equilibria, the ruler needs the cooperation of the citizens to attain the Pareto-superior equilibrium. The *deliberation councils* created by the governments in South Korea and Malaysia made coordination possible and lead to high-economic growth equilibrium. High fractionalisation in African countries, however, might cause coordination failure.

The chapter is related to the work on the "state capacity" to raise taxation. Besley and Persson (2009) theoretically show that a high expected demand for public spending, such as the potential of war, induces the ruler to invest in the state capacity. Acemoglu (2005) presents a theoretical model to show that a ruler who heavily discounts the future, or suffers from a precarious tenure, will fail in collecting taxation and increasing economic development. His results are confirmed in this chapter.

In the literature there are studies on economic growth under autocracies that explain growth difference. Overland et al. (2005) discuss the relationship

[5]The effect of political accountability is complehensively studied in the democracy model (Persson and Tabellini, 2002).

between capital accumulation and political revolution, and show that if the current capital stock is higher than some threshold level, the autocrat will be willing to promote economic growth. Shen (2007) shows that the autocrat may promote economic development to increase current consumption, although this implies earlier democratization. Oechslin (2010) studies whether an increase in the exogenous government revenue increases growth-promoting government spending.

The chapter is organized as follows. In section 2, I will present a framework of the model and the basic commitment problem without economic growth. In section 3, it is shown how economic growth solves the commitment problem. In section 4, the revolution constraint is introduced. Finally, the conclusion is offered in section 5.

3.2 The Model

3.2.1 The Framework

In an infinite horizon economy, time is discrete and indexed by t. There is a representative citizen and a ruler. The representative agent has the utility function of

$$U_t = \sum_{j=0}^{\infty} \beta^j \ln c_{t+j} \tag{3.1}$$

where c_{t+j} is the consumption at time $t + j$ and β is the discount factor.

The agent can access two types of production technology, both of which use capital as the only production factor and produce the same goods. One is called the marketable section, and the production function is given by $Ak_{a,t}$,

where $k_{a,t}$ is the amount of capital used in the section. The other, which is called the non-marketable section, is denoted by $Bk_{b,t}$, where $k_{b,t}$ is the capital in the non-marketable section. I assume $A > B$, which means that the marketable sector is more efficient at producing goods than the non-marketable section. Let $k_t = k_{a,t} + k_{b,t}$. For clear description, let $\alpha_t \in [0, 1]$ denote the fraction of capital used for the marketable sector, so that, given the available capital stock k_t, the capital stocks of each sector can be rewritten as $k_{a,t} = \alpha_t k_t$ and $k_{b,t} = (1 - \alpha_t)k_t$. For simplicity, I assume no depreciation of capital.

The ruler imposes a tax rate τ_t on the output at time t. The output from the marketable section is fully taxed and a fraction $\theta \in (0, 1)$ of the output from the non-marketable section is taxable. Parameter θ reflects the fact that in the non-marketable sector tax avoidance would be possible. The ruler's objective is not to maximize social welfare, but to maximize the sum of the discounted present value of the utility derived from consumption $c_{r,t}$, which is supposed to be the total amount of taxation at the same period, i.e. $c_{r,t} = \tau_t A\alpha_t k_t + \tau_t \theta B(1 - \alpha_t)k_t$. The ruler's utility function is

$$V_t = \sum_{j=0}^{\infty} \beta_r^j \ln c_{r,t+j}, \tag{3.2}$$

where β_r is the ruler's discount factor, which is possibly different from the agent's discount factor β. For simplicity, I ignore the productive role of the ruler.[6] Further, it can be interpreted that some of the ruler's consumption would benefit the agent as public goods, such as national defense. Such an extension does not change the following analysis if the agent's utility from the public spending is additively separable from the utility of the private consumption.

[6]The assumption of A being higher than B implies that the ruler provides the public goods for production in the marketable sector. See Barro (1990) for the productive role of public goods that the ruler provides for economic growth.

The timing of events within every period is as follows:

1. Given capital stock k_t, the agent makes investment decision α_t.
2. The ruler sets the tax rate τ_t.
3. The agent produces goods and the ruler receives taxation.
4. The agent consumes some of the output, c_t, and saves the rest as capital stock for the next period, k_{t+1}.

The assumption that the autocrat can set the tax rate after the agent chooses the production technology implies that he has absolute authority in terms of setting policy. In other words, even if the autocrat announces the tax rate before the agent invests, he can renege on the announcement and impose a different tax rate, and the commitment problem would be realised.

The Markov perfect equilibrium is used as a solution in this model. The Markov strategies are functions only of the current payoff-relevant state, k_t, and of prior actions within the same period. Furthermore, I focus on the stationary MPE, such that the ruler's decision on the tax rate is independent from the current level of capital stock.

Although the ruler's choice of the tax rate depends on the agent's investment decision, α_t, the agent is not supposed to internalize the effect when making a decision on the production technology. The assumption is implied by the fact that the ruler's choice of tax depends on the "aggregate" levels of capital. Since the size of each agent is infinitesimally small, it does not take the effect of the decision into account.

3.2.2 Commitment Problem Without Economic Growth

This subsection discusses the simple model without capital accumulation. Suppose that the capital stock is constant over time: $k_t = \bar{k}$ for any t. Let $\{\alpha^N, c^N, \tau^N\}$ be a profile of the MPE strategies of this game.

The MPE with constant capital stock are backwardly characterized as follows. First, the agent consumes all post-tax output, i.e. $c^N(\alpha_t, \tau_t) = (1-\tau_t)A\alpha_t\bar{k} + (1-\tau_t\theta)B(1-\alpha_t)\bar{k}$. Then, it is easily shown that the ruler optimally sets $\tau^N(\alpha_t) = 1$ for any $\alpha_t \in [0,1]$. Since the tax rate does not affect the capital stock in the next period, the ruler will grab all resources available.

Finally, anticipating this tax rate, the agent does not invest in the marketable section, i.e. $\alpha^N = 0$. More specifically, the agent invests in the more productive sector from the post-tax perspective, and then makes a decision based on the following general rule:

$$\alpha^N \begin{cases} = 1 & \text{if } \tau^N(\alpha^N) < \bar{\tau} \\ \in [0,1] & \text{if } \tau^N(\alpha^N) = \bar{\tau} \\ = 0 & \text{if } \tau^N(\alpha^N) > \bar{\tau} \end{cases} \tag{3.3}$$

where $\bar{\tau} = (A-B)/(A-\theta B) \in (0,1)$. Note that $\bar{\tau}$ is the tax rate under which the post-tax productivity is the same over the sectors. Thus, given the ruler's MPE strategy on the tax rate, the agent's optimal response is to allocate all capital to the non-marketable sector. The taxation that the ruler can collect in equilibrium is $\theta B\bar{k}$.

Now, consider a hypothetical situation in which the ruler can commit to the tax rate, $\tau_t = \bar{\tau}$. Then, since the agent invests only in the marketable section every period, the taxation to the ruler is $\bar{\tau}A\bar{k}$. Hence, the ruler would like to

commit to a tax rate equal to $\bar{\tau}$, which leads to efficient investment, if

$$\bar{\tau}A > \theta B. \tag{3.4}$$

Condition (3.4) holds when ratio A/B is high and/or θ takes the extreme value, which is sufficiently low or high. Under the high ratio of A/B, the ruler would like to lead the agent to invest in the market sector.[7] A low value of θ means that the ruler faces difficulties in capturing the output in the non-marketable sector. A high value of θ leads to a high $\bar{\tau}$ since the citizens are reluctant to invest in the non-market sector. Although the effects create an incentive for the ruler to commit to the low tax rate, the commitment is not be attainable in MPE.

Proposition 3.1 summarises the results in this subsection.

Proposition 3.1. *In MPE, the agent always uses the non-marketable section for any* $\bar{k} > 0$ *and the ruler sets the tax rate equal to 1. Further, the ruler suffers from the commitment problem if the ratio* A/B *is high and/or* θ *is extremely low or high, all of which derive inequality (3.4).*

Proposition 3.1 shows a lack of commitment to the low tax rate, leading to underinvestment. The importance of the commitment problem has been comprehensively shown in the literature on the political economy of economic development.[8] Furthermore, the empirical literature has found positive correlation between investments and property rights protection.[9] Thus, it would be a consensus that one of the key elements for economic development is to

[7]There also exists an indirect effect from an increase of A/B, which is an increase of the threshold tax rate $\bar{\tau}$, as the agent is more likely to invest in the marketable sector.

[8]See Acemoglu (2006) for a theoretical analysis and see North and Weingast (1989) for historical research.

[9]See Knack and Keefer (1995) and Acemoglu et al. (2005) for a cross-country analysis and Besley (1995) for a farmer-level analysis.

credibly commit to property rights protection of private capital. Although the significance of commitment is widely confirmed, it is not obvious how commitment would be credibly made. While the proposed solutions for credible commitment in the literature are reputation in a repeated game and institutional development, in the next section it is shown that economic growth is also a key for commitment.

Finally, to stress the importance of commitment in this economy, I assume that inequality (3.4) always holds.

3.3 Markov Perfect Equilibrium with Economic Growth

In this section, I characterize the MPE, in which the capital accumulation of the agent affects the ruler's decision on the tax. A key point is that the tax on the output has the income effect on the agent's consumption-saving choice. Let $\{\alpha^G, c^G, k^G, \tau^G\}$ denote a set of the MPE strategies for the players.

3.3.1 The Agent's Decision

In the first stage of period t, the agent still follows investment rule (3.3), evaluated at the MPE tax $\tau^G(\alpha^G; k_t)$, since the agent would like to invest in the sector with higher productivity.[10]

In the fourth stage, the agent makes a consumption-saving choice. Lemma 3.1 shows the consumption and saving functions given $\{k_t, \alpha_t, \tau_t\}$.

[10]Under the stationary MPE, the investment rule does not depend on the current capital stock, since the ruler's equilibrium decision on the tax rate is independent from it.

Lemma 3.1. *Given k_t, α_t, τ_t, the agent chooses consumption, $c^G(\alpha_t, \tau_t; k_t)$, and capital, $k^G(\alpha_t, \tau_t; k_t)$, such that*

$$c^G(\alpha_t, \tau_t; k_t) = ((1-\beta)/\beta)[\gamma_a(\tau_t)\alpha_t + \gamma_b(\tau_t)(1-\alpha_t)]k_t, \tag{3.5}$$

$$k^G(\alpha_t, \tau_t; k_t) = [\gamma_a(\tau_t)\alpha_t + \gamma_b(\tau_t)(1-\alpha_t)]k_t, \tag{3.6}$$

where $\gamma_a(\tau) = \beta(1 + (1-\tau)A)$ and $\gamma_b(\tau) = \beta(1 + (1-\theta\tau)B)$. Hence, the growth rate in this economy is denoted by $\gamma_a(\tau_t)\alpha_t + \gamma_b(\tau_t)(1-\alpha_t)$.

Lemma 3.1 can be derived using the Euler equation, the budget constraint and the transversality condition. Capital accumulation in this economy is determined by equation (3.6), which implies that fraction β of the post-tax output and the non-depreciated current capital stock is saved for the next-period capital stock. An increase in τ, of course, reduces the next capital stock because of the income effect.

3.3.2 Commitment Problem and Equilibrium

Although the Markov strategy of the tax rate is a function of k_t and α_t, I will only characterize the action on the equilibrium path. If the ruler puts weight on the future consumptions, then he has incentive to set the low tax rate to promote economic growth. I will check whether this mechanism is self-enforcing in MPE.

The ruler's optimization problem is summarised by the following Bellman equation:

$$\mathcal{V}^G(\alpha_t; k_t) = \max_{\tau_t \in [0,1]} \ln[\tau_t(\alpha_t A + (1-\alpha_t)\theta B)k_t] + \beta_r \mathcal{V}^G(\alpha^G_{t+1}; k^G_{t+1}), \tag{3.7}$$

$$\text{s.t. } k^G_{t+1} = k^G(\alpha_t, \tau_t; k_t) \text{ and } \alpha^G_{t+1} = \alpha^G.$$

Before solving the MPE policy, I consider a hypothetical situation where the agent always chooses the same α for any available capital. From the Euler equation and the stationary condition, such as the constant tax rate, the solution of this hypothetical problem is $\hat{\tau}(\alpha) = \min\{\hat{\tau}^I(\alpha), 1\}$, where $\hat{\tau}^I(\alpha)$ is the interior solution of the above problem, such that

$$\frac{1}{\hat{\tau}^I(\alpha)} + \frac{\beta_r}{1-\beta_r} \cdot \frac{\gamma_a'(\hat{\tau}^I(\alpha))\alpha + \gamma_b'(\hat{\tau}^I(\alpha))(1-\alpha)}{\gamma_a(\hat{\tau}^I(\alpha))\alpha + \gamma_b(\hat{\tau}^I(\alpha))(1-\alpha)} = 0. \tag{3.8}$$

The first term of the equation (3.8) denotes an increase in the marginal utility from the marginal increase in the tax rate. The second term shows a decrease in the marginal utility from the decrease in the capital accumulation over the future. If the effect of the first term is sufficiently low compared to that of the second term, the ruler optimally sets a lower tax rate than 1. Lemma 3.2 summarises the discussion.

Lemma 3.2. *Suppose that the agent always chooses, $\alpha_t = \alpha$ for any t. Then the ruler sets tax rate $\hat{\tau}(\alpha) = \min\{\hat{\tau}^I(\alpha), 1\}$, where*

$$\hat{\tau}^I(\alpha) = \frac{(1-\beta_r)[1 + \alpha A + (1-\alpha)B]}{\alpha A + (1-\alpha)\theta B}. \tag{3.9}$$

Tax rate $\hat{\tau}^I(\alpha)$ satisfies that $\partial\hat{\tau}^I/\partial\alpha < 0$, $\partial\hat{\tau}^I/\partial\beta_r < 0$, $\partial\hat{\tau}^I/\partial A <\ (=)\ 0$ if $\alpha \in (0,1]$ $(a = 0)$ and $\partial\hat{\tau}^I/\partial B \gtreqless 0$ if and only if $\alpha \gtreqless \theta/(1-\theta)A$.

Equation (3.9) can be derived as an explicit solution of equation (3.8). Notice that an increase in α decreases $\hat{\tau}^I(\alpha)$. The key point is that under high α, the negative effect of the tax rate on economic growth becomes large.

I can now characterize the MPE tax rate, τ^G. At first, I will consider the case of $\hat{\tau}^I(1) \leq \bar{\tau}$. In this case, imposing the low tax rate $\hat{\tau}^I(1)$ is self-enforcing if the agent always chooses the marketable sector. In fact, the agent invests only in

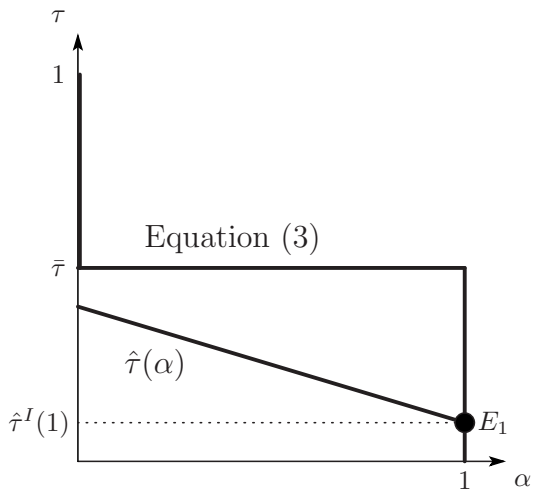

Figure 3.1: Unique growth equilibrium

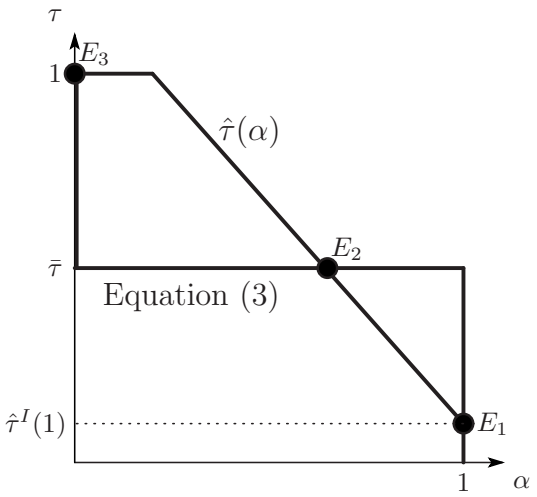

Figure 3.2: Multiple equilibria

the market sector if the ruler chooses $\hat{\tau}^I(1)$.

Although $\hat{\tau}^I(1)$ is the equilibrium tax rate, if $\hat{\tau}^I(1) < \bar{\tau} < \hat{\tau}^I(0)$, there also exists two inefficient stationary equilibria due to coordination failure. The first is that the agent chooses α^G, which satisfies $\hat{\tau}^I(\alpha^G) = \bar{\tau}$. Then, the ruler credibly sets $\bar{\tau}$. The second is more inefficient, in that the agent invests all resources in the non-marketable section and the ruler sets $\tau^G = \min\{\hat{\tau}^I(0), 1\}$. Notice that the MPE of $\alpha^G = 1$ and $\tau^G = \hat{\tau}^I(1)$ is Pareto superior to the other equilibria. Since the agent does not take into account the effect of the production choice on the ruler's decision, coordination failure occurs among agents.

In Figures 3.1 and 3.2, the ruler's optimal tax in the hypothetical situation, i.e. $\hat{\tau}(\alpha)$, and the agent's optimal investment rule given the ruler's strategy, i.e. equation (3.3), are denoted. Their intersections represent MPE. Figure 3.1 shows the unique high growth MPE in which a low tax and efficient investment are realised. Figure 3.2 shows the multiple equilibria due to coordination failure. Any points of E_1, E_2 and E_3 are attainable in MPE.

Finally, only the inefficient equilibrium exists when $\hat{\tau}^I(1) > \bar{\tau}$. In this case, the ruler sets $\tau^G = \min\{\hat{\tau}^I(0), 1\}$ and the agent invests only in the non-marketable

section. Although the ruler would like to commit to tax rate $\bar{\tau}$ to promote production and economic growth, the ruler is tempted into imposing the higher tax rate. Hence, in this case, economic growth does not become a commitment device.

The key variable for a credible low tax is the elasticity of the growth rate on the tax rate: $-\hat{\tau}^I[\gamma_a'(\hat{\tau}^I)\alpha+\gamma_b'(\hat{\tau}^I)(1-\alpha)]/[\gamma_a(\hat{\tau}^I)\alpha+\gamma_b(\hat{\tau}^I)(1-\alpha)]$. If the elasticity is high, the marginal decrease in economic growth due to imposing the higher tax becomes larger. Hence, this mechanism prevents the ruler from imposing the high tax rate and stagnating the economy, since increasing the tax rate heavily decreases the agent's capital accumulation. Notice that, given the levels of τ and $\alpha \in (0,1]$, the higher the value of A, the higher the elasticity.[11] While productivity A increases the growth rate, it has a large impact on the marginal decrease in economic growth.

Furthermore, the ruler with the high discount factor could commit to a low tax rate. Since he puts weight on future consumption, he has an incentive to promote economic growth.

The following proposition summarises the discussion.

Proposition 3.2. *There are three types of MPE dependent on parameters. (i) When both productivities A and B are high and/or the ruler's discount factor δ is high (satisfying $\hat{\tau}^I(0) < \bar{\tau}$), there exists a unique high-growth equilibrium in which the ruler can commit to a low tax rate $\hat{\tau}^I(1)$ and the agent invests everything in the marketable sector.*

(ii) When productivity A is low and/or the ruler's discount factor δ is low (satisfying $\bar{\tau} < \hat{\tau}^I(1)$), there exists a unique low-growth equilibrium in which the ruler sets $\min\{\hat{\tau}^I(0), 1\}$ and the agent invests everything in the non-marketable section.

(iii) When productivity A is high but B is low (satisfying $\hat{\tau}^I(1) \leq \bar{\tau} \leq \hat{\tau}^I(0)$),

[11] This result holds when capital depreciation or capital taxation are not one hundred percent.

multiple equilibria exist due to the coordination problem. One is the high-growth equilibrium, which is the same as in case (i). Another is the low-growth equilibrium, which is the same as in case (ii). The last is the intermediate equilibrium, in which the ruler sets $\bar{\tau}$ and the agent invests in both sectors.

As the East Asian non-democratic countries could adopt and commit to the market-friendly policies, their economic and political environments satisfied the conditions for the high growth equilibrium in this model. The productivity of the marketable sector would reflect many variables in the economy; for example, the formal and informal institutions favoring economic transactions, technology, education and so on. The relatively high educational attainment in the East Asian countries in 1960, compared to the African countries, has been observed. The results of the model suggest that educational attainment not only contributes to economic development directly, but it also helps the ruler's commitment, which leads to the agent's efficient investment.

Furthermore, in some East Asian countries, South Korea and Malaysia, *deliberation councils* were founded to allow communication among private firms and governments. The councils were used to coordinate investment in specific industries. Hence, even if the economic and political environments satisfied the case of multiple equilibria, it could be said that the government obtained cooperation from the private sectors and led the economy to the high-growth equilibrium.

Explanation of the economic stagnation in African countries based on the model would be more difficult. Despite disadvantages in the economic environment, such as the landlocked region and the low level of educational attainment, the per capita GDP in the African countries in 1960 was not so different from that of the East Asian countries. In fact, the future of Africa's economy

was regarded optimistically (Easterly and Levine, 1997). If the economic and political environment satisfied the conditions for the high growth equilibrium, the story of coordination failure would be sensible for explaining stagnation. The high level of fractionalisation among citizens in the sub-Saharan African countries might make coordination difficult. If, instead, the environment fitted the conditions of the low growth equilibrium, the non-democratic African countries would not be able to attain high economic growth unless productivity increased and/or the ruler emphasised for future consumption.

3.4 Political Replacement Effect

While the previous section focused on the effct of growth on the commitment problem, one important constraint against the ruler's discretion is the possibility of a loss of political power. In this section, the ruler faces the revolution constraint, where citizens can organize a rebel group to replace the ruler.[12] I assume that after successful revolution, a new but identical ruler will take office.

The structure and the timing of the game are modified as follows. After producing outputs and paying taxation, the agent makes a decision whether to join a rebel group. Let J_t be an indicator function, such that it selects 1 if the agent joins the group and 0 if otherwise. I assume that if the representative agent joins the revolution, it can be successful with probability 1, while if not, the ruler can keep his position.[13]

The benefit of joining the revolution is that after a successful revolution, fraction $\kappa \in [0, 1]$ of the taxation the ruler possesses is returned to the group. The

[12]The revolution constraint in this section follows Acemoglu (2005).

[13]The assumption of a successful revolution implies that there exists no externality among the citizens.

cost is that the agents loose fraction $\xi_t \in [0, \lambda]$ of the current production, where exogenous parameter λ is assumed to be in $[\kappa, 1]$. Fraction ξ_t is determined by the exogenous random variable, which is realised after taxation is corrected and before the agents decide to join the group. Random variable ξ_t follows the uniform distribution over $[0, \lambda]$. Parameter λ may reflect the severity of the organisational problem inside the revolutionary group.

Furthermore, I assume that after successful revolution at time t, the replaced ruler obtains the continuous value $\mathcal{W}(k_t)$. For obtaining consistent results, I parameterize the function, such that

$$\mathcal{W}(k_t) = \frac{1}{1-\beta_r} \ln k_t + \varphi,$$

where φ reflects the life process of the ruler after being replaced.[14] If the citizen does not amount an insurrection, the ruler consumes all taxation collected in the period. The model implicitly assumes that the ruler does not save for a replacement when he is in office. The assumption is justified by the fact that, after the successful revolution, the ruler might be killed or confined.[15] Thus, the saving might be in vain.

To make the analysis plausible, the value of φ is bounded above, such that in equilibrium the ruler would not like to resign his position. Specifically, I

[14]Suppose that, after the revolution, the ruler chooses the consumption plan given the lifetime income ψk_t. Then,

$$\begin{aligned} \mathcal{W}(k_t) &= \max_{\left\{\{c_{r,t+j}\}_{j=0}^{\infty} : \sum_{j=0}^{\infty} c_{r,t+j} = \psi k_t\right\}} \sum_{j=0}^{\infty} \beta_r^j \ln c_{r,t+j} \\ &= \frac{1}{1-\beta_r} \ln k_t + \frac{1}{1-\beta_r} \left(\ln(1-\beta_r)\psi + \frac{\beta_r}{1-\beta_r} \ln \beta_r \right). \end{aligned}$$

Thus, φ is $(\ln(1-\beta_r)\psi)/(1-\beta_r) + \beta_r(\ln \beta_r)/(1-\beta_r)^2$.

[15]A low value of φ may reflect the fact that the ruler would be killed or confined after the successful revolution. A high value means that the ruler can defect to some foreign country with a huge amount of assets.

assume that

$$\varphi < \frac{1}{1-\beta_r}\left[\ln \theta B + \frac{\beta_r}{1-\beta_r}\ln \gamma_b(1)\right]. \tag{A1}$$

To interpret the above inequality, consider an example where the agent always invests in the non-marketable section and the ruler imposes a tax rate equal to 1. Inequality (A1) implies that, facing this situation, the ruler would like to keep his position rather than resign and enjoy $\mathcal{W}$.

Let $\{\alpha^R, \tau^R, J^R, c^R, k^R\}$ be the MPE strategies for the game with the revolution constraint. Furthermore, as in the previous section, I focus on the stationary MPE, such that the agent's decision on the production sector and the ruler's decision on the tax rate are independent from the current level of total capital stocks k_t.

Now consider the agent's decision regarding revolution. The decision to join the rebel group depends on the net benefits for the revolution, which is $d(\alpha_t, \tau_t, \xi_t) = \kappa[\tau_t A\alpha_t + \tau_t \theta B(1-\alpha_t)]k_t - \xi_t[A\alpha_t + B(1-\alpha_t)]k_t$. For simplicity, let $\bar{\xi}(\tau_t, \alpha_t) = \kappa[A\alpha_t + B(1-\alpha_t)\theta]\tau_t/[A\alpha_t + B(1-\alpha_t)]$. Notice that the condition of $d(\alpha_t, \tau_t, \xi_t) \geq 0$ is the same as that of $\xi_t \leq \bar{\xi}(\alpha_t, \tau_t)$. Hence, the agent's decision to join the revolution can now be written as

$$J^R(\alpha_t, \tau_t; k_t, \xi_t) = \begin{cases} 1 & \text{if } d(\alpha_t, \tau_t, \xi_t) \geq 0 \text{ (or } \xi_t \leq \bar{\xi}(\alpha_t, \tau_t)) \\ 0 & \text{if } d(\alpha_t, \tau_t, \xi_t) < 0 \text{ (or } \xi_t > \bar{\xi}(\alpha_t, \tau_t)). \end{cases} \tag{3.10}$$

Notice that $\bar{\xi}(\tau, \alpha)$ is less than κ for any $\tau \in [0,1]$ and any $\alpha \in [0,1]$. Thus, the probability that the ruler retains political power is $\eta(\tau_t, \alpha_t) = 1 - \Pr\{\xi_t \leq \bar{\xi}(\tau_t, \alpha_t)\} = 1 - \bar{\xi}(\tau_t, \alpha_t)/\lambda$, which decreases in τ_t and α_t, i.e. $\partial\eta(\tau, \alpha)/\partial\tau < 0$ and $\partial\eta(\tau, \alpha)/\partial\alpha < 0$. Intuitively, the high level of τ attracts the agents to join

the revolution since it makes the revolution profitable to the agents. The high level of α has two different effects upon joining the revolution. The positive effect arises from the fact that it makes the total taxation larger, given the tax rate. The negative effect is derived from the increase in the cost of joining the revolution. It can be shown that the first effect always dominates the second.[16] Furthermore, notice that the probability of retaining office decreases in κ and increases in λ. Low κ and high λ represent the low net benefits of the citizens in a revolution.

As in the last section, the agent's investment decision is given by equation (3.3). The agent's consumption-saving decision now depends on the cost-and-benefit of the revolution. The log-utility function still assures that the fraction β of the disposable income is saved.

Lemma 3.3. *Consider the model with revolution. Given k_t, α_t, τ_t, ξ_t and J_t, the representative agent chooses consumption, $c^R(\alpha_t, \tau_t, J_t; k_t, \xi_t)$, and capital, $k^R(\alpha_t, \tau_t, J_t; k_t, \xi_t)$ as follows.*

$$c^R(\alpha_t, \tau_t, J_t; k_t, \xi_t) = ((1-\beta)/\beta)[\gamma_a(\tau_t)\alpha_t + \gamma_b(1-\alpha_t) + \beta J_t d(\alpha_t, \tau_t, \xi_t)]k_t, \tag{3.11}$$

$$k^R(\alpha_t, \tau_t, J_t; k_t, \xi_t) = [\gamma_a(\tau_t)\alpha_t + \gamma_b(\tau_t)(1-\alpha_t) + \beta J_t d(\alpha_t, \tau_t, \xi_t)]k_t. \tag{3.12}$$

If the agent challenged the ruler and received net benefits $d(\alpha_t, \tau_t, \xi_t)k_t$, then the agent saves fraction β of it. Since the positive benefits from the revolution are a bonus for the agent, both consumption and savings increase as an income effect.

Now, consider the choice of the ruler who faces the revolution constraint.

[16] Notice that it holds that $\partial^2\eta(\tau,\alpha)/\partial\tau^2 = 0$ and $\partial^2\eta(\tau,\alpha)/\partial\tau\partial\alpha < 0$.

Given k_t and α_t, the Bellman equation of the ruler is now as follows:

$$\begin{aligned}
&\mathcal{V}^R(\alpha_t; k_t) \\
&= \max_{\tau_t \in [0,1]} \eta(\tau_t, \alpha_t)\mathbb{E}[\ln(\tau_t(\alpha_t A + (1-\alpha_t)\theta B)k_t) + \beta_r \mathcal{V}^R(\alpha^R_{t+1}; k^R_{t+1})|\xi_t \geq \bar{\xi}] \\
&\qquad + (1 - \eta(\tau_t, \alpha_t))\mathcal{W}(k_t), \quad (3.13)
\end{aligned}$$

$$\text{s.t.} \quad J^R_t = J^R(\alpha_t, \tau_t; k_t, \xi_t), \;\; k^R_{t+1} = k^R(\alpha_t, \tau_t, J^R_t; k_t, \xi_t) \;\text{ and }\; \alpha^R_{t+1} = \alpha^R.$$

Notice that keeping the position provides two kinds of benefits to the ruler. One is the current consumption. If in office, the ruler can consume all taxation. The other is the future consumption. Only when the ruler keeps his position can he enjoy economic growth.

Since I focus on the stationary equilibrium, consider, as in section 3.3.2, the hypothetical case where the agent always invests fraction α of the capital stock to the marketable section. Let $\tilde{\tau}(\alpha) = \min\{\tilde{\tau}^I(\alpha), 1\}$ denote the ruler's optimal decision in this hypothetical case, where $\tilde{\tau}^I(\alpha)$ is the interior solution. Following the Euler equation and the stationary condition, the interior solution $\tilde{\tau}^I(\alpha)$ is determined by the following:[17]

$$\begin{aligned}
&\eta(\tilde{\tau}^I(\alpha), \alpha)\left[\frac{1}{\tilde{\tau}^I(\alpha)} + \frac{\beta_r}{1-\beta_r} \cdot \frac{\gamma_a'(\tilde{\tau}^I(\alpha))\alpha + \gamma_b'(\tilde{\tau}^I(\alpha))(1-\alpha)}{\gamma_a(\tilde{\tau}^I(\alpha))\alpha + \gamma_b(\tilde{\tau}^I(\alpha))(1-\alpha)}\right] \\
&\quad + \frac{\eta_\tau(\tilde{\tau}^I(\alpha), \alpha)}{1 - \beta_r \eta(\tilde{\tau}^I(\alpha), \alpha)} \left\{ \begin{array}{l} \ln \tilde{\tau}^I(\alpha)(A\alpha + B\theta(1-\alpha)) - (1-\beta_r)\varphi \\ + \frac{\beta_r}{1-\beta_r} \ln[\gamma_a(\tilde{\tau}^I(\alpha))\alpha + \gamma_b(\tilde{\tau}^I(\alpha))(1-\alpha)] \end{array} \right\} = 0 \quad (3.14)
\end{aligned}$$

Three effects of political replacement are noteworthy. First, note that the first term of equation (3.14) represents the same effect in equation (3.8). The first term in the bracket shows the marginal increase of utility derived from the

[17] The derivation is shown in the Appendix.

marginal increase of the tax rate. The second term in the bracket reflects the growth effect, which decreases the equilibrium tax rate. The only difference is that both effects are weighted by the probability of keeping office, $\eta(\tilde{\tau}^I(\alpha), \alpha)$. Only if the ruler keeps his position can he receive the taxation and the benefits of economic growth.

Second, the elasticity of keeping office, with respect to the tax rate, is shown in the weight of the second term of equation (3.14) after a simple calculation, i.e. $-\tilde{\tau}^I(\alpha)\eta_\tau(\tilde{\tau}^I(\alpha), \alpha)/\eta(\tilde{\tau}^I(\alpha), \alpha)$, and denotes the marginal effect of political replacement. The ruler who tries to marginally increase the tax rate faces the increased probability of the successful revolution. If the ruler cannot keep his position in the period, he loses the taxation and the benefits of economic growth shown by the bracket in the second term. Hence, I call this marginal replacement effect the political accountability effect. A high political accountability effect leads to a low tax rate if the value of φ is low enough to satisfy condition (A1).[18] Since parameter φ represents the utility of the ruler when he is replaced, the ruler facing a low φ would like to retain office and then impose a lower tax rate.

Finally, the denominators of the weight in the second term, $1-\beta_r\eta(\tilde{\tau}^I(\alpha), \alpha))$, show the political stability effect. High political instability, which is represented by a low $\eta(\tilde{\tau}^I(\alpha), \alpha)$, makes it difficult fot the ruler to commit to a low tax rate. The result is intuitive, since the ruler facing a sever revolution constraint likely grabs many resources while in office.

Note that parameters λ and κ affect both political accountability and political stability. Since the low level of λ and the high level of κ motivate the citizens to join the revolution when the ruler sets a high tax rate, the political accountability

[18]Under the MPE values of investment decision α^R and tax rate τ^R, the value of φ satisfies, such that the bracket of the third term is positive.

effect increases. However, low λ and high κ lead to political instability. A ruler who faces a high probability of successful revolution tries to extract a large amount of output, so as to enjoy the position. Although the political instability effect weakens the political accountability effect, the net effect is positive for committing to a low tax.

Similar to the equilibrium in the last section, three types of MPE exist. The values in the conditions of each equilibrium are replaced by $\tilde{\tau}^I(1)$ and $\tilde{\tau}^I(0)$ from $\hat{\tau}^I(1)$ and $\hat{\tau}^I(0)$, respectively. Since the replacement effect decreases tax rate $\tilde{\tau}(\alpha)$, the high-growth MPE would be more likely to be attainable, compared to the last section.[19]

The following proposition summarises the discussion.

Proposition 3.3. *In the model with political replacement, there exists three types of equilibria, all of which have similar characteristics in Proposition 3.2. Political replacement contributes to a credible commitment to a low tax rate* $\tilde{\tau}^I(1)$*, which is amplified by low* λ*, high* κ *and low* φ*.*

The literature on the empirics of economic growth shows a positive correlation between the institution variables, e.g. property rights protection, and economic variables, e.g. economic growth. The institution variables would reflect the political accountability effect. The mechanism behind the correlation, proposed by this chapter, is that the high performance of political institutions helps the ruler commit to a low tax rate, and then the low tax rate allows the citizens to invest efficiently and leads to high economic growth.[20] As an institutional variable, the low value of φ shows the ruler's constraint from the successful revolution. If the revolution does not politically punish the current

[19] Actually, it holds that $\tilde{\tau}(\alpha) \leq \hat{\tau}(\alpha)$.

[20] The inverse causality may exist, which this chapter does not deal with, such that the high economic growth leads to the institutional change, i.e. democratization. See Shen (2007).

ruler, he would like to enjoy his discretionary power and cannot credibly commit to a low tax. Indeed, the rulers in East Asian countries needed economic success to obtain political legitimacy (World Bank, 1993). Furthermore, consistent with the results of the theoretical model, the empirical literature also shows a negative correlation between political instability and economic growth (Alesina et al., 1996; Devereux and Wen, 1998).

The characteristics of MPE have another implication. The value of λ, which represents a difficulty in organizing a revolution may be regarded as the level of fractionalisation or segregation in the population. Collier and Hoeffler (2004) empirically show that the level of fractionalisation decreases the risk of civil war and they interpret as the citizens under high fractionalisation face a difficulty in organizing the rebel group.[21] The model proposes that the relatively high level of fractionalisation of the sub-Saharan African countries would be due to the lack of political accountability, i.e. the barrier to the ruler's commitment and to economic growth.[22] The empirical literature shows a negative correlation between fractionalisation and quality of government (Easterly and Levine, 1997; La Porta et al., 1999; Alesina et al., 2003).

3.5 Conclusion

In this chapter, I developed a model that explains the relationship between economic growth and an autocratic ruler's commitment problem. Without capital accumulation, the ruler is always tempted to impose a high tax rate in MPE,

[21] Collier and Hoeffler (2002) argue that the incidence of civil war in sub-Saharan African countries is due to poor economic performance, which is partially canceled out by high social fractionalisation.

[22] Although in the last section I discussed how fractionalisation may lead to a serious coordination problem among citizens, the value of λ in this section directly affects the ruler's commitment problem.

which leads to underdevelopment. With capital accumulation, the tax rate affects the future capital stock through the income effect. Then, when the impact of the tax rate on economic growth is large and/or the ruler's discount factor is high, the ruler has an incentive to impose a low tax rate, which implies that the ruler can make a credible commitment. The high elasticity of the growth rate with respect to the tax rate is achieved by high productivity in the marketable section. High productivity can be interpreted as the high level of education in East Asian countries. Hence, East Asian countries would be considered to have a potential advantage for political commitment and for attaining economic growth. Furthermore, the model shows the possibility of multiple equilibria. The *deliberation councils* established by some East Asian rulers can help with coordination among the private sectors and the government, leading to the economy to high-growth equilibrium.

Another result is to show that political replacement has two different effects on the commitment problem. First, if the ruler can be replaced when he adopts a bad policy, the ruler who takes into account the future consumption needs to maintain high economic growth (political accountability effect). Second, if the ruler can be easily replaced for any policy, the ruler will be reluctant to promote economic growth (political instability effect). Thus, political accountability helps the ruler to commit to a low tax rate, while political instability leads to a more severe commitment problem. The model shows that the political accountability effect dominates the political instability effect, and political replacement contributes to the ruler's commitment. One of the key elements to make political accountability work is to reduce the cost of revolution. The high level of fractionalisation in sub-Saharan African countries may prevent their governments from being accountable, since the high fractionalisation implies difficulties in organising rebel groups, which leads to the high cost of

revolution.

3.6 Appendix: Proofs

Proof of Lemma 3.1

Note that the agent's budget constraint is

$$k_{t+1} + c_t = (1 - \tau_t)A\alpha_t k_t + (1 - \tau_t\theta)B(1 - \alpha_t)k_t + k_t.$$

Given $\{k_t, \alpha_t, \tau_t\}$, the Euler equation is shown by

$$-\frac{1}{c_t^G} + \beta\frac{(1 - \tau_{t+1}^G)A\alpha_{t+1}^G + (1 - \theta\tau_{t+1}^G)B(1 - \alpha_{t+1}^G) + 1}{c_{t+1}^G} = 0.$$

Functions (3.5) and (3.6) satisfy the Euler equation and the budget constraint. Furthermore, they also satisfy the usual transversality condition.

Proof of Lemma 3.3

A similar proof to Lemma 3.1 can be applied. The agent's budget constraint is now

$$k_{t+1} + c_t = (1 - \tau_t)A\alpha_t k_t + (1 - \theta\tau_t)B(1 - \alpha_t)k_t + J_t d(\alpha_t, \tau_t, \xi_t)k_t.$$

Then, the Euler equation is shown by

$$-\frac{1}{c_t^R} + \beta\mathbb{E}_{\xi_{t+1}}\frac{1}{c_{t+1}^R}[(1-\tau_{t+1}^R)A\alpha_{t+1}^R + (1-\theta\tau_{t+1}^R)B(1-\alpha_{t+1}^R) + J_{t+1}^R d(\alpha_{t+1}^R, \tau_{t+1}^R, \xi_{t+1})] = 0.$$

Equations (3.11) and (3.12) satisfy the FOC, the budget constraint and the transversality condition.

Proof of Proposition 3.3

Assume that α_t is always constant for any period t. Furthermore, let $\gamma(\tau, \alpha) = \gamma_a(\tau)\alpha + \gamma_b(\tau)(1-\alpha)$. Then, the ruler's problem can be written as

$$\tilde{\mathcal{V}}(\alpha; k_t) = \max_{\tau} \eta(\tau, \alpha)[\ln \tau(\alpha A + (1-\alpha)\theta B)k_t + \beta_r \tilde{\mathcal{V}}(\alpha; k_{t+1})] + (1-\eta(\tau, \alpha))\mathcal{W}(k_t) \tag{3.15}$$

subject to $k_{t+1} = \gamma(\tau, \alpha)k_t$. Furthermore, let

$$h(\tau, \alpha) = \eta(\tau, \alpha)[\ln \tau(\alpha A + (1-\alpha)\theta B)k_t + \beta_r \tilde{\mathcal{V}}(\alpha; k_{t+1})] + (1-\eta(\tau, \alpha))\mathcal{W}(k_t).$$

I will prove proposition 3.3 step-by-step.

Step 1: Derive the value function using the guess-and-verify method. I guess that $\tilde{\mathcal{V}}(\alpha; k) = x \ln k + y$. Then, equation (3.15) is

$$x \ln k_t + y = \eta(\tilde{\tau}(\alpha), \alpha)[\ln \tilde{\tau}(\alpha)(\alpha A + (1-\alpha)\theta B)k_t + \beta_r(x \ln \gamma(\tilde{\tau}(\alpha), \alpha)k_t + y)] + (1-\eta(\tilde{\tau}(\alpha), \alpha))\mathcal{W}(k_t).$$

Hence, it holds that

$$x = \frac{1}{1-\beta_r},$$

and

$$y = \frac{\eta(\tilde{\tau}(\alpha),\alpha)}{1-\beta_r\eta(\tilde{\tau}(\alpha),\alpha)}\left[\ln\tilde{\tau}(\alpha)(A\alpha+\theta B(1-\alpha)) + \frac{\beta_r}{1-\beta_r}\ln\gamma(\tilde{\tau}(\alpha),\alpha) + \frac{(1-\eta(\tilde{\tau}(\alpha),\alpha))\varphi}{\eta(\tilde{\tau}(\alpha),\alpha)}\right].$$

Step 2: Derive equation (3.14). It is derived using the first-order condition, $h(\tilde{\tau}^I,\alpha)=0$ and the stationary condition.

Step 3: Check the second order condition and the uniqueness of $\tilde{\tau}^I(\alpha)$ and $\tilde{\tau}^I(\alpha) < \hat{\tau}^I(\alpha)$, if any. Let $\underline{\tau}_\alpha \in (0,\hat{\tau}^I(\alpha))$ be such that $\ln\underline{\tau}_\alpha(A\alpha+B\theta(1-\alpha)) + \beta_r[\ln\gamma(\underline{\tau}_\alpha,\alpha)]/(1-\beta_r) - (1-\beta_r)\varphi = 0$. Note that from assumption (A1), $\underline{\tau}_\alpha$ is uniquely determined and $\ln\tau(A\alpha+B\theta(1-\alpha))+\beta_r[\ln\gamma(\tau,\alpha)]/(1-\beta_r)-(1-\beta_r)\varphi \gtreqless 0$ if and only if $\tau \gtreqless \underline{\tau}_\alpha$.

At first, it can be shown that in regions $[0,\underline{\tau}_\alpha)$ and $(\hat{\tau}^I(\alpha),1]$, there exists no solution satisfying the first order condition.

Now, consider region $[\underline{\tau}_\alpha,\hat{\tau}^I(\alpha)]$. Because of the fact that h_τ is continuous in τ, $h_\tau(\underline{\tau}_\alpha,\alpha)>0$ and $h_\tau(\hat{\tau}^I(\alpha),\alpha)<0$, there exists at least one tax rate satisfying $h_\tau(\tau,\alpha)=0$ in the region. It can be shown that, for any $\tilde{\tau}^I(\alpha)$, it holds that $h_{\tau\tau}(\tilde{\tau}^I(\alpha),\alpha)<0$. This result means that $\tilde{\tau}^I(\alpha)$ is unique, since function h_τ is differentiable in $[\underline{\tau}_\alpha,\hat{\tau}^I(\alpha)]$.

Finally, the above discussion assures the uniqueness of $\tilde{\tau}(\alpha)$ and $\tilde{\tau}^I(\alpha) \leq \hat{\tau}^I(\alpha)$.

Step 4: Show the sign of $\partial\tilde{\tau}^I(\alpha)/\partial\alpha$. It can be shown that $h_{\tau\alpha}(\tilde{\tau}^I,\alpha)<0$, at least if $\tilde{\tau}^I(\alpha)\leq\bar{\tau}$. Then, in this case, it holds that

$$\frac{\partial\tilde{\tau}^I(\alpha)}{\partial\alpha} = -\frac{h_\alpha(\tilde{\tau}^I(\alpha),\alpha)}{h_\tau(\tilde{\tau}^I(\alpha),\alpha)} < 0.$$

Step 5: Show three types of equilibria. Since $\tilde{\tau}^I(\alpha)$ is decreasing in α, at least if $\tilde{\tau}^I(\alpha)\leq\bar{\tau}$, function $\tilde{\tau}(\alpha)$ crosses through $\bar{\tau}$ only once, if at all. Hence, the same

reasoning as in Proposition 3.2 can be applied to prove the MPE.

Step 6: Show $\partial\tilde{\tau}^I/\partial\lambda > 0$, $\partial\tilde{\tau}^I/\partial\kappa < 0$ and $\partial\tilde{\tau}^I/\partial\varphi > 0$. It can be shown that $h_{\tau\lambda}(\tilde{\tau}^I, \alpha) > 0$, $h_{\tau\kappa}(\tilde{\tau}^I, \alpha) < 0$ and $h_{\tau\phi}(\tilde{\tau}^I, \alpha) > 0$. Thus, the above inequalities hold.

Chapter 4

Rights and Judicial Independence

4.1 Introduction

Why do some rulers establish and support political institutions, such as legislatures and judiciaries, which constrains their behaviour, while others do not? Why do some rulers protect property rights and human rights, even if it is costly? The answers to these questions are especially important since the literature shows a positive relationship between the quality of institutions or the protection of rights and economic development (Acemoglu et al., 2005; Rodrik et al., 2004; Sen, 1999; Blume and Voigt, 2007). Figuring out a ruler's incentive to establish institutions is a key to shedding light on the mechanism of economic development.

This chapter focuses on a lack of commitment inherent in political power, which the literature on transaction-cost politics underlines as an obstacle to economic development (North, 1990; Dixit, 1996; Acemoglu, 2003). Even though the ruler announces protection of private property rights, he has no limitations on reneging on it. The abuse of political power to ignore property rights prevents citizens, who anticipate the ruler's violation of his announcement,

from investing in an efficient way, although investment brings benefit to both citizens and the ruler. Hence, with a constant lack of commitment, the ruler cannot collect sufficient taxes, a part of which are used for productive public expenditures. This inefficiency hampers economic development.

Research in economic history shows not only the existence of this commitment problem, but also a possible solution. In a seminal paper, North and Weingast (1989) argue that, in 17th-century England, the government under the Stuarts' reign could not borrow enough money to cover war costs due to their inability to honor contractual agreements. After the Glorious Revolution of 1688, the development of institutions, which was an advanced role of Parliament and the independent judiciary, enabled the government to keep their credible commitments.

After the Cold War, a number of competitive authoritarian governments came into the world (Levitsky and Way, 2002). A competitive authoritarian regime is defined as one in which the ruler relies on democratic rules to obtain and exercise political authority, but often violates or manipulates them. Although the competitive authoritarian government would make an attempt to influence judicial decisions, an independent judiciary contributes to the ability of the government to commit to the rule of law. For the purpose of the states' survival, the Asian authoritarian regimes, the Kuomintang of China in Taiwan and the People's Action Party in Singapore, established institutions that included high-quality courts. The judiciaries in these countries promote foreign investment and enhance financial credibility in the regimes, which are crucial for such small states to survive (Root and May, 2008; Silverstein, 2008).

Checks and balances by an independent judiciary can protect property rights from the state's expropriation. Judicial independence (JI) plays a vital role in law enforcement without interference from the executive branch or

the legislature. Judges with the security of tenure can undertake constitutional review independent of the ruler, even if judges' decisions are against the ruler's will. Judges with JI can decide cases according to the rule of law even if their decisions are against the ruler's will.[1]

An independent judiciary is necessary for credibility, but is not sufficient. The establishment of JI causes another commitment problem: Can the government commit to keep the judiciary independent? A government strong enough to create institutions is also strong enough to abolish the institutions to renege on a promise of property rights protection. Therefore, the independent judiciary must be credible in order to become the fundamental solution to the commitment problem.

Related to the above issue, transmission from ruler to citizens of information about the judiciary plays a key role in the credibility of commitment. Unless receiving information, citizens would doubt the effectiveness of JI. Although not presenting a theoretical model, Farber (2002) argues that, by protecting human rights, the ruler can send a signal that he limits his power to confiscate private property. Because of the complementarity between the independent judiciary and human rights protection, the signal can be effective.

To wrestle with these issues, I develop a political commitment game between a self-interested ruler and citizens. The game allows an independent judiciary as an endogenous commitment technology associated with endogenous reneging costs (Lohmann, 1992; Perino, 2010). In the game, the ruler creates the endogenous level of JI with proportional cost and announces the tax rate. After citizens produce output, which involves costly effort, the ruler has the opportunity to renege on the announced tax rate. If the ruler tries to

[1] Although formal JI entitles judges to exercise judicial review, a fear of overrule by the ruler may prevent judges from asserting their authority. A key to credible commitment is de facto JI.

renege, he must pay the reneging cost, which is positively proportional to the level of JI. I assume the exogenous information transmission such that, with some positive probability, citizens have perfect information on JI and, with the remaining probability, citizens are not aware of it.

This chapter has two main contributions. I show that, in equilibrium with the positive probability of information transmission, the ruler creates a positive level of JI and can commit to the announced tax rate. The equilibrium tax rate, however, is on the inefficient side of the Laffer curve. The inefficiently high tax arises from the difficulty of honouring property rights. Reduction in the tax rate has two effects; one is an increase in production and taxation, and the other is the additional cost to increase the level of JI for credible commitment, since an increase in production tempts the ruler to renege on the announcement. The ruler's ability to commit to the low tax rate increases with the cost of overruling judicial decisions and the probability of successful information transmission, while decreasing with the cost of creating JI.

Second, I analytically argue the positive role of human rights under the commitment problem. Even though citizens never observe the degree of JI, the ruler guarantees human rights as a signal of JI if the cost of human rights is low. Citizens who observe the credible signal produce the outputs, since they believe the ruler abides by his announcement. The crucial assumption for this result is that a high level of JI makes it less costly to guarantee human rights (the single crossing property). In this equilibrium, however, in addition to the inefficient tax rate, another source of inefficiency arises. Since the ruler needs to protect a positive level of costly human rights for credible commitment, the ruler who would like to acquire cost reduction in human rights establishes an inefficiently high level of JI, in the sense that the ruler does not fully use JI for lowering tax rates. Despite two types of inefficiency, the creation of an

independent judiciary achieves a Pareto improvement compared with the case of lack of commitment, since citizens enjoy property rights protection and the ruler can collect taxes.

The literature suggests a type of trigger strategy as the solution to a commitment problem concerning property rights protection (Greif et al., 1994; Grossman and Noh, 1994; Weingast, 1995; Acemoglu, 2003, 2006). A crucial assumption for maintaining a cooperative equilibrium is coordination among citizens to punish the ruler who deviates from cooperation. If citizens cannot coordinate, they have no ability to constrain the ruler's exploitative actions. Myerson (2008) shows that courts are a communication tool that improves the ability of supporters to punish a ruler who reneges on announcements, and thus the ruler benefits from having courts as evidence of credible commitment. Furthermore, Stephenson (2003) and Carrubba (2005) argue that courts' judgments are a public signal that helps the political party to punish rivals who deviate from mutual restraint to employ a moderate policy.

The literature proposes various explanations for why incumbent rulers found independent judiciaries. Moustafa (2007) discusses five functions of courts in authoritarian regimes. The ruler uses courts to (1) exercise social control, (2) obtain legitimacy of the government, (3) control administrative agents, (4) make a credible commitment to a market economy, and (5) delegate controversial reforms to the judiciary. Maskin and Tirole (2004) show that, in democratic countries, delegation to nonaccountable judges is beneficial if office-motivated politicians have strong incentive to pander to public opinion for re-election. A noteworthy explanation of the ruler's incentive to establish a judiciary centres on the strategic relationship with the future government. An independent judiciary would make it costly for the future government to alter the currently adopted policies. Thus, if the current government anticipates

regime change and has a different policy-preference from the future government, the current government depends on the independent judiciary to make the present policy durable (Landes and Posner, 1975; Hanssen, 2004).

This chapter proceeds as follows. Section 4.2 describes the simple game of a commitment problem under exogenous information transmission. Section 4.3 analyses human rights as a signal. Section 4.4 discusses the theoretical implications of this model and their empirical validity. Section 4.5 concludes. All proofs are in the Appendix.

4.2 The model of judicial independence

Consider a simple economy in which a unit measure of identical citizens produces consumption goods and a ruling elite levies a tax on the produced goods. Citizens exert costly effort, e, to produce consumption goods, the amount of which is the same as the exerted effort. Cost of effort is αe^2.[2] Before production starts, the ruler announces the tax rate, $t \in [0, 1]$, but, after production completes, he can change it to a different rate, $\tau \in [0, 1]$.[3] The level of τ represents the degree of violating property rights protection. Each citizen receives payoff $(1 - \tau)e - \alpha e^2$, and the ruler's payoff is shown later.

Before introducing the independent judiciary as a commitment device, I analyse two extreme cases: full commitment and lack of commitment. In both cases, the ruler simply maximises the taxation. At first, consider the full commitment case, in which the ruler always follows the announcement, i.e.,

[2]The following analysis and results qualitatively do not change under general cost function $c(e)$ that satisfies $c(0) = 0$, $c'(0) = 0$, and for any positive efforts $c'(\cdot) > 0$, $c''(\cdot) > 0$, and $-ec'''(e)/c''(e) < 2$. The quadratic cost function, αe^2, satisfies all the assumptions.

[3]The result of this chapter does not change in extensions such that the ruler can impose a tax rate higher than 1 and/or impose also the other tax that is fixed and unrelated to production, e.g., a poll tax.

$t = \tau$. In this case, citizens choose their effort of $e^C(t) = (1-t)/2\alpha$. Then, the ruler sets the tax rate at the top of the Laffer curve, i.e., $t^C = \arg\max_t te^C(t) = 1/2$.

Next, suppose that the ruler freely reneges on the announcement. In the extensive game, the ruler finally imposes $\tau^N = 1$ for any history of the game. Then, citizens who anticipate this ruler's behaviour choose effort of $e^N = 0$, no matter what tax rate the ruler announced. In this one-period game, since the ruler does not guarantee property rights without any commitment devices, citizens do not produce consumption goods at all, and then the ruler cannot collect taxes.[4]

4.2.1 The independent judiciary as a commitment device

To solve the commitment problem, the ruler creates an independent judiciary. The objective is to restrict the ruler's ex-post discretion. However, a problem still arises: How can the ruler commit to the independent judiciary? The ruler, who has the power to establish institutions, can subordinate the independent judiciary afterward. Hence, the independent judiciary must be self-enforcing in equilibrium.

The ruler, at first, sets the non-negative level of JI, F. A high level of F implies that the judiciary is fully independent from administration and legislation and has authority, i.e., the judges are hired based on the merit system rather than the ruler's appointment and are tenured, and the judiciary has been authorised for constitutional reviews.[5]

The level of JI is positively related with the cost to the ruler when he over-

[4] In a repeated setting of this game, if citizens can coordinate with each other and the players' discount rates are sufficiently high, then the ruler can commit to the low tax rate. This is because citizens use trigger strategy such that, when the ruler reneges on the announcement, citizens do not produce at all in some periods.

[5] Although it is important, and is usual in political science, to consider independence and authority of judiciary distinctly, I assume that both factors contribute to high F.

rules the judiciary and reneges on the announcement. I assume that the cost is λF, where λ is a positive parameter.[6] Overruling judicial decisions is costly to the ruler in terms of both domestic and international legitimacy (Levitsky and Way, 2002). The ruler's subordination of the judiciary can cause political challenge by his opponents, especially in the case of fragmented politics such that preferences and powers are divergent inside the government, or such that opposition parties have a strong political power for regime change (Ginsburg, 2003; Chávez et al., 2011). In 17th-century England, a ruler who observed the Glorious Revolution feared that another revolution would occur if he reneged on his commitment (North and Weingast, 1989). Furthermore, even though facing risk of punishment by the ruler, judges who have strong motivation to enforce the rule of law, or who attract public support for JI, can nullify the ruler's unconstitutional decisions (Vanberg, 2005; Staton, 2006; Hilbink, 2012). The ruler's abuse of his absolute power also causes international criticism. For many countries, especially small countries that depend heavily on international economic transactions, international reputation is essential for the survival of the regime (Silverstein, 2008). Parameter λ reflects these social factors against the ruler.[7] The ruler under fragile legitimacy after violating JI faces a high value of λ. Although JI would be effective in market transactions, I assume that JI is irrelevant to market productivity.

Furthermore, following Perino (2010), I assume that the ruler needs to pay cost γF to create the level of JI, F, where γ is a positive parameter.[8] The cost

[6]The assumption implies that the ruler needs to pay the same penalty regardless of the direction of deviation. However, the results of this model does not change under an assumption that the ruler incurs a cost only when he imposes a higher tax rate than announced.

[7]While F represents the independence of a judiciary, λF shows the "effectiveness" of the independence judiciary.

[8]In some countries, parameter γ can be negative, which implies that, by establishing JI, the ruler domestically and/or internationally gains political and monetary support that outweigh the cost of creating JI. Then, the ruler establishes JI as high as he can, and imposes tax t^C. However, I assume that the benefit from founding JI does not outweigh the cost.

proportional to F shows loss of the ruler's power in various situations. For example, a ruler with a high value of JI faces difficulty in persecuting political opponents. Parameter γ also represents social and institutional factors against the ruler. For instance, democratic rules and institutions help lower the cost, i.e., result in a lower value of γ.[9] In competitive authoritarian states that rely on elections for the legitimacy of the regime, the current incumbent already faces some restraint on political power to hold favourable elections. Thus, an independent judiciary in competitive authoritarian states makes a relatively small contribution to a fair election, compared to fully authoritarian countries

Important points of the commitment device are the degree of information transmission about JI and citizens' beliefs about JI. If citizens do not receive information on JI and underestimate it, the independent judiciary cannot function perfectly as a commitment device. To analyse this potential information problem, I introduce a stochastic state which takes either o or u. At state o, citizens can observe the level of JI, while at state u, F is unobservable. The probability that state o is realised is denoted by p, which is interpreted as the quality of media and/or citizens' education level in this economy. Suppose, further, that the ruler does not know whether citizens observe the level of JI, when he announces the tax rate.[10] Then, the ruler's payoff is

$$\mathcal{R}(F, t, \tau, e_o, e_u) = p\tau e_o + (1-p)\tau e_u - I_{t\neq\tau}\lambda F - \gamma F,$$

where e_o, (e_u), is citizens' effort when the state is o, (u), and $I_{t\neq\tau}$ denotes the indicator function, which equals 1 when $t \neq \tau$ and 0 when $t = \tau$.

The timing of the game is the following:

[9] See Helmke and Rosenbluth (2009) for the relationship between democracy and independent judiciary.

[10] Whether citizens have information on the state does not matter for the ruler when he imposes tax τ.

1. The ruler sets the level of JI, F, and pays the setting cost, γF.

2. The ruler announces the tax rate, t.

3. Nature determines the state from $\{o, u\}$ with exogenous probability.

4. Citizens choose effort e, with or without information about JI.

5. The ruler sets the tax rate, τ. If he changes the tax rate, that is, $\tau \neq t$, he pays the cost, λF.

Let $\{F_p^J, t_p^J, \tau_p^J, e_{o,p}^J, e_{u,p}^J\}$ denote a set of perfect Bayesian equilibrium (PBE) strategies of this game. As in the usual imperfect information game, the game has multiple equilibria dependent on citizens' beliefs. I focus on the equilibrium such that the ruler's expected payoff is maximised.[11] I will characterise a set of possible PBE in the footnotes.

Before directly characterising PBE of this game, I will analyse an extreme case of full information transmission, corresponding to $p = 1$. This example clarifies the role of an independent judiciary.

4.2.2 A case of full information transmission: $p = 1$

In this extreme case, citizens can observe the exact level of JI. Since full information transmission implies that citizens can completely oversee the ruler's actions, the equilibrium production is the highest in any value of p.

The equilibrium is solved by simple backward induction. At the last stage, the ruler reneges on his announcement and sets the tax rate equal to 1 if the additional taxation, $(1 - t)e$, is greater than the cost for change, λF. Hence, the

[11] This focus is reasonable since the first mover is the ruler, who has an incentive to inform the citizens about JI in any PBE.

ruler sets a tax rate such as

$$\tau_1^J(F,t,e) = \begin{cases} t & \text{if} \quad e < \bar{e}(F,t), \\ t \text{ or } 1 & \text{if} \quad e = \bar{e}(F,t), \\ 1 & \text{if} \quad e > \bar{e}(F,t), \end{cases} \tag{4.1}$$

where $\bar{e}(F,t) = \lambda F/(1-t)$. When $e = \bar{e}(F,t)$, the ruler is indifferent between committing to announced tax t and violating it to impose tax rate 1. For the existence of equilibrium in any sub-game, I define a behavioural strategy, r, such that the ruler sets tax rate 1 with probability r and sets t with $1-r$.[12] Then, strategy (4.1) can be rewritten as

$$r_1^J(F,t,e) \begin{cases} = 0 & \text{if} \quad e < \bar{e}(F,t), \\ \in [0,1] & \text{if} \quad e = \bar{e}(F,t), \\ = 1 & \text{if} \quad e > \bar{e}(F,t). \end{cases} \tag{4.2}$$

Equations (4.1) and (4.2) show that citizens' high effort tempts the ruler to abolish the independent judiciary and renege on the announcement. I use τ^J and r^J interchangeably.

At the fourth stage, given F, t and equation (4.2), each citizen chooses effort to maximise her payoff. Notice that the level of effort in equation (4.2) is an aggregate level, and then, each citizen does not take into account the effect of her action on the ruler's decision at the final stage. In equilibrium, each citizen chooses effort as

$$e_{o,1}^J(F,t) = \arg\max_e \left[1 - r_1^J(F,t,e_{o,1}^J)\right](1-t)e - \alpha e^2. \tag{4.3}$$

[12]The other types of behavioural strategies are at least weakly dominated by a behavioural strategy belonging to the above class.

Given F and t, a system of equations (4.2) and (4.3) determines the equilibrium levels of efforts and taxes, shown by the next lemma.

Lemma 4.1. *Given F and t, the equilibrium strategy of efforts is*

$$e^J_{o,1}(F,t) = \begin{cases} e^C(t) & \text{if } e^C(t) \leq \bar{e}(F,t), \\ \bar{e}(F,t) & \text{if otherwise.} \end{cases} \tag{4.4}$$

Given F, t and $e^J_{o,1}(F,t)$, the equilibrium behavioural strategy of taxes is

$$r^J_1(F,t,e^J_{o,1}(F,t)) = \begin{cases} 0 & \text{if } e^C(t) \leq \bar{e}(F,t), \\ 1-2\alpha\lambda F/(1-t)^2 & \text{if otherwise.} \end{cases} \tag{4.5}$$

Equation (4.4) shows that exerted effort is lower than or equal to $\bar{e}$ so that, on the equilibrium path, the ruler cannot strictly increase his payoff by reneging on the announcement. Notice that the threshold level of effort, $\bar{e}$, is increasing with the ruler's total cost of abolishing JI, λF. Thus, if the ruler established the higher level of JI at the second stage, citizens could exert more effort when $\bar{e}(F,t) < e^C(t)$.

Finally, consider the ruler's choice in the first and second stages. Let $\hat{\mathcal{R}}(F,t,r,e_o)$ denote the ruler's payoff under the behavioural strategy r so that

$$\hat{\mathcal{R}}(F,t,r^J_1,e^J_{o,1}) = [1-r^J_1(F,t,e^J_{o,1}(F,t))]te^J_{o,1}(F,t) + r^J_1(F,t,e^J_{o,1}(F,t))(e^J_{o,1}(F,t)-\lambda F) - \gamma F.$$

Given (4.4) and (4.5), the ruler chooses F and t to maximise $\hat{\mathcal{R}}(F,t,r^J_1,e^J_{o,1})$.

The next lemma makes it simple to characterise the equilibrium JI and announced tax.

Lemma 4.2. *In equilibrium, $e^J_{o,1}(F^J_1,t^J_1) = e^C(t^J_1) = \bar{e}(F^J_1,t^J_1)$.*

Lemmas 4.1 and 4.2 show that, on the equilibrium path, the ruler does not renege on the announcement at the final stage. In equilibrium, citizens choose effort, not only to best respond to the "implemented" tax rate from the ex-post point of view, i.e., $e^J_{o,1}(F^J_1, t^J_1) = e^C(\tau^J_1)$, but also to maximise the amount under the constraint that the ruler does not renege on his announcement, i.e., $e^J_{o,1}(F^J_1, t^J_1) = \bar{e}(F^J_1, t^J_1)$.

Furthermore, lemma 4.2 shows that equilibrium JI is

$$F^J_1 = (1 - t^J_1)e^C(t^J_1)/\lambda. \tag{4.6}$$

Then, the equilibrium JI and announced tax are as follows:

$$\{F^J_1, t^J_1\} = \arg\max_{F,t} \; te^C(t) - \gamma F \quad \text{subject to} \quad F = (1-t)e^C(t)/\lambda.$$

The constraint shows that JI, F, and announced tax, t, have a negative relation. If the ruler tries to make the low tax rate credible, he needs to create a high level of JI, since he has a large incentive to renege on the announced tax rate.

From the first order condition of the above maximisation problem, equilibrium tax rate t^J_1 becomes[13]

$$t^J_1 = \frac{1}{2}\left(1 + \frac{\gamma}{\lambda + \gamma}\right). \tag{4.7}$$

The following proposition summarises the equilibrium strategies and denotes the comparative statics.

Proposition 4.1. *(i) The equilibrium strategies of this game are given by equations (4.1) (or (4.2)), (4.4), (4.6) and (4.7).*

[13]The closed-form solution of F^J_1 is $F^J_1 = [1 - \gamma/(\lambda + \gamma)]^2/8\alpha\lambda$.

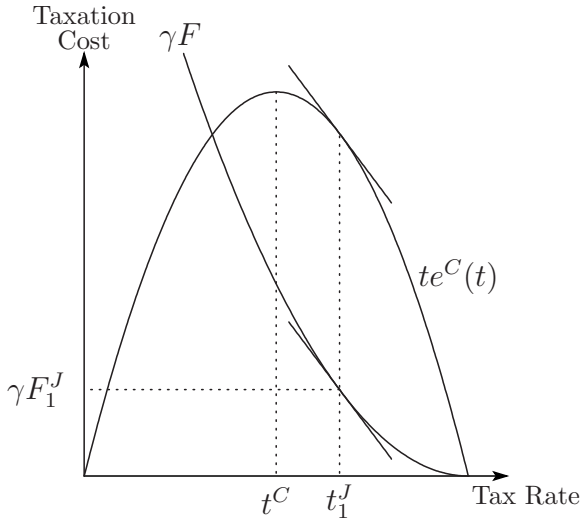

Figure 4.1: The Laffer curve and the cost of JI

(ii) t_1^J *is decreasing with* λ *and increasing with* γ*. Furthermore,* t_1^J *is strictly higher than* t^C *that is a tax rate maximising taxation without the commitment problem.*

(iii) F_1^J *is decreasing with* α *and* γ*.*

The equilibrium tax rate is always higher than the rate maximising taxation with full commitment; that is, the equilibrium tax is on the inefficient side of the Laffer curve. To explain the result intuitively, consider a small decrease in the announced tax rate from the equilibrium rate and an increase in the level of JI that satisfies equation (4.6). Such a change has two effects on the ruler's payoff. One is an increase in taxation and the other is an increase in the cost to create the self-enforcing independent judiciary. The second effect shows the potential inefficiency of credible commitment. Since a decrease in the announced tax rate, if committed to, induces an increase in private production and, then, induces a greater potential for additional taxation, it strongly tempts the ruler to abolish the independent judiciary. Thus, the ruler needs to pay the cost of an increase in JI for credible commitment. Figure 4.1 shows the relationship between taxation and the cost of the self-enforcing independent judiciary with

respect to the tax rate.

Both a low unit cost for the ruler to create JI, i.e., low γ, and a high unit cost for the ruler to subvert the judiciary, i.e., high λ, improve his ability to commit to the low tax rate. Under low γ, the ruler can afford to create a high level of JI. Furthermore, remember that the ruler can credibly commit to a tax rate low enough to satisfy the condition that additional taxation from reneging on the announcement equals the cost of subordinating JI. Hence, the ruler facing high λ can credibly commit to the low tax rate. In section 4.4, I will discuss an interpretation of these comparative statistics.

Establishment of an independent judiciary becomes a Pareto improvement compared to the case of lack of commitment. Remember that, in the case without JI, the ruler cannot collect any taxes since citizens anticipate the ruler's abuse of power and then do not produce. Although creating JI is costly to the ruler, equilibrium JI enables him to collect taxes greater than the cost. Citizens also enjoy JI. Since the ruler protects their property rights, citizens benefit from producing consumption goods.

4.2.3 Equilibrium in exogenous information transmission

Now, I analyse the general model with two stochastic states: one with perfect information on JI, denoted by state o, and the other without information, denoted by state u. Assume $p \in [0, 1]$. I use the same notation to outline the perfect Bayesian equilibrium as in subsection 4.2.2.

At first, since the ruler's payoff at the final stage is irrelevant to citizens' information structure, the ruler imposes the tax rate based on equations (4.1) and (4.2); that is, $\tau_p^J(F, t, e) = \tau_1^J(F, t, e)$ and $r_p^J(F, t, e) = r_1^J(F, t, e)$ for any p. Then, at state o, citizens also choose the amount of effort as in equation (4.3); that is,

$e^J_{o,p}(F,t) = e^J_{o,1}(F,t)$ for any p.

At state u, citizens anticipate the level of JI, based on the announced tax rate. Let $\Pi(f|t) = \Pr(F \leq f|t)$ be a probability distribution function representing their belief conditional on the announced tax rate. Then, citizens under state u maximise their expected utility based on their belief;

$$e_u(t,\Pi) = \arg\max_e \int_f [1 - r^J_p(f,t,e^J_{u,p})](1-t)ed\Pi(f|t) - \alpha e^2.$$

Next, consider the ruler's strategy about announced tax and JI. When citizens know the level of JI, the ruler cannot obtain additional gain by reneging on the announced tax rate. However, when citizens do not have information on JI, the ruler may realise a strictly positive gain by reneging on the announcement. The expected payoff of the ruler using behavioural strategy r is

$$\begin{aligned}
&\hat{\mathcal{R}}(F,t,r^J_p,e^J_{o,p},e_u) \\
&= p\left\{[1 - r^J_1(F,t,e^J_{o,1}(F,t))]te^J_{o,1}(F,t) + r^J_1(F,t,e^J_{o,1}(F,t))(e^J_{o,1}(F,t) - \lambda F)\right\} \\
&+ (1-p)\left\{[1 - r^J_1(F,t,e_u(t,\Pi))]te_u(t,\Pi) + r^J_1(F,t,e_u(t,\Pi))(e_u(t,\Pi) - \lambda F)\right\} - \gamma F.
\end{aligned}$$

Let $t(\Pi)$ and $F(\Pi)$ be the policy that maximises the ruler's expected payoff given citizens' belief function.

Now, I define PBE of this game. Citizens under u choose as $e^J_{u,p}(t) = e_u(t,\Pi^J_p)$ based on their belief Π^J_p, and the ruler sets the level of JI as $F^J_p = F(\Pi^J_p)$ and announces the tax rate as $t^J_p = t(\Pi^J_p)$. Belief function Π^J_p is consistent with the ruler's strategy if the information set is on the equilibrium path, i.e, given announcement t^J_p, $\Pi^J_p(f|t^J_p)$ equals 0 for any $f < F^J_p$ and equals 1 for any $f \geq F^J_p$. If the announced tax does not equal t^J_p, I assume the specific belief function such that $\Pi^J_p(f|t) = 0$ for any $f \geq 0$. This belief on the out-of-equilibrium

path sufficiently restricts the ruler's discretion. If the out-of-equilibrium tax rate is announced, whatever the level is, citizens under state u believe that the ruler will renege on the announcement. Although this restriction of the out-of-equilibrium belief is slightly strong, it makes the following analysis simple.[14]

On the equilibrium path, citizens correctly anticipate the level of JI even if they do not have information on it. This means that, on the equilibrium path, subordination of the judiciary is not strictly profitable to the ruler. The following proposition presents the PBE most favourable to the ruler among all PBE and shows the comparative statics.[15]

Proposition 4.2. *(i) In the PBE that maximises the ruler's expected payoff, citizens under state u choose* $e^J_{u,p}(t^J_p)$ *equal to* $e^C(t^J_p)$ *if the announced tax rate is* t^J_p *and equal to* 0 *if otherwise. The ruler chooses* (F^J_p, t^J_p) *equal to* (F^J_1, t^J_1) *if* $p \geq 1/2$ *and equal to* $(\tilde{F}, \tilde{t})$ *if otherwise, where* $\tilde{t} = [(1-p)\lambda + \gamma]/(\lambda + \gamma)$*, and* $\tilde{F} = (1-\tilde{t})e^C(\tilde{t})/\lambda$*.*

(ii) For any $p < 1/2$*,* t^J_p *is higher than* t^J_1*, and decreasing with p. As in Proposition 4.1,* t^J_p *is decreasing with* λ*, increasing with* γ*, and strictly higher than* τ^C*.*

(iii) For any $p < 1/2$*,* F^J_p *is lower than* F^J_1*, and increasing with p. As in Proposition 4.1,* F^J_p *is decreasing with* α *and* γ*.*

Points of proof for PBE strategies are as follows. At first, since, on the equilibrium path, even citizens under state u exactly expect the level of JI the ruler sets, the ruler obtains a payoff by at most the amount he can collect in the special case $p = 1$, which is $\mathcal{R}(F^J_1, t^J_1, t^J_1, e^C(t^J_1), e^C(t^J_1))$. Suppose that, in the

[14] Equilibrium policy (F^J_p, t^J_p) is unchanged by other reasonable out-of-equilibrium beliefs such as, (i) for any $t < t^J_p$, $\Pi(f|t) = 1$ for any $f \geq 0$, and (ii) for any $t > t^J_p$, $\Pi(f|t) = 0$ for any $f \in [0, F^J_p)$ and $\Pi(f|t) = 1$ for any $f \geq F^J_p$.

[15] The full range of PBE is characterised as the following. First, on the equilibrium path, citizens choose the same level of effort under any states as that in the perfectly observed case, which is $e^J_{o,1}(F^J_p, t^J_p)$. Equilibrium JI and announced tax need to satisfy the following two inequalities: $t^J_p \geq \tilde{t}$ and $t^J_p e^J_{o,1}(F^J_p, t^J_p) - \gamma F^J_p \geq 0$. The first inequality is about the credible commitment and the second is non-negative payoff condition.

PBE, the ruler chooses (F_1^J, t_1^J). Then, citizens choose $e^C(t_1^J)$ for any state on the equilibrium path. The ruler's payoff is $\mathcal{R}(F_1^J, t_1^J, t_1^J, e^C(t_1^J), e^C(t_1^J))$. However, if the probability of state u, that is $1-p$, is sufficiently high, the ruler may have a gain by decreasing the level of JI from F_1^J to renege on the announcement. Note that he cannot change the announced tax rate because of citizens' off-equilibrium beliefs. Consider the ruler's deviation to $F = 0$.[16] Then, since citizens under state o do not produce, the ruler receives payoff $\mathcal{R}(0, t_1^J, 1, 0, e^C(t_1^J))$. Hence, the condition of (F_1^J, t_1^J) being implementable in PBE is $\mathcal{R}(F_1^J, t_1^J, t_1^J, e^C(t_1^J), e^C(t_1^J)) \geq \mathcal{R}(0, t_1^J, 1, 0, e^C(t_1^J))$, which equals condition $p \geq 1/2$.

Equilibrium policy (F_p^J, t_p^J) is intuitive. Value $\tilde{t}$ shows the lowest tax rate to which the ruler can credibly commit in PBE. If the probability that citizens have perfect information on JI, i.e., p, is sufficiently high, the ruler can implement the same policy as in the case of perfect information, i.e., $t_p^J = t_1^J \geq \tilde{t}$. In this case, the deviation to a lower level of JI to renege on the announced tax is not profitable to the ruler. At state o, which is likely to be realised, citizens find the deviation, and then they lower production. Thus, the ruler loses tax revenue from them. The benefit from deceiving citizens at state u does not cover the cost. Suppose, instead, that p is low enough to satisfy $p < 1/2$. Then, the ruler's best choice is to commit to as low a tax as possible, i.e., $t_p^J = \tilde{t}$. Notice that the equilibrium tax rate is still on the inefficient side of the Laffer curve.

Probability of information transmission, p, is crucial to credibility of commitment. When p is smaller than $1/2$, an increase in p contributes to commitment to the lower tax rate. Suppose an extreme case where citizens never obtain information on JI, i.e., $p = 0$. Then, the ruler does not have any incentive to create an independent judiciary, so, in equilibrium, $F_0^J = 0$. Thus, since the ruler cannot commit to a tax rate strictly lower than 1, the citizens does not produce

[16] Actually, $F = 0$ is the optimal deviation to the ruler. See proof in Appendix.

at all. The next section argues that, even in this miserable situation, the ruler can commit to JI by guaranteeing human rights if the cost of human rights is low.

4.3 Human rights as a signal

This section analyses the case in which citizens cannot observe JI, i.e., $p = 0$. It is the worst scenario for both the ruler and citizens, since citizens cannot produce consumption goods at all because they anticipate a lack of commitment, and then the ruler cannot collect taxes.

Farber (2002) argues that, to inform citizens of the level of JI, the ruler can provides them human rights. Even though human rights protection is irrelevant to production efficiency and costly to the ruler, it can be a credible signal of the ruler's enthusiasm for committing to JI. This is because under a high level of JI, the ruler can protect those rights at low cost. By building on Farber's work, this section creates a model to discuss a mechanism behind how human rights protection becomes a signal of JI and how it affects the equilibrium level of the credible tax rate and JI.

The model is changed as follows. After the ruler sets JI, he provides the level of human rights, $G \in [0, \infty)$, to citizens. Human rights include, for example, freedom from torture, freedom of speech, freedom of religion, and so on. I assume that if the ruler creates a level of JI higher than $\bar{F}$, then the cost of introducing human rights G is δG where $\delta < 1$, while if strictly less than $\bar{F}$, the cost is G. Protecting human rights is costly for the ruler since the absence of torture and the presence of freedom of speech allow his political opponents the right to challenge his political position. The independent judiciary helps the ruler to protect human rights because it can enforce the protection as a veto

player.[17] I also assume that the level of human rights does not affect production efficiency and citizens' utility. In the following discussion, I omit subscript u for simple expression.

The ruler's payoff is now

$$\mathcal{R}(F, G, t, \tau, e) = \tau e - I_{t \neq \tau} \lambda F - \gamma F - I_{F \geq \bar{F}} \delta G - (1 - I_{F \geq \bar{F}}) G,$$

where $I_{F \geq \bar{F}}$ is an indicator function equal to 1 if $F \geq \bar{F}$ and equal to 0 if otherwise.

Let $\{F^H, G^H, t^H, \tau^H, (r^H), e^H\}$ denote a set of PBE strategies. As in the last section, I focus on the PBE in which the ruler's expected payoff is maximised.

At the last stage, the ruler chooses the tax rate still based on equations (4.1) and (4.2), irrespective of the value of human rights, i.e., $\tau^H(F, G, t, e) = \tau_1^J(F, t, e)$ and $r^H(F, G, t, e) = r_1^J(F, t, e)$ for any G.

Citizens' beliefs regarding the level of JI is now conditional on the two variables the ruler sets, announced tax rate t and human rights G. I use same notation Π to denote the belief, that is, $\Pi(f|t, G) = \Pr(F \leq f|t, G)$. Hence, except their belief function, citizens' payoff maximisation problem is the same as what citizens under state u face in subsection 4.2.3. Let $e(G, t, \Pi)$ denote the solution of the payoff maximisation problem given belief Π.

Again, let $\hat{\mathcal{R}}$ denote the ruler's payoff under a behavioural strategy, r. Given citizens' response $e(G, t, \Pi)$, the ruler's choice of JI, human rights, and announced tax are

$$\{F(\Pi), G(\Pi), t(\Pi)\} = \arg\max_{F,G,t} \hat{\mathcal{R}}(F, G, t, r^H, e(G, t, \Pi)).$$

The equilibrium needs to specify the out-of-equilibrium belief. As in the

[17] The literature argues that JI positively contributes to the protection of human rights (Keith, 2002; Keith et al., 2009).

last section, I simplify it such that for any out-of-equilibrium announcement $t \neq t^H$ and/or human rights $G \neq G^H$, the belief function is $\Pi(f|G,t) = 1$ for any $f \geq 0$.[18] Then, the PBE is characterised such that citizens make efforts $e^H(G,t) = e(G,t,\Pi^H)$ and the ruler establishes JI $F^H = F(\Pi^H)$, provides human rights $G^H = G(\Pi^H)$, and announces tax $t^H = t(\pi^H)$. The equilibrium belief Π^H is calculated based on the Bayes rule on the equilibrium path and is denoted above off the equilibrium path.

The following proposition characterises the PBE with the ruler's highest payoff among all PBE payoffs and shows comparative statistics.[19]

Proposition 4.3. *Let* $t^{Int} = (1+\delta)/2$ *and* $t^{Cor} = 1 - (2\alpha\lambda\bar{F})^{1/2}$. *Also, let* $F^{Bou} = (1-t^{Int})e^C(t^{Int})/\lambda$, $F^{Int} = (t^{Int}-\delta)e^C(t^{Int})/\gamma$, $F^{Cor} = (t^{Cor}-\delta)e^C(t^{Cor})/\gamma$ *and* $\tilde{G}(t) = [(1-t)e^C(t) + \gamma\bar{F}]/(1-\delta)$.

(i) Suppose that $F^{Bou} \leq \bar{F} \leq F^{Int}$. *Then, in the PBE in which the ruler's expected payoff is maximised, his choice of JI, human rights, and announced tax is such that* $F^H = \bar{F}$, $G^H = \tilde{G}(t^{Int})$ *and* $t^H = t^{Int}$. *Announced tax is higher than* t^C, *is also higher than* t_1^J *if and only if* δ *is higher than* $\gamma/(\lambda+\gamma)$, *is increasing with* δ *and is independent from* $\bar{F}$, λ *and* γ. *Human rights protection is increasing with* γ *and* $\bar{F}$.

(ii) Suppose that $\bar{F} \leq \min\{F^{Bou}, F^{Cor}\}$. *Then, the ruler chooses* $F^H = \bar{F}$, $G^H = \tilde{G}(t^{Cor})$

[18] Although this simple belief function, of course, allows unreasonable equilibria, the focus on the ruler's most preferred PBE excludes them. The equilibrium survives forward induction refinements, although the refinements the literature uses are not directly applicable in this game. Cho and Kreps (1987), for example, invent a refinement for signaling games with "hidden knowledge," while this game is on "hidden actions." A forward induction criterion based on the same motivation of Cho and Kreps (1987) is as follows. Suppose that $F^H \geq \bar{F}$ and $e^H(G^H,t^H) \leq \bar{e}(F^H,t^H)$. If signal G^H satisfies the condition that $G^H > [\gamma F^H + (1-t^H)e^H(F^H,t^H)]/(1-\delta)$, it must hold that for any $G \in [[\gamma F^H + (1-t^H)e^H(F^H,t^H)]/(1-\delta), G^H]$, the belief function is $\Pi(f|G,t^H) = 0$ for any $f \in [0,F^H)$ and $\Pi(f|G,t^H) = 1$ for any $f \geq \bar{F}$. This refinement implies that the ruler needs a minimum amount of human rights to show that he founds JI with level of F^H.

[19] I characterise the full range of PBE actions without proof. Equilibrium JI is either $\bar{F}$ or 0. Positive JI $\bar{F}$ can be an equilibrium if strategies satisfy the following: $e^H(G^H,t^H) = \min\{e^C(t^H), \bar{e}(\bar{F},t^H)\}$, $[t^H e^H(G^H,t^H) - \delta G]/\gamma \geq \bar{F}$ and $G^H \geq [(1-t^H)e^H(G^H,t^H) + \gamma\bar{F}]/(1-\delta)$. The first condition shows the citizens' equilibrium effort. The second shows the ruler's non-negative payoff condition, and the third shows the credible signaling. Furthermore, there always exists PBE such that $F^H = 0$. In this case, equilibrium action is that G^H equals 0, t^H can be anything, and $e^H(G^H,t^H)$ equals 0.

and $t^H = t^{Cor}$*. Announced tax is higher than* t^C*, is also higher than* t_1^J *if and only if* $\bar{F}$ *is smaller than* F_1^J*, is decreasing with* α*,* λ *and* $\bar{F}$*, and is independent from* γ *and* δ*. Human rights are increasing with* δ*,* λ*,* γ *and* $\bar{F}$*.*

(iii) Suppose otherwise. Then, the ruler chooses $F^H = 0, G^H = 0$ *and* t^H *is anything.*

(iv) Citizens choose efforts $e^H(G,t) = e^C(t)$ *if* $G = G^H > 0$ *and* $t = t^H$*, and* $e^H(G,t) = 0$ *if otherwise.*

Implications of this proposition and intuitive explanation of the proof are as follows. At first, if the equilibrium level of JI is strictly positive, then it is $\bar{F}$. Suppose that, in equilibrium, F^H is strictly positive but less than $\bar{F}$. In this case, the ruler does not gain the benefits from reducing the cost of providing human rights G, and so the signal is not credible. Thus, the ruler prefers to set $F = 0$ rather than F^H and renege on the announcement, which leads to a contradiction. Suppose, instead, that F^H is strictly greater than $\bar{F}$. Then, the ruler can increase his payoff by reducing JI to $\bar{F}$ since citizens do not observe this reduction and so do not change production. Furthermore, the reduction of F does not affect the cost of protecting human rights G^H, while it reduces the cost of creating JI.

Then, suppose that the ruler establishes independent judiciary $\bar{F}$ and announces tax t^H. Now consider human rights protection G^H. If the ruler commits to the announcement, then he receives payoff

$$\mathcal{R}(\bar{F}, G^H, t^H, t^H, e^H) = t^H e^H(G^H, t^H) - \gamma\bar{F} - \delta G^H.$$

If the ruler founds no JI to renege on the announcement and to impose tax rate 1 finally, he receives

$$\mathcal{R}(0, G^H, t^H, 1, e^H) = e^H(G^H, t^H) - G^H.$$

For credible signaling, $\mathcal{R}(\bar{F}, G^H, t^H, t^H, e^H)$ must be higher than $\mathcal{R}(0, G^H, t^H, 1, e^H)$, which can be rewritten as

$$G^H \geq [(1 - t^H)e^H(G^H, t^H) + \gamma\bar{F}]/(1 - \delta).$$

The inequality provides the minimum value of credible signaling.

Given the minimum value of signaling, tax rate t^{Int} denotes the interior solution satisfying $e^C(t^{Int}) < \bar{e}(\bar{F}, t^{Int})$, and t^{Cor} denotes the corner solution.[20] Even if human rights satisfy the above condition and taxes maximise the payoff, the ruler does not establish JI unless the payoff is non-negative, i.e., the ruler establishes JI $\bar{F}$ if for the interior solution, $\mathcal{R}(\bar{F}, \tilde{G}(t^{Int}), t^{Int}, t^{Int}, e^C(t^{Int})) \geq 0$ which equals the case $\bar{F} \leq F^{Int}$, and for the corner solution, $\mathcal{R}(\bar{F}, \tilde{G}(t^{Cor}), t^{Cor}, t^{Cor}, e^C(t^{Cor})) \geq 0$ which equals the case $\bar{F} \leq F^{Cor}$.

In PBE, the equilibrium level of JI can be inefficiently high. If $\bar{F}$ satisfies $F^{Bou} \leq \bar{F} \leq F^{Int}$, the ruler creates JI to gain the cost reduction of providing human rights. The equilibrium announcement in this case is t^{Int}, which is higher than t^{Cor}. Thus, if citizens observe the level of JI, i.e., if $p = 1$, the ruler can commit to lower tax t^{Cor}, instead of higher tax t^{Int}. In other words, under perfect information transmission, announcement t^{Int} becomes credible under a lower level of JI than $\bar{F}$. This high $\bar{F}$ is inefficient because the ruler does not completely take advantage of the independent judiciary to lower the tax rate.

In the case where the level of $\bar{F}$ is low, i.e., $\bar{F} < \min\{F^{Bou}, F^{Cor}\}$, if the ruler tries to implement the low tax rate, he needs to increase the level of JI the same as in section 4.2. Although the ruler actually wants to increase JI so as to commit to the lower tax, signaling for JI higher than $\bar{F}$ is not credible. Then the ruler faces boundary constraint, $e^C(t^{Cor}) = \bar{e}(\bar{F}, t^{Cor})$, and announces the tax rate, t^{Cor}.

[20] Notice that in PBE with the ruler's highest payoff, lemma 4.2 does not always hold, although $e^C(t^H) \leq \bar{e}(\bar{F}, t^H)$ still holds.

The equilibrium tax rate, t^H, is again located on the inefficient side of the Laffer curve. The reason is similar to the one in section 4.2. Suppose that the ruler sets a lower rate that brings the same tax revenue as the equilibrium tax rate does. Since, with this tax rate, production is higher, the ruler has more incentive to renege on the announcement. Then, the ruler needs to protect a higher degree of human rights, which leads to a higher cost, while, in section 4.2, the ruler must set a higher level of JI.

The marginal effect of $\bar{F}$ on the credible tax rate is not continuous. At low values of $\bar{F}$, a marginal increase contributes to lowering the tax since JI increases. However, if the level of $\bar{F}$ is high enough to satisfy $\bar{F} > F^{Int}$ (or $F^{Cor} < \bar{F} < F^{Bou}$), the ruler cannot commit to an announced tax less than 1. Since JI $\bar{F}$ is needed to make the announcement credible, implementation cost is too high to reward the ruler who established JI $\bar{F}$.

An increase of δ prevents the ruler from committing to the low tax rate if $F^{Bou} \leq \bar{F} \leq F^{Int}$. In this case, the cost of human rights protection becomes large compared to tax revenues. If the value of δ is near to t^{Int} or t^{Cor}, a high level of human rights protection is needed for credible signaling. Then, providing signaling becomes too costly to make the announcement credible, and so the ruler is reluctant to create an independent judiciary in equilibrium.

Posner (1998) argues that, for poor countries without institutional environments for enforcing legal rights, it is costly to establish well-functioning legal systems. Posner (1998) then proposes that the state should, at first, create a rule that involves small fixed and marginal costs. His argument would correspond to the case of high δ and/or high $\bar{F}$ in this model. In this case, the profits from creating a high level of JI does not outweigh the cost. Furthermore, he argues that formal judicial systems can be substituted by informal institutions. Remember that the last section shows that education and media diffusion are

effective for credible commitment. Thus, given the high cost of credible signaling, the most efficient way to enforce rights would be to use them, rather than relying on protecting human rights.

4.4 Discussion

This section briefly discusses theoretical implications derived from this model and their empirical validity. At first, I intuitively discuss relationships between choice variables of players, e.g., economic development, JI, property rights protection and human rights protection. Since these variables are simultaneously determined in the model, pay attention to identification of empirical models. Then, I discuss what causes a variation of these endogenous variables.

As already confirmed in the literature, a credible commitment to property rights protection, denoted by low τ, causes economic development, denoted by high e, which is shown by the equilibrium effort function $e_p^J = e^C(\tau)$. The empirical literature finds that property rights protection has a positive effect on GDP per capita (e.g., Acemoglu et al., 2005; Rodrik et al., 2004). Furthermore, since the equilibrium tax rate is always located on the inefficient side of the Laffer curve, property rights protection leads to high tax revenue.

Although the theoretical literature emphasises reputation equilibrium for credible commitment, this chapter unravels a mechanism of institutional solution to the commitment problem. Equation (4.6) shows that, in equilibrium, the ruler needs a high level of JI so as to commit to a low tax rate credibly, i.e., there exists a positive relationship between JI and property rights protection. This finding is supported by numerous anecdotes, for instance, 17th-century England after the Glorious Revolution (North and Weingast, 1989) and the Supreme Constitutional Court of Egypt established in 1979 (Moustafa, 2007).

Furthermore, La Porta et al. (2004) empirically show that both indices of JI and constitutional review positively correlate with an index of property rights protection.

By combining the above two arguments, the model shows that a high level of JI leads to economic development through credible commitment to property rights protection. Contrary to this prediction, Glaeser et al. (2004) find no correlation between an index of JI and the GDP growth rate. In fact, various evidences show that, even though courts are granted "formal" JI, a fear of subversion of judicial systems by the ruler prevents courts from carrying out their mission based on the rule of law (Ramseyer and Rasmusen, 2003; Ginsburg, 2003). To tackle with this problem, Feld and Voigt (2003) distinguish between de jure JI and de facto JI and show that although de jure JI does not affect the GDP growth rate, de facto JI positively correlates with it. The degree of de facto JI in their paper is considered as the level of credible JI in this chapter.

Whereas the model provides a consistent positive connection between JI, property rights protection and economic development, the effect of human rights protection on those variables are not straightforward. The role of human rights in this chapter is a signal of JI. Thus, only in an economy where citizens cannot evaluate JI, i.e., probability p is sufficiently low, human rights protection is relevant to property rights protection and economic development. An empirical prediction of this study is that human rights protection and economic development have a nonlinear relationship, which is influenced by degree of free media diffusion or education attainment, which represent p. Blume and Voigt (2007) show positive linear correlation between human rights protection and the investment ratio, while they do not find a linear correlation of human rights protection with GDP growth and total factor productivity. Further works analysing the nonlinear relationship are necessary to conclude the empirical

evaluation of human rights protection.

Now, I will discuss what develops the ruler's incentive to establish JI and protect property rights. The model shows that a state with high democratic values, represented by low γ, can establish a highly independent judiciary i.e., the existing institutions enforce the complementary institutions. This result explains a reason that democratic regimes (and also competitive authoritarian regimes) have judicial systems independent from the executive and legislative branches more often than autocratic regimes (Levitsky and Way, 2002; Helmke and Rosenbluth, 2009). The model predicts that, through a channel of JI, democratic values also contribute to property rights protection and economic development.[21]

The ruler can successfully protect property rights under high λ, which is interpreted such that the ruler faces a high risk of losing legitimacy either domestically or internationally if he ignores the judicial decisions; for example, England after the Glorious Revolution and small states dependent on international trade (North and Weingast, 1989; Silverstein, 2008). While high λ leads to property rights protection and economic development, the effect of λ on the level of JI is ambiguous. A state with high λ needs a lower level of JI to commit to a given tax rate than a state with low λ needs to commit to the rate. Thus, although the rulers facing high λ can commit to a low tax rates, they do not need to found a high level of JI. For example, although, in the UK, the judiciary has not been authorised to conduct constitutional review, the legislature can credibly commit to various policies.

Proposition 4.2 shows that probability of information transmission, denoted by p, contributes to commitment to an effective judicial system and property

[21] The empirical literature does not achieve consensus about the relationship between democracy and economic growth. Democracy would have several channels to affect economic growth. See Barro (1996); Tavares and Wacziarg (2001).

rights protection, and economic development. Remember that probability p is interpreted as the degree of free media diffusion or education attainment in the country. Djankov et al. (2003) empirically show that state ownership of the media positively correlate with autocracy. Then, consistent with the results of this model, they also show that the share of government ownership of the press negatively correlates with property rights protection. Furthermore, Brunetti and Weder (2003) also empirically show that a free press helps to reduce government's corruption.

4.5 Conclusion

This chapter has analysed an independent judiciary as a commitment device in a game of political commitment between a ruler and citizens. The model shows that, as long as citizens observe JI with some positive probability, the ruler creates an independent judiciary and protects property rights credibly. Furthermore, even if the probability equals zero, by protecting human rights, which function as a signal of credible JI, the ruler can credibly commit to property rights protection.

Although equilibrium with a positive level of JI brings Pareto improvements to both the ruler and citizens, two types of inefficiency arise. The first source of inefficiency is that the equilibrium tax rate is on the inefficient side of the Laffer curve. Suppose that the ruler announces a low tax rate and citizens produce the large amount of goods. Then, because he can collect large additional taxes from reneging on the announcement, the ruler has a large incentive to renege on the announcement, which implies the high cost of credible commitment. Second, the protection of human rights needs an unnecessarily high level of JI, in which case the ruler does not effectively use JI for lowering the tax rate.

This model has two insufficiencies. First, for simplicity, I assume that the judiciary always acts to keep the announced tax rate, and so I exclude the judiciary as a player from the model. In general, however, the judiciary has policy preferences that can differ from the ruler's and citizens' preferences. Hence, the model should explicitly add the judiciary as a player, which would be consistent with the literature on third-party delegation. Second, although this model shows the creation of an independent judiciary, it does not show its evolution. Generally, it takes significant time to make the judiciary effective, and the evolution is not monotonic. Therefore, the model should be extended to a multi-period game with adjustment costs of improving the judicial system.

4.6 Appendix: Proofs

The Proof of Lemma 4.1

At first, consider the maximisation problem of equation (4.3) given a fixed value of r. Let $e_{o,1}(r)$ denote a solution of this problem. From the first-order condition, $e_{o,1}(r) = (1-r)(1-t)/2\alpha$. Notice that $e_{o,1}(r)$ decreases with r. Furthermore, $e_{o,1}(1)$ equals 0.

From the properties of $e_{o,1}(r)$ stated above and equation (4.2), a system of equations (4.2) and (4.3) has a unique solution of equations (4.4) and (4.5).

The Proof of Lemma 4.2

Assume that, in equilibrium, $e^C(t_1^J) < \bar{e}(F_1^J, t_1^J)$. Then, the ruler can increase his payoff by lowering F, since it does not affect citizens' decision of effort. However, this fact contradicts the assumption that F_1^J is an equilibrium level of JI.

Alternatively, assume that $e^C(t_1^J) > \bar{e}(F_1^J, t_1^J)$. The ruler's maximised payoff is $\mathcal{R} = [t_1^J\lambda/(1-t_1^J) - \gamma]F_1^J$, and policy (F_1^J, t_1^J) meets the constraint $F_1^J < (1-t_1^J)e^C(t_1^J)/\lambda$. In this case, the ruler's maximised payoff must be zero. Suppose that it is positive. Then, the ruler can increase his payoff by increasing F, which contradicts the assumption that F_1^J is an equilibrium level of JI. Now consider tax rate $t' = 1-\epsilon$, where ϵ is positive and sufficiently small. Furthermore, let F' be the level of JI such that (F', t') meets the constraint that $0 < F' < (1-t')e^C(t')/\lambda$. Under these values, the ruler's payoff is strictly positive, i.e., $R' = [t'\lambda/(1-t') - \gamma]F' > 0$. Hence, the assumption that $e^C(t_1^J) > \bar{e}(F_1^J, t_1^J)$ contradicts.

The Proof of Proposition 4.1

(ii) Notice that $t_1^J = [1+\gamma/(\lambda+\gamma)]/2 > 1/2 = t^C$. Furthermore, $\partial t_1^J/\partial\lambda < 0$ and $\partial t_1^J/\partial\gamma > 0$.

(iii) Notice that $\partial F_1^J/\partial\alpha < 0$ and $\partial F_1^J/\partial\gamma < 0$.

The Proof of Proposition 4.2

At first, note that since, in the PBE, citizens under state u have perfect knowledge about the equilibrium level of JI, the ruler's payoff is at most the amount in the special case where $p = 1$.

Then, I characterise the conditions that the ruler can set policy (F_1^J, t_1^J). Suppose that the ruler chooses (F_1^J, t_1^J). Under this policy, citizens choose effort as $e_{o,1}^J(F_1^J, t_1^J) = e^C(t_1^J)$, irrespective of the information structure. In this case, the ruler's expected payoff is

$$\mathcal{R}(F_1^J, t_1^J, t_1^J, e^C(t_1^J), e^C(t_1^J)) = t_1^J e^C(t_1^J) - \gamma(1-t_1^J)e^C(t_1^J)/\lambda.$$

Now, consider the deviation from equilibrium JI F_1^J, i.e., the case where the ruler tries to renege on the announced tax rate. Notice that the ruler still needs to announce tax rate t_1^J due to citizens' off-equilibrium action. Since he resets the tax rate equal to 1, the ruler establishes no JI. Then, citizens under state o does not produce at all. The ruler's expected payoff in this case is

$$\mathcal{R}(0, t_1^J, 1, 0, e^C(t_1^J)) = (1-p)e^C(t_1^J).$$

The relationship between the two payoffs is

$$\mathcal{R}(F_1^J, t_1^J, t_1^J, e^C(t_1^J), e^C(t_1^J)) \gtreqless \mathcal{R}(0, t_1^J, 1, 0, e^C(t_1^J)) \text{ if and only if } t_1^J \gtreqless \frac{(1-p)\lambda + \gamma}{\lambda + \gamma} = \tilde{t}.$$

Therefore, only if $t_1^J \geq \tilde{t}$, policy (F_1^J, t_1^J) is in equilibrium. The condition can be rewritten as $p \geq 1/2$. Furthermore, I can straightforwardly prove that, if condition $p \geq 1/2$ holds, the ruler's optimal action is (F_1^J, t_1^J).

Next, suppose that $0 < p < 1/2$. In this case, the ruler cannot credibly implement policy (F_1^J, t_1^J) in equilibrium. Since, on the equilibrium path, citizens under state u also anticipate the exact level of F, the ruler cannot receive strictly positive gains from reneging on the announcement. From this property on the equilibrium path, the equilibrium that maximises the ruler's payoff is the solution of the following maximisation problem:

$$\max_{F,t} \; te_{o,1}^J(F,t) - \gamma F \quad \text{s.t.} \;\; t \leq \tilde{t}.$$

In the solution, $e_{o,1}^J(F,t) = e^C(t) = \bar{e}(F,t)$ holds because of a similar proof to lemma 4.2. Hence, the solution is $t = \tilde{t}$ and $F = \tilde{F}$.

Finally, suppose that $p = 0$. Then, the next lemma holds.

Lemma 4.3. *Suppose that $p = 0$. There is no perfect Bayesian equilibrium such that the ruler sets the strictly positive level of JI and commits to the announced tax strictly lower than* 1.

Proof. Suppose that, in equilibrium, the ruler creates the positive level of JI, $F_0^J > 0$. However, the ruler can receive a positive gain from lowering the level of JI since citizens does not change their production. □

From the lemma, the ruler sets $F_0^J = 0$ and announces any tax rate in equilibrium. A potential announcement is 1, which equals $\lim_{p\to 0} \tilde{t}$. Furthermore, notice that $\lim_{p\to 0} \tilde{F} = 0$.

The Proof of Proposition 4.3

I prove this proposition with four steps. In the first three steps, under the assumption that the equilibrium level of JI is strictly positive, I characterise the equilibrium actions of the ruler. Then, in the final step, I analyse the non-negative payoff conditions about the ruler's payoff.

Step 1: Note that since, on the equilibrium path, citizens can expect the exact level of JI, the ruler does not receive strictly positive gains by reneging on the announcement. Using this fact, I prove the following lemma.

Lemma 4.4. *If the equilibrium level of JI is strictly positive, it is always $\bar{F}$.*

Proof. Suppose that there is an equilibrium level of JI $F^H \in (0, \bar{F})$. Then, the equilibrium announced tax rate is strictly less than 1. On the equilibrium path, citizens choose effort as $e^H(G^H, t^H) = e^J_{o,1}(F^H, t^H) > 0$. Then, the ruler's payoff is $t^H e^H(G^H, t^H) - \gamma F^H - G^H$. However, the ruler has incentive to set $F = 0$ since $e^H(G^H, t^H) - G^H > t^H e^H(G^H, t^H) - \gamma F^H - G^H$. Hence, the assumption of $F^H \in (0, \bar{F})$ leads to a contradiction.

Next, suppose that equilibrium F^H is in $(\bar{F}, \infty)$. Then, the following inequality holds;

$$t^H e^H(G^H, t^H) - \gamma F^H - \delta G^H \geq e^H(G^H, t^H) - (\lambda+\gamma)\bar{F} - \delta G^H > e^H(G^H, t^H) - (\lambda+\gamma)F^H - \delta G^H.$$

The first inequality means that the ruler does not receive positive gains by establishing lower JI and reneging on the announcement, and the second inequality comes from the assumption that $F^H > \bar{F}$. Therefore, strict inequality $(1 - t^H)e^H(G^H, t^H) < \lambda F^H$ holds, and, from equation (4.3), $e^H(G^H, t^H) < \bar{e}(F^H, t^H)$. Then, consider the level of JI $F' = F^H - \epsilon$, where ϵ is positive and sufficiently small. With F', the ruler increases his payoff without violating the constraints for credible commitment. Hence, it contradicts the assumption. □

Step 2: Consider the credible signal. To make the signal credible, the level of G^H must satisfy the following inequality;

$$\mathcal{R}(\bar{F}, G^H, t^H, t^H, e^H) = t^H e^H(G^H, t^H) - \gamma\bar{F} - \delta G^H \geq \mathcal{R}(0, G^H, t^H, 1, e^H) = e^H(G^H, t^H) - G^H.$$

With citizens' beliefs that maximise the ruler's equilibrium payoffs, the level of signal is

$$G(t^H) = \frac{1}{1-\delta}\left[(1 - t^H)e^H(G^H, t^H) + \gamma\bar{F}\right].$$

Step 3: Announced tax rate t is the solution of the following payoff maximisation problem;

$$\max_t \; te^J_{o,1}(\bar{F}, t) - \gamma\bar{F} - \frac{\delta}{1-\delta}\left[(1 - t)e^J_{o,1}(\bar{F}, t) + \gamma\bar{F}\right].$$

The formulation implies that the ruler provides the human rights, the level of

which shows the credible signal for JI, and that citizens know the level of JI on the equilibrium path. Then, the following lemma holds.

Lemma 4.5. *In PBE such that the ruler's payoff is maximised and $F^H = \bar{F}$, the equilibrium effort level satisfies that $e^H(G^H, t^H) = e^C(t^H) \leq \bar{e}(\bar{F}, t^H)$.*

Proof. Suppose that $\bar{e}(\bar{F}, t^H) < e^C(t^H)$. In this case, citizens choose $e^H(G(t^H), t^H) = \bar{e}(\bar{F}, t^H)$. The ruler's equilibrium payoff is, then,

$$\mathcal{R}(\bar{F}, G(t^H), t^H, t^H, \bar{e}(\bar{F}, t^H)) = \left[\frac{(t^H - \delta)\lambda}{1 - t^H} - \gamma\right]\frac{\bar{F}}{1 - \delta}.$$

In PBE, the above payoff must be non-negative.

Now consider the announcement $t' = t^H + \epsilon$ where ϵ is positive and sufficiently small so that it satisfies $\bar{e}(\bar{F}, t') < e^C(t')$. The following ruler's strategies and citizens' actions can be supported by another PBE: JI is $\bar{F}$, announcement is t', human rights is $G(t')$, and effort on the equilibrium path is $\bar{e}(\bar{F}, t')$. This is because

$$\mathcal{R}(\bar{F}, G(t'), t', t', \bar{e}(\bar{F}, t')) = \left[\frac{(t' - \delta)\lambda}{1 - t'} - \gamma\right]\frac{\bar{F}}{1 - \delta} > \mathcal{R}(\bar{F}, G(t^H), t^H, t^H, \bar{e}(\bar{F}, t^H)) \geq 0.$$

However, the first strict inequality shows contradiction with the assumption that t^H is a PBE announcement that maximises the ruler's payoff. □

Then, the candidate of the equilibrium tax is $\arg\max_t\{(t - \delta)e^C(t) \text{ s.t. } e^C(t) \leq \bar{e}(\bar{F}, t)\}$. The interior solution of this problem denoted by t^{Int} is $(1 + \delta)/2$. The interior solution of this problem is the solution if $\bar{F} \geq (1 - t^{Int})e^C(t^{Int})/\lambda = F^{Bou}$. Suppose that $\bar{F} < F^{Bou}$. Then, the solution is the corner t^{Cor} such that $e^C(t^{Cor}) = \bar{e}(\bar{F}, t^{Cor})$, i.e., $t^{Cor} = 1 - (2\alpha\lambda\bar{F})^{1/2}$. Notice that t^{Cor} decreases with α, λ and $\bar{F}$. Furthermore, t^{Cor} is higher than t^C, since, in this case, $t^{Cor} > t^{Int} > t^C$.

Step 4: Consider the ruler's payoff. If the ruler's payoff is negative, the ruler's equilibrium action is $F^H = 0$ and $G^H = 0$. Suppose that $\bar{F} \geq F^{Bou}$. Then, the interior solution is in equilibrium if $\mathcal{R}(\bar{F}, G(t^{Int}), t^{Int}, t^{Int}, e^C(t^{Int})) \geq 0$, which can be rewritten as $\bar{F} \leq (t^{Int} - \delta)e^C(t^{Int})/\gamma = F^{Int}$. Suppose, instead, that $\bar{F} < F^{Bou}$. Then, the corner solution is in equilibrium if $\mathcal{R}(\bar{F}, G(t^{Cor}), t^{Cor}, t^{Cor}, e^C(t^{Cor})) \geq 0$, which equals $\bar{F} \leq (t^{Cor} - \delta)e^C(t^{Cor})/\gamma = F^{Cor}$.

Bibliography

Acemoglu, Daron (2003) "Why not a political Coase theorem? Social conflict, commitment, and politics," *Journal of Comparative Economics*, Vol. 31, No. 4, pp. 620-652, December.

——— (2005) "Politics and economics in weak and strong states," *Journal of Monetary Economics*, Vol. 52, No. 7, pp. 1199-1226, October.

——— (2006) "Modeling Inefficient Institutions," in Blundell, Richard, Whitney Newey, and Torsten Persson eds. *Advances in Economic Theory and Econometrics: Proceedings of the Ninth World Congress of the Econometric Society*, Cambridge: Cambridge University Press.

Acemoglu, Daron, Simon Johnson, and James A. Robinson (2005) "Institutions as a Fundamental Cause of Long-Run Growth," in Aghion, Philippe and Steven Durlauf eds. *Handbook of Economic Growth*, Vol. 1, Amsterdam: Elsevier.

Alesina, Alberto, Sule Özler, Nouriel Roubini, and Phillip Swagel (1996) "Political Instability and Economic Growth," *Journal of Economic Growth*, Vol. 1, No. 2, pp. 189-211, June.

Alesina, Alberto, Arnaud Devleeschauwer, William Easterly, Sergio Kurlat, and

Romain Wacziarg (2003) "Fractionalization," *Journal of Economic Growth*, Vol. 8, No. 2, pp. 155-94, June.

Alesina, Alberto and Guido Tabellini (2007) "Bureaucrats or Politicians? Part I: A Single Policy Task," *American Economic Review*, Vol. 97, No. 1, pp. 169-179, March.

Barro, Robert (1973) "The control of politicians, an economic model," *Public Choice*, Vol. 14, No. 1, pp. 19-42.

Barro, Robert J (1990) "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, Vol. 98, No. 5, pp. S103-26, October.

Barro, Robert J. (1996) "Democracy and Growth," *Journal of Economic Growth*, Vol. 1, No. 1, pp. 1-27, March.

Barro, Robert J. and Jong-Wha Lee (1993) "International comparisons of educational attainment," *Journal of Monetary Economics*, Vol. 32, No. 3, pp. 363-394, December.

Besley, Timothy (1995) "Property Rights and Investment Incentives: Theory and Evidence from Ghana," *Journal of Political Economy*, Vol. 103, No. 5, pp. 903-37, October.

——— (2006) *Principled Agents? The Political Economy of Good Government*, Oxford: Oxford University Press.

Besley, Timothy and Maitreesh Ghatak (2005) "Competition and Incentives with Motivated Agents," *American Economic Review*, Vol. 95, No. 3, pp. 616-636, June.

Besley, Timothy and Masayuki Kudamatsu (2008) "Making Autocracy Work," in Helpman, Elhanan ed. *Institutions and Growth*, Cambridge: Harvard University Press.

Besley, Timothy and Torsten Persson (2009) "The Origins of State Capacity: Property Rights, Taxation, and Politics," *American Economic Review*, Vol. 99, No. 4, pp. 1218-44, September.

Blume, Lorenz and Stefan Voigt (2007) "The Economic Effects of Human Rights," *Kyklos*, Vol. 60, No. 4, pp. 509-538, November.

Brehm, John and Scott Gates (1997) *Working, Shirking, and Sabotage: Bureaucratic Response to a Democratic Public*, Ann Arbor, Michigan: University of Michigan Press.

Brunetti, Aymo and Beatrice Weder (2003) "A free press is bad news for corruption," *Journal of Public Economics*, Vol. 87, No. 7-8, pp. 1801-1824, August.

Carrubba, Clifford J. (2005) "Courts and Compliance in International Regulatory Regimes," *Journal of Politics*, Vol. 67, No. 3, pp. 669-689, August.

Chávez, Rebecca Bill, John A. Ferejohn, and Barry R. Weingast (2011) "A Theory of the Politically Independent Judiciary: A Comparative Study of the United States and Argentina," in Helmke, Gretchen and Julio Rios-Figueroa eds. *Courts in Latin America*, Cambridge: Cambridge University Press.

Cho, In-Koo and David M Kreps (1987) "Signaling Games and Stable Equilibria," *Quarterly Journal of Economics*, Vol. 102, No. 2, pp. 179-221, May.

Collier, Paul (2009) "The political economy of state failure," *Oxford Review of Economic Policy*, Vol. 25, pp. 219-240.

Collier, Paul and Jan Willem Gunning (1999) "Why Has Africa Grown Slowly?" *Journal of Economic Perspectives*, Vol. 13, No. 3, pp. 3-22, Summer.

Collier, Paul and Anke Hoeffler (2002) "On the Incidence of Civil War in Africa," *Journal of Conflict Resolution*, Vol. 46, No. 1, pp. 13-28.

——— (2004) "Greed and grievance in civil war," *Oxford Economic Papers*, Vol. 56, No. 4, pp. 563-595, October.

Devereux, Michael B. and Jean-Francois Wen (1998) "Political instability, capital taxation, and growth," *European Economic Review*, Vol. 42, No. 9, pp. 1635-1651, November.

Dewatripont, Mathias, Ian Jewitt, and Jean Tirole (1999) "The Economics of Career Concerns, Part II: Application to Missions and Accountability of Government Agencies," *Review of Economic Studies*, Vol. 66, No. 1, pp. 199-217, January.

Dixit, Avinash (2002) "Incentives and Organizations in the Public Sector: An Interpretative Review," *Journal of Human Resources*, Vol. 37, No. 4, pp. 696-727.

Dixit, Avinash K. (1996) *The Making of Economic Policy: A Transaction-Cost Politics Perspective*, Cambridge: The Mit Press.

Djankov, Simeon, Caralee McLiesh, Tatiana Nenova, and Andrei Shleifer (2003) "Who Owns the Media?" *Journal of Law and Economics*, Vol. 46, No. 2, pp. 341-81, October.

Drometer, Marcus (in press) "Bureaucrats and short-term politics," *Public Choice*.

Easterly, William and Ross Levine (1997) "Africa's Growth Tragedy: Policies and Ethnic Divisions," *The Quarterly Journal of Economics*, Vol. 112, No. 4, pp. 1203-50, November.

Farber, Daniel A. (2002) "Rights as Signals," *Journal of Legal Studies*, Vol. 31, No. 1, pp. 83-98, January.

Feld, Lars P. and Stefan Voigt (2003) "Economic growth and judicial independence: cross-country evidence using a new set of indicators," *European Journal of Political Economy*, Vol. 19, No. 3, pp. 497-527, September.

Ferejohn, John (1986) "Incumbent Performance and Electoral Control," *Public Choice*, Vol. 50, No. 1, pp. 5-25.

Ginsburg, Tom (2003) *Judicial Review in New Democracies: Constitutional Courts in Asian Cases*, Cambridge: Cambridge University Press.

Glaeser, Edward L., Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer (2004) "Do Institutions Cause Growth?" *Journal of Economic Growth*, Vol. 9, No. 3, pp. 271-303, September.

Greif, Avner (2008) "Toward Political Economy of Implementation: The Impact of Administrative Power on Institutional and Economic Developments," in Helpman, Elhanan ed. *Institutions and Growth*, Cambridge: Harvard University Press.

Greif, Avner, Paul Milgrom, and Barry R Weingast (1994) "Coordination, Commitment, and Enforcement: The Case of the Merchant Guild," *Journal of Political Economy*, Vol. 102, No. 4, pp. 745-76, August.

Grossman, Herschel I. and Suk Jae Noh (1994) "Proprietary public finance and

economic welfare," *Journal of Public Economics*, Vol. 53, No. 2, pp. 187-204, February.

Hanssen, F. Andrew (2004) "Is There a Politically Optimal Level of Judicial Independence?" *American Economic Review*, Vol. 94, No. 3, pp. 712-729, June.

Helmke, Gretchen and Frances Rosenbluth (2009) "Regimes and the Rule of Law: Judicial Independence in Comparative Perspective," *Annual Review of Political Science*, Vol. 12, pp. 345-366.

Herbst, Jeffrey (2000) *States and Power in Africa: Comparative Lessons in Authority and Control*, New Jersey: Princeton University Press.

Hilbink, Lisa (2012) "The Origins of Positive Judicial Independence," *World Politics*, Vol. 64, No. 4, pp. 587-621, October.

Keith, Linda Camp (2002) "Judicial Independence and Human Rights Protection Around the World," *Judicature*, Vol. 85, No. 4, pp. 194-200, January-February.

Keith, Linda Camp, C. Neal Tate, and Steven C. Poe (2009) "Is The Law a Mere Parchment Barrier to Human Rights Abuse?" *Journal of Politics*, Vol. 71, No. 2, pp. 627-643, April.

Knack, Stephen and Philip Keefer (1995) "Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures," *Economics and Politics*, Vol. 7, No. 3, pp. 207-27, November.

La Porta, Rafael, Florencio Lopez-de Silanes, Andrei Shleifer, and Robert Vishny (1999) "The Quality of Government," *Journal of Law, Economics and Organization*, Vol. 15, No. 1, pp. 222-79, April.

La Porta, Rafael, Florencio Lopez de Silanes, Cristian Pop-Eleches, and Andrei Shleifer (2004) "Judicial Checks and Balances," *Journal of Political Economy*, Vol. 112, No. 2, pp. 445-470, April.

Laffont, Jean-Jacques (2000) *Incentives and Political Economy*, Oxford: Oxford University Press.

Landes, William M and Richard A Posner (1975) "The Independent Judiciary in an Interest-Group Perspective," *Journal of Law and Economics*, Vol. 18, No. 3, pp. 875-901, December.

Levitsky, Steven and Lucan A. Way (2002) "The Rise of Competitive Authoritarianism," *Journal of Democracy*, Vol. 13, No. 2, pp. 51-65.

Lohmann, Susanne (1992) "Optimal Commitment in Monetary Policy: Credibility versus Flexibility," *American Economic Review*, Vol. 82, No. 1, pp. 273-86, March.

Maskin, Eric and Jean Tirole (2004) "The Politician and the Judge: Accountability in Government," *American Economic Review*, Vol. 94, No. 4, pp. 1034-1054, September.

Migdal, Joel S. (1988) *Strong Societies and Weak States: State-Society Relations and State Capabilities in the Third World*, New Jersey: Princeton University Press.

Moe, Terry M. (2006) "Political Control and the Power of the Agent," *Journal of Law, Economics and Organization*, Vol. 22, No. 1, pp. 1-29, April.

Moe, Terry M (in press) "Public Bureaucracy and the Theory of Political Control," in Gibbons, Robert and John Roberts eds. *Handbook of Organizational Economics*, New Jersey: Princeton University Press.

Morris, Stephen (2001) "Political Correctness," *Journal of Political Economy*, Vol. 109, No. 2, pp. 231-265, April.

Moustafa, Tamir (2007) *The Struggle for Constitutional Power: Law, Politics, and Economic Development in Egypt*, Cambridge: Cambridge University Press.

Muller, Wolfgang C (2008) "Governments and bureaucracies," in Caramani, Daniele ed. *Comparative Politics*, Oxford: Oxford university press.

Myerson, Roger B. (2008) "The Autocrat's Credibility Problem and Foundations of the Constitutional State," *American Political Science Review*, Vol. 102, No. 1, pp. 125-139, February.

Niskanen, William A. (1971) *Bureaucracy and Representative Government*, Chicago: Aldine-Ahterton.

North, Douglass C. (1990) *Institutions, Institutional Change and Economic Performance*, Cambridge: Cambridge University Press.

North, Douglass C. and Barry R. Weingast (1989) "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England," *Journal of Economic History*, Vol. 49, No. 04, pp. 803-832, December.

Oechslin, Manuel (2010) "Government Revenues and Economic Growth in Weakly Institutionalised States," *Economic Journal*, Vol. 120, No. 545, pp. 631-650, 06.

Overland, Jody, Kenneth Simons, and Michael Spagat (2005) "Political instability and growth in dictatorships," *Public Choice*, Vol. 125, No. 3, pp. 445-470, December.

Perino, Grischa (2010) "How delegation improves commitment," *Economics Letters*, Vol. 106, No. 2, pp. 137-139, February.

Persson, Torsten and Guido Tabellini (2002) *Political Economics: Explaining Economic Policy*, Cambridge: The MIT Press.

Posner, Richard A (1998) "Creating a Legal Framework for Economic Development," *World Bank Research Observer*, Vol. 13, No. 1, pp. 1-11, February.

Ramseyer, J. Mark and Eric B. Rasmusen (2003) *Measuring Judicial Independence: The Political Economy of Judging in Japan*, Chicago, IL: The University of Chicago Press.

Rodrik, Dani (2000) "Institutions for high-quality growth: What they are and how to acquire them," *Studies in Comparative International Development*, Vol. 35, pp. 3-31.

Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi (2004) "Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development," *Journal of Economic Growth*, Vol. 9, No. 2, pp. 131-165, Jun.

Root, Hilton and Karen May (2008) "Judicial Systems and Economic Development," in Ginsburg, Tom and Tamir Moustafa eds. *Rule By Law: The Politics of Courts in Authoritarian Regimes*, Cambridge: Cambridge University Press.

Rouban, Luc (2004) "Politicization of the Civil Service in France," in Peters, B. Guy and Jon Pierre eds. *The Politicization of the Civil Service in Comparative Perspective: A Quest for Control*, London: Routledge.

Sen, Amartya (1999) *Development as Freedom*, Oxford: Oxford University Press.

Shen, Ling (2007) "When will a Dictator be Good?" *Economic Theory*, Vol. 31, No. 2, pp. 343-366, May.

Silverstein, Gordon (2008) "Singapore: The Exception That Proves Rules Matter," in Ginsburg, Tom and Tamir Moustafa eds. *Rule By Law: The Politics of Courts in Authoritarian Regimes*, Cambridge: Cambridge University Press.

Staton, Jeffrey K. (2006) "Constitutional Review and the Selective Promotion of Case Results," *American Journal of Political Science*, Vol. 50, No. 1, pp. 98-112, January.

Stephenson, Matthew C. (2003) ""When the Devil Turns...": The Political Foundations of Independent Judicial Review," *Journal of Legal Studies*, Vol. 32, No. 1, pp. 59-89.

Suleiman, Ezra (2003) *Dismantling Democratic States*, New Jersey: Princeton University Press.

Tavares, José and Romain Wacziarg (2001) "How Democracy Affects Growth," *European Economic Review*, Vol. 45, No. 8, pp. 1341-1378, August.

Tirole, Jean (1986) "Hierarchies and Bureaucracies: On the Role of Collusion in Organizations," *Journal of Law, Economics and Organization*, Vol. 2, No. 2, pp. 181-214, Fall.

——— (1994) "The Internal Organization of Government," *Oxford Economic Papers*, Vol. 46, No. 1, pp. 1-29, January.

Tullock, Gordon (2002) "Bureaucracy," in Tullock, Gordon, Arthur Seldon, and Gordon L. Brady eds. *Government Failure: A primer in public choice*, Washington, DC: Cato Institute.

Vanberg, Georg (2005) *The Politics of Constitutional Review in Germany*, Cambridge: Cambridge University Press.

Vlaicu, Razvan and Alexander Whalley (2011) "Hierarchical Accountability in Government: Theory and Evidence." mimeo.

Weingast, Barry R. (1995) "The Economic Role of Political Institutions: Market-Preserving Federalism and Economic Development," *Journal of Law, Economics and Organization*, Vol. 11, No. 1, pp. 1-31, April.

Wilson, James Q (1989) *Bureaucracy: What Government Agencies Do and Why They Do It*, New York: Basic Books.

World Bank (1993) *The East Asian Miracle: Economic Growth and Public Policy*, New York: Oxford University Press.