

Legal Protection of Property Rights: A Dynamic Evolution Model

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Abstract

This paper analyses a dynamic evolution model of institutions, where the security of property rights is affected by coercive capacity, political power, legal quality, and private protection. Since they are endogenously determined in equilibrium, the legal quality can be used as a summary indicator of property security. The main result suggests the legal protection of property rights increases over time mainly because the economy's vulnerability to expropriation declines as a result of arising importance of commercial and industrial activities as compared to agriculture. The rule of law and a strong government coexist only when the common people are capable of defending themselves collectively against state predation. The main predictions are consistent with broad historical evidence.

JEL: O10, O40, P16, N10.

Key Words: *Property Rights, Coercion, Political Regime, Legal Development, Democratization, Factor Composition, Rent Seeking.*

1 Introduction

Across societies and over time, the security level of property rights varies a lot, which in turn affects a society's order and prosperity (North and Thomas 1973). Recent research suggests that protection against state predation, which is the focus of this paper, is more important to economic growth than protection against private predation by fellow citizens (Acemoglu et al. 2005), partially because informal contract enforcement can arise spontaneously (Greif 2006), and also because such private order is usually desirable to both state and citizens. The danger from state predation, however, is always present due to the inherent difficulty in monitoring: Who can discipline the state that by nature has to be the monopolist of coercive power? The only robust solution is to create a cyclical chain of institutions in the form of a self-sustaining equilibrium (Weingast 1997, North et al. 2009).

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This paper provides a simple analytical framework to study such a general equilibrium of institutions from a historical or evolutionary perspective. Specifically, the balance of coercive force across groups shapes the political regime, which enables the ruler to legitimately tax others; the legal system is established by the ruler as a public commitment device to refrain from arbitrary expropriation, which is also curbed in equilibrium by various informal means of private protection (Tullock 1980, Olson 1993, Hirshleifer 1994). The security of property rights is thus founded on the bedrock of the owners' overall capacity to defend them through four distinct channels in this framework, namely, coercive capacity, political power, legal quality, and private protection. Since they are endogenously determined in the equilibrium, the legal quality can be used as a summary indicator of property security.

The main result suggests that the legal protection of property rights increases over time mainly because the economy's vulnerability to expropriation is reduced by the rising importance of commercial and industrial activities over agriculture. In particular, the technical features of land, such as its relatively fixed supply and difficulty to hide or destroy, make landowners vulnerable to expropriation. In contrast, physical capital such as machines or know-hows in commercial and industrial activities is endogenously invested, more dispersedly distributed among people, and easier to move or hide (DeLong and Shleifer 1993, Engerman and Sokoloff 1997, Rajan and Zingales 2003, Lagerlof and Tangeras 2008). The evolving factor composition from land to capital along the economic development process is shown to be the ultimate force that pushes the wheel of endogenous institutional change towards better security of property rights in history. This path of legal development can be facilitated by moderate heterogeneity in property ownerships. Extreme income inequality, however, tends to delay the progress, or even cause democracy degeneration and reduce legal quality (Andrias 2015, Pistor 2019).

To fix ideas, the benchmark model focuses on the transition process from monarchy to democracy among owners of land and physical capital. The dynamic evolution path of legal quality is illustrated as in Figure 1. The monarch, once established, will remain unchallenged when land distribution is stable, since the coercive power is usually proportional to land size. The optimal legal quality q_{tL}^* is thus very low so that the monarch faces little constraint in expropriating others. After physical capital investment starts from T_K , however, the trade-off between legitimate tax and arbitrary expropriation changes dramatically, where the capital's lower vulnerability to expropriation induces the monarch to favor tax more; as a consequence, the legal quality q_{tK}^* improves, while the informal rent-seeking intensity declines at a faster pace than before. Once the wealth and coercive power of property owners become large enough, they will have the capability to challenge the monarch, which induces the political regime to transit to democracy at T_D when all property owners share

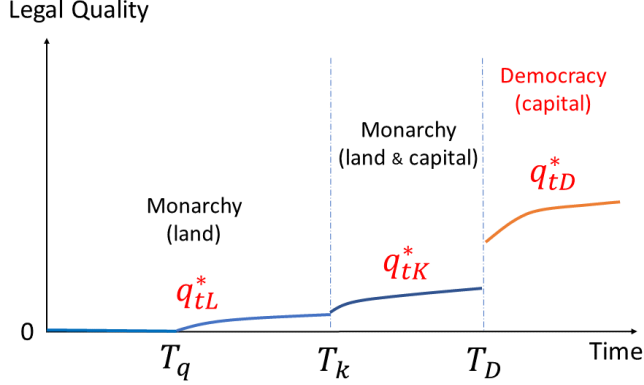


Figure 1: Legal Protection of Property Rights Evolves over Time

political rights; the political democratization leads to a discrete jump in legal quality q_{tD}^* , suggesting that in order to achieve better protection of property rights by law, the masses need to get political rights first. This evolution path is consistent with the relevant historical evidence in England (Moore 1966, North and Thomas 1973, Rosenberg and Birdzell 1986, North and Weingast 1989, Rapaczynski 1996, Polanyi 2001).

Results of this paper demonstrate the importance of dynamic compatibility between economic structure, political transition, and legal protection of property rights.¹ For example, an economy based on land or other natural resources, regardless of how rich it may be, is not likely to provide secure property rights to common people. Broad participation of the masses in commercial and industrial activities, in contrast, provides a much more solid foundation for democratization in political and legal power. Decline of property security, however, may also occur in a mature democracy if technological shocks make ordinary people more vulnerable to expropriation, and degeneration towards elite rule may follow surreptitiously if wealth inequality has become sufficiently high (Andrias 2015, Pistor 2019). The converse is also true, where a corrupt legal system may hold back the normal developmental process in order to preserve the political power of the ruling group. Severe incompatibilities between economic development and institutions would give rise to conflicting expectations and interests, which, if not reconciled in time, may lead to political upheavals and regime transitions.

¹This echoes the observation of Eggertsson (2005:184): "Only societies capable of continually renewing their property rights structures and adjusting them to new technologies, external shocks and internal dynamics are able to sustain growth indefinitely."

A new insight emerging from the model is the sign-switching relationship between the legal quality and the state's advantage in expropriation over ordinary citizens: Whereas a weak legal system is typically associated with a powerful government under an exploitative political regime, both law and state can be strong under democracy.² That is, a strong rule of law and a capable government in taxation can function together *only* when the political power is widely distributed among citizens, who control sufficient coercive power to discipline the government.

This may account for the seemingly contradictory evidence that, while democracy is generally believed to improve property rights, much higher tax rates are commonly observed in Europe after democratic transitions (Angeles 2011). A potential explanation provided by the model is that the taxes, now chosen collectively by the citizens, are not exploitative anymore but for public good purpose such as building infrastructure or maintaining a high quality legal system (Lee 2003, Lizzeri and Persico 2004). Since sufficient constraints on arbitrary expropriation are credibly imposed by the rule of law, the government under democracy can be trusted with stronger fiscal and other capabilities than before (North and Thomas 1973).

Though this paper studies the institutional changes at the national level, the evolutionary order of different formats of property rights protection suggested in the model, from using coercive means to harnessing political forces, and finally to relying on the legal system, also applies to local conflicts on property rights. For example, after studying how agents in the frontiers of Australia, Brazil and the U.S. established their property rights, Alston et. al (2012) find that the *de facto* property holders in the frontiers tend to protect their properties from competitors through violence, which however is very costly; a natural step then is to use political forces to acquire *de jure* property rights, that is, shifting the main protection method from coercion to political and legal means.

This paper belongs to a broad literature connecting growth, development, and institutions in a long-term perspective (Bertocchi 2006). Its primary contribution is analyzing the relationship between several distinct but closely related formats of property rights protection in a dynamic political economy model. Due to the complex nature of property rights security, there is an enormous amount of work on this subject from several disciplines. This paper is closely related to studies using a political economy analytical framework.³ Most of these papers, however, study property rights under a fixed government without considering factor composition of the economy, while in contrast, this paper focuses on the coevolution of political and legal

²Besley and Persson (2009), for example, proposes that investments in legal and fiscal capacities are often complements. In their model, however, property rights refer to protection against risk of expropriation by other private agents and not by the government, where government expropriation is ruled out by assumption.

³See Grossman and Kim (1995), Rapaczynski (1996), Sonin (2003), Gonzalez (2007), Gradstein (2007), Besley and Persson (2009), Besley and Ghatak (2010), and Cervellati et al. (2012).

institutions adapting to changing production factors; Cervellati et al. (2012) is an exception in this regard, but its main focus is on contract enforcement.

This paper also sheds light to a common conceptual confusion observed in this literature, where the rich are often assumed to have advantage in rent-seeking (Besley and Persson 2009, Sonin 2003), but the poor in open fight (Acemoglu and Robinson 2001). These two types of ultra-legal coercive forces, namely, private protection activities in rent-seeking and violent confrontations of collective actions, both affect property rights in important ways. They are, however, rarely analyzed together in a single framework, and as a result, their interactions and dynamic compatibility have not been studied. This paper endogenizes them simultaneously and finds that, in a *given* political regime of elite rule, the elite must possess both higher rent-seeking power and dominant coercive power in an open fight, because the latter is the very reason that gets them into political ruling in the first place. Only when the poor have accumulated enough income and coercive power, a critical *transition* time will then arrive, where the balance of power tips over to favor the poor, leading to political regime change. This newly acquired dominance of coercive power by the masses, however, has to be continuously maintained and embodied by political and legal institutions to curb the elite’s advantage in rent-seeking, otherwise the elite capture or democracy degeneration may occur surreptitiously.

This paper proceeds as follows. The basic elements of the political economy model are introduced in Section 2. The evolution path of the benchmark model is analyzed in Section 3 with supporting historical evidence. Extensions with heterogeneity in property ownership are provided in Section 4. Concluding remarks are in the final section. All proofs are collected in the Appendix.

2 The Political Economy Model

2.1 The Economy

There are overlapping generations in the economy with a fixed population size. Each individual lives for two periods including childhood and adulthood. All decisions are made by adults.

Preferences. Individuals are identical in preferences represented by a log-linear utility function $u_{ti} = (1 - \beta) \log c_{ti} + \beta \log(z + b_{ti})$, where c_{ti} is the adulthood consumption of individual i in generation t , b_{ti} is his bequest for offspring,⁴ $\beta \in (0, 1)$ indicates the relative weight of bequest in utility, and $z > 0$ is a constant. The budget constraint is $c_{ti} + b_{ti} \leq \widehat{I}_{ti}$, where \widehat{I}_{ti} is individual i ’s disposable income at adulthood.

As a result of utility maximization, the individual’s optimal bequest is $b_{ti} = \max\{\beta(\widehat{I}_{ti} - Z), 0\}$ where

⁴This bequest motive from the “joy of giving” is commonly adopted in the literature on income distribution and growth (Altonji, Hayashi and Kotlikoff 1997, Galor and Moav 2006).

$Z \equiv z(1 - \beta)/\beta$. That is, only when an individual's income is higher than a certain level Z , would there be any resources left as bequest; this is a reasonable result given that the model economy starts from the agricultural era where many people live at the subsistence level and may not afford any savings. The total bequest in society B_t is then $B_t = \sum_i b_{ti} = \sum_i \max\{\beta(\hat{I}_{ti} - Z), 0\}$.

Endowment. The initial endowment of land L is exogenously distributed among N landowners, who may also generate physical capital $k_{ti} = b_{t-1,i}$ using bequest.⁵ The initial state of the model economy corresponds to a time when agriculture is the dominant production method, and the physical capital stock is zero. The total quantity of land $L = \sum_i L_i$ is fixed over time, while the aggregate stock of physical capital $K_t = \sum_i k_{ti}$ depreciates fully after one period, which is equivalent to one's adulthood (about 20 to 30 years). Each individual is also endowed with a unit of labor.⁶

Final Output Production. In every period, the economy produces a single homogeneous good that can be used for consumption and investment. An individual with land L_i and physical capital k_{ti} gets an income

$$I_{ti} = A_t(L_i + k_{ti})$$

from production. The knowledge stock A_t grows at an exogenous speed $g > 0$ so that $A_{t+1} = A_t(1 + g)$, which is the ultimate growth engine.⁷ This income function can be endogenized as the optimization outcome from reasonable production functions (see Huang 2012b).

2.2 The Transition of Political Regime

The political regime is established endogenously based on *might-is-right*, where the ruler has to possess dominant coercive power over a potential challenging group in each period, otherwise it may be overthrown and replaced by a new political regime.

The *coercive capability* of a group of N_j individuals, denoted by v_{tj} , is determined by its economic resources \mathbf{I}_{tj} and cohesiveness ψ_{tj} . To capture a salient feature of collective action due to free-riding and information problems, $\psi_{tj} = \psi(N_j)$ is assumed to decrease with group size N_j , where $\psi'(N_j) \leq 0$. The exact functional form can be affected by many elements such as culture, ideology, religion, or the presence of charismatic leaders. The group's overall economic strength \mathbf{I}_{tj} is indicated by its aggregate income:

⁵Blending two distinct types of factor owners (landowners and capitalists) into one group is mainly for simplification; the main results of the model also go through when heterogeneity is introduced in Section 4.

⁶The role of human capital in production is not explicitly analyzed in this paper mainly because its effect on property rights protection is qualitatively similar to physical capital; some further discussions on this are provided in Section 5.

⁷Note that the exogenous growth rate g , though positive, can be arbitrarily close to zero in the model, which is also consistent with the almost zero growth rate in the Malthusian era (Galor and Weil 2000, Hansen and Prescott 2002).

$\mathbf{I}_{tj} = \sum_{i=1}^{N_j} I_{ti}$. Thus the group coercive capability v_{tj} is

$$(1) \quad v_{tj} = \boldsymbol{\psi}_{tj} \mathbf{I}_{tj} = \psi(N_j) \sum_{i=1}^{N_j} I_{ti}.$$

The stability of the political regime in each period t is an endogenous result of a political transition game, where some individuals may form a group to challenge the current ruler's political dominance. The coercive capabilities of the challenging group and the ruler are denoted by $v_{tC} \equiv \boldsymbol{\psi}_{tC} \mathbf{I}_{tC}$ and $v_{tR} \equiv \boldsymbol{\psi}_{tR} \mathbf{I}_{tR}$, respectively. Then the relative coercive power of the challenging group in each period t is denoted by x_t where

$$x_t \equiv \frac{v_{tC}}{v_{tR}} = \frac{\boldsymbol{\psi}_{tC} \mathbf{I}_{tC}}{\boldsymbol{\psi}_{tR} \mathbf{I}_{tR}}.$$

Let $x^* \in (0, 1)$ denote a threshold such that the challenging group will obey the current political order when their relative coercive power x_t is weak (if $x_t \leq x^*$), and revolt otherwise (if $x_t > x^*$). The ruler will respond to revolt by extending political power to the challenging group, which is a peaceful transition to a more inclusive political regime. In other words, the political transition is simplified as an automatic process where the current political regime continues as long as $x_t \leq x^*$ holds, and is replaced by a more democratic regime when $x_t > x^*$ is reached.⁸

2.3 The Independent Legal System

The highest possible expropriation rates for land and physical capital are denoted by τ_l and τ_k , respectively. Since the size of land and its productivity are more difficult to hide, move, or misreport than business activities, $\tau_l > \tau_k$ is assumed to hold. That is, it is easier to expropriate land than capital. Unlike roaming bandits, the political ruler may find it not optimal to impose such high tax rates because of negative effects on incentives in production and investment. To simplify analysis, we fix the ruler's optimal tax rate at a constant level τ_0 for all factors, where $\tau_0 < \tau_k < \tau_l$ holds. This means that the ruler's promised tax rate τ_0 is lower than the maximal expropriation rates for all factors.

This condition, however, is *dynamically inconsistent* because the ruler has incentives to renege on its promise. For example, the ruler may promise to tax at τ_0 before production starts, but *ex post* it may tax at much higher rates up to τ_l and τ_k . Repeated interactions and reputation may mitigate such dynamic inconsistency to some degree, but their effectiveness can be reduced by unexpected shocks such as an impending war (Tilly 1990, Olson 1993).

⁸This is a reduced-form version of the smooth political transition equilibrium in Huang (2012b), in which other outcomes such as repression and revolution are analyzed. Though they are not considered in this paper since the focus now is on the legal development, some relevant discussions are provided in Section 4.

An independent legal system, in comparison, provides a more reliable institutional warranty for the promised tax rate to be respected. This is indicated by the legal quality $q_t \in [0, 1]$ such that the legitimate tax τ_0 is enforced only with probability q_t , while in the rest of time, the ruler overrides the law and attempts to expropriate the citizens. When such expropriation occurs (with probability $1 - q_t$), individuals may use informal means for self-protection.⁹

The political ruler chooses the optimal legal quality to maximize its overall expected income that includes production profit, tax revenue and gains from expropriation. The cost of legal investment is $c(q_t)$, where $c' > 0$ and $c'' > 0$ are assumed.

2.4 Investment in Private Protection: A Rent-Seeking Game

Given that the legal protection of property rights is not perfect, citizens need to invest in private means to counteract the ruler's potential expropriation. For example, they may purchase weapons, hire guards, hide revenues or even destroy outputs. This is modeled as a rent-seeking game between the ruler and citizens. Its negative impact is captured by a deadweight loss of $(1 - \theta)Y_t$ for the society whenever expropriation occurs, where $\theta \in (0, 1)$, in addition to the direct rent-seeking expenditures.

The rent-seeking capacity of the ruler is denoted by s_{tR} , and that of an individual i by s_{ti} . The ruler's rate of success in the rent-seeking game with an individual i is denoted by μ_{ti} , where

$$\mu_{ti} \equiv \frac{s_{tR}}{s_{tR} + s_{ti}}.$$

With probability μ_{ti} , the ruler wins in the game and expropriates the individual i 's income by the amount $\tau_i \theta I_{ti}$, while with probability $1 - \mu_{ti}$, it loses and is thus expropriated by individual i of the amount $\tau_R \theta I_{tR}$ plus the lost tax revenue $\tau_0 I_{ti}$, where $\tau_i, \tau_R \in \{\tau_l, \tau_k\}$ are the maximal expropriation rates for land and capital.

The ruler enjoys relative advantage in the rent-seeking game because its specialization in political ruling enhances its efficiency in private protection, while in contrast, citizens are usually engaged in economic production. This is captured by a lower rent-seeking cost for the ruler: to achieve the same level of private protection capacity s_t , the cost is s_t/ρ for the ruler, where $\rho > 1$, while for a typical citizen it is equal to s_t . So the ruler's *rent-seeking advantage* is indicated by ρ .

⁹There are other benefits of operating a legal system such as providing social order and mitigating property transgressions among ruled agents themselves (Huang 2013). Though not explicitly modeled in this paper in order to focus on conflicts between the ruler and citizens, they are partially captured by $\tau_k < \tau_l$ since trade relies more on a stable order than agriculture. Possible interactions between them are briefly discussed in the last section.

Note that the rent-seeking capacity s_{ti} and coercive capability v_{tj} are both ultra-legal coercive forces affecting property rights security. However, they have quite distinct features and roles. In the political transition game, the usage of coercion v_{tj} by the challenging group to gain political power against the current ruler is to forge agreement on the political regime: once the balance of power is demonstrated to all relevant sides, the resources will soon be returned back to productive usage.¹⁰ In contrast, resources invested into rent-seeking capacities s_{ti} are permanently transformed and engaged routinely as a credible counteracting force against the ruler's usage of arbitrary power.¹¹

2.5 The Time Line of Decisions

The timing of major decisions in each period is as follows. (1) **The Political Regime Stage.** The ruled agents decide whether to obey the current ruler or to form a challenging group to initiate a fight against it. The choice depends on the balance of the two parties' coercive power x_t . This occurs after production is finished and all agents get economic incomes I_{ti} . (2) **The Legal Investment Stage.** Once the political regime is settled, the ruler determines q_t , the quality of an independent legal system that enforces the implementation of the promised tax rate τ_0 . (3) **The Rent-Seeking Stage.** Given the political regime and legal quality, each individual decides how much resource to invest in rent-seeking. Then with probability q_t , tax $\tau_0 I_{ti}$ is collected, otherwise the rent-seeking game is played. And finally, bequest and capital investment are made for next period. The game is solved by backward induction.¹²

3 The Evolution Path of Legal Protection

3.1 Weak Law in Monarchy with Land

In the beginning of the model economy, agriculture is the dominant production method and there is no physical capital. The initial political regime is monarchy where a dominant landowner with land L_R is the ruler. The rest land $L - L_R$ is equally distributed among $N - 1$ agents in this benchmark case, while heterogeneity in land ownership is discussed in the next section.

In the **Rent-Seeking Stage**, each individual makes optimal investment in rent-seeking to maximize

¹⁰For example, in some crucial periods of political transition, many people may intensively engage in demonstrations until some desirable outcome is reached, but afterwards they go back to routine work and life.

¹¹Such restraining effect, however, is in turn limited in equilibrium by the overall coercion power of citizens that is embodied by the political regime. In other words, these two forces would be in tandem with each other in the dynamic equilibrium.

¹²The length of an individual's adulthood, which corresponds to one period in the overlapping generation model, is used as the horizon for all choices. Allowing longer horizons for political decisions may alter the timing but not the qualitative results of the development process.

their expected revenue, taking as given legal quality q_t and others' rent-seeking expenditure. The monarch's revenue contains two parts, the land income I_{tR} and the political rent including tax and expropriation. When the legal system works properly, the monarch receives a legitimate tax revenue $(N - 1)\tau_0 I_{ti}$. If not, then the monarch engages in rent-seeking with each of the $N - 1$ agents at tax-collecting occasions; as a result, the monarch either gets $(N - 1)\theta\tau_l I_{ti}$ when he wins with probability μ_t ,¹³ or $-\theta\tau_l I_{tR}$ when he loses. So the monarch's expected rent-seeking revenue π_{tR} is

$$\pi_{tR} = \theta\tau_l [\mu_t(N - 1)I_{ti} + (1 - \mu_t)(-I_{tR})].$$

The monarch's objective function at this stage is to maximize her net revenue $\widehat{I}_{tR}(q_t)$, which is the total revenue (from production, tax, and expropriation) minus expenditures on rent-seeking and maintaining the legal system, conditional on the legal quality q_{tL} determined in an earlier stage. Let

$$\widehat{I}_{tR}^*(q_{tL}) = \max_{s_{tR}} [I_{tR} + q_{tL}(N - 1)\tau_0 I_{ti} + (1 - q_{tL})\pi_{tR} - s_{tR}/\rho - c(q_{tL})].$$

Following similar arguments, the objective function of an individual i in the rent-seeking stage is to maximize her disposable income $\widehat{I}_{ti}(q_{tL})$ where

$$(2) \quad \widehat{I}_{ti}^*(q_{tL}) = \max_{s_{ti}} [I_{ti} - q_{tL}\tau_0 I_{ti} - (1 - q_{tL})\frac{\pi_{tR}}{N - 1} - s_{ti}].$$

Proposition 1 *The optimal expenditures on informal rent-seeking are*

$$(3) \quad s_{ti}^* = (1 - q_{tL})\rho\theta\tau_l Y_t \frac{1}{(1 + \rho(N - 1))^2},$$

$$(4) \quad s_{tR}^* = (N - 1)\rho s_{ti}^*.$$

The success rate of ruler's expropriation is

$$\mu_t^* = \frac{s_{tR}^*}{s_{ti}^* + s_{tR}^*} = \frac{\rho(N - 1)}{1 + \rho(N - 1)} \equiv \mu,$$

which increases in both ρ and N . The percentage of rent-seeking expenditure in total income is

$$E_{tL}^* = \frac{(N - 1)s_{ti}^* + s_{tR}^*}{Y_t} = \rho\theta\tau_l(1 - q_t) \frac{(1 + \rho)(N - 1)}{(1 + \rho(N - 1))^2},$$

which decreases in q_{tL} and increases in ρ , τ_l , and θ .

These results are quite intuitive. The monarch is more likely to succeed in expropriation when it is more efficient in expropriation (i.e., if ρ is larger). The total expenditure on rent seeking is high when the legal

¹³Since the winning probability μ_{ti} would be identical across individuals, it will be written as μ_t to simplify notations.

quality q_{tL} is low, when the total available rent in the economy is high (indicated by $\theta\tau_l$), and when the ruler's advantage in expropriation ρ is large.

In the **Legal Investment Stage**, the monarch, anticipating the informal rent-seeking capacity investment s_{ti}^* and s_{tR}^* in Proposition 1, chooses the optimal legal quality q_{tL}^* to maximize its expected net revenue $\widehat{I}_{tR}^*(q_{tL})$.

Proposition 2 *The marginal benefit of legal quality $\omega_{tL} \equiv \tau_0(Y_t - I_{tR}) - \theta\tau_l(\mu^2 Y_t - I_{tR})$ strictly decreases in ρ and θ . The optimal legal quality under monarchy q_{tL}^* is*

$$q_{tL}^* = \begin{cases} 0 & \text{if } \omega_{tL} \leq c'(0) \\ c'^{-1}(\omega_{tL}) & \text{if } \omega_{tL} > c'(0) \end{cases} .$$

There exists a threshold $\widehat{\rho}$, below which the legal investment would start after T_q , where

$$T_q = \ln \frac{c'(0)}{\omega_{tL}/A_t} / \ln(1 + g),$$

and then increases over time. If $\rho \geq \widehat{\rho}$, the legal quality would remain 0 under monarchy until physical capital starts. A high ρ thus delays the beginning of legal investment and reduces legal quality.

These results suggest that when ρ is sufficiently large, the monarch faces very small risks of being robbed by others so that he will find it optimal to have no rule of law, under which he faces no constraint in confiscating ruled agents. Since the total private protection expenditure is high when ρ is large, the political order is maintained not by law but by the monarch's dominance in rent-seeking. Expropriation is thus the routine, and its associated waste is high.

In contrast, when ρ is small, the monarch does not enjoy much advantage in expropriation compared with the risk of being robbed by others, a rule of law is likely to emerge. And furthermore, the optimal legal quality q_{tL}^* will become higher over time because the marginal benefit of law increases steadily. This implies that the rent-seeking expenditure relative to total income, E_{tL}^* , which can be a good indicator of waste in economy, declines over time.

In the **Political Regime Stage**, the political regime's stability is backed up by the ruler's dominant coercive power. The following proposition shows that a sufficiently large land size L_R enables the monarch to enforce a stable political order without credible challenge from other landlords. The actual size is affected by the relative cooperative effectiveness of the monarch over the potential challenging group.

Proposition 3 *When land is the main source of wealth, monarchy continues without any revolt as long as*

$$\frac{L_R}{L} \geq \frac{1}{1 + \phi x^*},$$

where $\phi \equiv \psi(1)/\psi(N-1)$ indicates the monarch's relative coercive effectiveness.

In summary, when wealth comes only from land (or other natural resources), as long as the monarch owns enough land to support his dominant coercive power, the monarchy political order is stable. The investment in an independent legal system is determined by the relative benefit of committing to the promised tax rate τ_0 compared with arbitrary expropriation at a much higher rate τ_l . The ruled agents are unable to collectively overthrow the monarchy using coercive power, and their capability to resist expropriation through private protection is also dwarfed by the monarch's advantage in expropriation ρ . So as a consequence of the strong political power and weak law, expropriation is the norm and property rights are not secure under monarchy with land.

3.2 Legal Quality Improved with Physical Capital

Physical capital investment, as in the format of commercial and industrial activities, starts from period T_k when savings become available for landowners, where T_k is determined by $\widehat{I}_{T_k,i}^* = Z$ from equation (2). The monarch lacks time or skill to carry out such entrepreneurial activities, but she does benefit from increased tax revenues.¹⁴ The income from capital, $A_t k_{ti}$, grows faster than land income $A_t L_i$ because the capital stock itself is increasing while land is fixed. This new source of economic wealth based on physical capital would soon change the legal and political landscape.

Since the maximal expropriation rates are different for land and capital, the average expropriation rate τ_{ti} for any agent's income is a mixture of these two rates depending on the weights of the two incomes, where $\tau_{ti} I_{ti} \equiv A_t(\tau_l L_i + \tau_k k_{ti})$ holds by definition. It is easy to see that τ_{ti} is decreasing over time because the weight on the smaller value τ_k , where $\tau_k < \tau_l$, is increasing due to capital investment. The economy's overall vulnerability to expropriation, τ_t , can be defined similarly, where

$$\tau_t = \frac{\tau_l L + \tau_k K_t}{L + K_t}$$

also decreases over time. The onset of physical capital investment renders expropriation less appealing than before, and thus the optimal legal quality after T_k , denoted by q_{tK}^* , would become higher.

Proposition 4 *The marginal benefit of legal quality with physical capital is $\omega_{tK} = \omega_{tL} + \theta\mu^2(\tau_l - \tau_t)Y_t$, where $\omega_{tK} > \omega_{tL}$ holds due to $\tau_t < \tau_l$. The optimal legal quality under monarchy after T_k is*

$$q_{tK}^* = \begin{cases} 0 & \text{if } \omega_{tK} \leq c'(0) \\ c'^{(-1)}(\omega_{tK}) & \text{if } \omega_{tK} > c'(0) \end{cases},$$

¹⁴As long as the monarch is relatively less effective in accumulating physical capital than the others, the main results will go through.

where $q_{tK}^* > q_{tL}^*$ holds unless when both are zero, and $q_{tK}^* > 0$ is possible even when $\rho \geq \hat{\rho}$.

The optimal expenditures on rent-seeking are lower than before, though the success rate of monarch is still the same as μ . The percentage of total rent-seeking expenditure is also reduced, where

$$E_{tK}^* = \frac{\tau_t (1 - q_{tK}^*)}{\tau_l (1 - q_{tL}^*)} E_{tL}^*.$$

After physical capital investment starts, the percentage of exploitable income in the aggregate outputs, τ_t , decreases over time. This is the underlying reason for why the endogenous legal quality q_{tK}^* becomes higher after T_k , and thus the percentage of rent-seeking expenditure E_{tK}^* decreases. The expenditure ratio of informal rent-seeking between the monarch and the ruled agents, however, stays constant over time because the political regime is still the same and ρ is fixed. The key driving force for better property security is not physical capital *per se*, but its *lower vulnerability to expropriation*.

In this paper, the coming of age of physical capital is taken as an exogenous historical fact. It is not far-fetched to imagine that, counter-factually, an alternative new production factor that is more effective in generating income than physical capital may not be adopted by the ruled agents if it is more vulnerable to expropriation. So the need for better protection may exert fundamental impact on the actual composition of production factors, where the less vulnerable varieties are more likely to be invested.¹⁵

3.3 Transition from Monarchy to Democracy

The ever increasing stock of physical capital as a new engine of growth induces a dynamic change of income distribution, which will be transmitted to other dimensions in society, culminating in fundamental transitions of political and legal institutions. Specifically, the joint income of $N - 1$ landlords, who may form the challenging group, grows faster than that of the monarch, and so does their coercive power. The political transition will arrive eventually from monarchy to a democracy of all property owners sharing political power.¹⁶

Proposition 5 *The political transition from monarchy to democracy occurs in period T_D where*

$$(5) \quad K_{T_D} = (1 + \phi x^*)L_R - L.$$

This political transition occurs later when ρ , θ , and ϕ are larger.

¹⁵See Bowles and Choi (2019), Goldstein and Udry (2008), and Scott (2009) for related analysis.

¹⁶This democracy would be equivalent to an oligarchy of property owners if there were laborers in the population. The model explicitly analyses choices of property owners only, given its focus on protection of *property* rights. The issues of human capital and intellectual property rights are left for future research.

This proposition makes it clear that the driving force of the increasing coercive power of the challenging group is physical capital K_t , which becomes large enough at T_D enabling the landowners to gain political rights. Condition (5) shows that when the monarch's relative coercive effectiveness ϕ is higher or when its land size L_R is larger, the political transition time T_D is reached later. Since capital investment comes from savings, which are reduced by rent-seeking expenditures, transition is also delayed when ρ and θ are larger.

3.4 Property Rights under Democracy

After T_D , political rights are shared among all property owners. This is implemented in each period by a random process where each citizen has a probability $p \in (0, 1)$ to be selected as the political ruler. As a result of the democratization process, all citizens are assumed to have identical land and physical capital as a benchmark case, while the effects of ownership heterogeneity are discussed in the next section.

The timing of the decision-making sequence is still the same as before, except that the optimal legal quality q_{tD}^* has to be decided before the identity of the ruler is revealed. The cost of maintaining the legal system is shared equally among all citizens and paid at the beginning of each period. When the law functions well, which occurs with probability q_{tD} , each citizen pays tax $\tau_0 I_{ti}$ as before; the tax revenue, after covering the cost of the legal system, is used for a public good shared among citizens, the value of which is thus $\tau_0 \sum_{i=1}^N I_{ti} - c(q_{tD})$. Note that the purpose of tax has changed under democracy; it is no longer expropriative. With probability $1 - q_{tD}$, the same rent-seeking game as before is played between the ruler and citizens.

Here arises a new type of *dynamic inconsistency under democracy*: No matter what legal quality one desires as a typical citizen, once selected as the political ruler, she will prefer a strictly lower legal quality *ex post* because she now enjoys a dominant rent-seeking capacity ρ as the incumbent ruler.

To ensure that the agreed upon q_{tD}^* will not be mitigated, transparency on legal enforcement is needed. The importance of a written constitution and the difficulty in changing it can be justified in this context. But the ultimate force underlying the adherence to q_{tD}^* by any ruler is the political and coercive power of citizens; once the violation of q_{tD}^* is observed and verified, the ruler will be stripped off power since the citizenry has the dominant coercive force. In the worst case where violation is undetected, the ruler is almost surely going to be replaced by another randomly selected citizen after one period as long as p is sufficiently low.¹⁷

¹⁷The potential danger of democracy being captured by a powerful elite group, however, may still exist, which is to be discussed in the next section.

Proposition 6 *Under democracy, the optimal legal quality q_{tD}^* is determined by*

$$[(1-p)\frac{2\theta\mu^2}{(N-1)\rho} + (\frac{1}{N} - p)(N\theta\mu^2 - 1)]\frac{N}{N-1}\tau_t Y_t = c'(q_{tD}^*),$$

where q_{tD}^* decreases in p . When p is sufficiently small, $q_{tD}^* > q_{tK}^*$ holds, q_{tD}^* increases in ρ , and the percentage of total rent-seeking expenditure E_{tD}^* is lower than before, where

$$E_{tD}^* = \frac{(1 - q_{tD}^*)}{(1 - q_{tK}^*)} E_{tK}^*.$$

This proposition suggests that the relationship between legal quality and ρ is flipped under democracy. Note that under monarchy both q_{tL}^* and q_{tK}^* decrease in ρ , because taxation and expropriation are substitutes in generating revenues for the ruler. But under democracy, political power is shared among citizens to serve the common interests; when ρ is larger, q_{tD}^* needs also to be higher in order to curb the rent-seeking temptation of the ruler.¹⁸ The relationship between legal quality and incumbent advantage ρ being negative under exploitative political regimes but positive under democracy is consistent with empirical evidence, where a strong rule of law and a capable government can function together only when the political power is relatively equally distributed among citizens.

Is legal quality higher in democracy? It should be by intuition, because in democracy the legal quality is determined to maximize a typical citizen's welfare; since they are relatively disadvantaged in rent-seeking compared with the ruler, they would prefer legal protection more than the ruler. The formal analysis, however, shows that such a result is far from being water proof. The reason is that the democratic ruler, unlike the monarch, does not get tax revenue into her own pocket; the only gain of being in the office is the expropriation opportunity as indicated by ρ . And indeed, under democracy, the ruler's *ex post* best choice of legal quality is always zero, which is worse than the monarch. This extremely severe dynamic inconsistency problem has to be diligently mitigated by a sufficiently low p , otherwise elite capture might occur serendipitous.

3.5 The Evolution Path and Historical Evidence

The increase of legal quality over time, as illustrated in Figure 1, is driven by three interconnected sources in the above benchmark model. (1) The benefit of legal system as represented by the tax revenue gradually increases due to productivity growth of A_t . Though it may not lead to any visible change of legal quality

¹⁸One can imagine that the opposite direction is also true: when the legal quality is high, then the government can be trusted to have high state capacity as indicated by ρ . That is, a strong rule of law allows the state to play a bigger role in society (Lizzeri and Persico 2004).

under monarchy for a long time, its effect keeps accumulating until the legal quality becomes positive after period T_q and keeps increasing over time since then. (2) The physical capital K_t , a new format of property that differs from land and other natural resources in its better protection against expropriation, tilts the trade-off between legal tax and expropriation in favor of the former, and thus induces the ruler to increase legal investment. So the trajectory of legal quality follows a higher sloped curve once capital investment starts in period T_k , and property is more secure than before. (3) A discrete jump of legal quality, however, has to wait until the transition of political regime at period T_D , when all property owners share political power to collectively determine the optimal legal protection of properties. So the political regime change is a necessary condition for a dramatic improvement of legal quality, which is possible only when the joint coercive power of the citizens is strong enough to gain political dominance.

The model predictions fit the historical evidence in England quite well. Feudal sovereigns might have protected individuals' property against the depredations of other individuals, but they themselves were often the greatest source of danger in that they often seize the property of their citizens without compensation and in an arbitrary manner (this corresponds to low legal quality in periods before T_q). To establish the basic right of subjects to the enjoyment of their property without arbitrary expropriation by the Crown, the English barons confronted King John in 1215, the result of which was Magna Carta, a great charter that helped shaped the English law and political tradition such that the common law court in England became relatively independent from the Crown in its protection of private property rights (this corresponds to higher legal quality after T_k). This was important to the expansion of commerce, and thus gave the English a considerable lead on their neighbors (North and Thomas 1973, North 1981, Rosenberg and Birdzell 1986).

The Crown, however, invested in many other ways (which are categorized as informal rent-seeking capacities s_{tR} in this paper) trying to sidestep the common court and expropriate citizens' properties. Since the Crown's advantage in expropriation was still much larger than ordinary people, severe violation of property rights was not uncommon. It had to wait until the Glorious Revolution in the 17th century (this corresponds to T_D) that the formation of a challenging group successfully established the dominant role of parliament in important policies, which greatly reduced the Crown's expropriating capacity (North and Weingast 1989). Such fundamental institutional changes in political and legal areas were firmly backed up by the arising importance of commercial and industrial interests in English economy (Justman and Gradstein 1999, Jha 2015). As a result, the security of property rights was much improved, which in turn greatly facilitated investment and production and later on triggered the Industrial Revolution.

The claim of property rights improvement after the Glorious Revolution is sometimes argued to be

inconsistent with the evidence that the tax rate was actually higher than before. From the thirteen century until the Glorious Revolution, the tax rate is around 2% to 6% of national income (Clark 2007, p. 148–154), while in contrast, the government’s share in aggregate output increased since 1688 to levels around 20% of national income by the end of the 18th century (Angeles 2011). This pattern of having higher taxes in societies with a more constrained executive branch is actually quite common in Europe at least since the mid-17th century (Dincecco 2009).

Such a confusion is indeed difficult to understand in a static environment, but could be easily explained in a dynamic environment where the change of political regime boosts up the legal quality and transforms the nature of tax from expropriation to financing public goods. Specifically, the property owners, now with political power in the format of being represented in the parliament that determines the tax rate and legal quality, are willing to pay higher tax than before because the tax is not exploitative anymore but for their collective interests such as improving the infrastructure. This is captured by the changing relationship between state capacity ρ and legal quality after democracy as stated in Proposition 6, that is, the possession of political power by common property owners enables the government to acquire more legitimacy and capacity to raise more tax for collective purposes.

4 Extensions and Discussions

In the benchmark model discussed above, some simplifying assumptions are adopted to illustrate the evolution path of legal development. For example, citizens are homogenous in property ownership and investment skills, the legal quality is the same for all property types, and it can be observed by all. These assumptions are relaxed in this section to derive more realistic results and new insights.

4.1 Legal Development Facilitated by Moderate Heterogeneity

If the initial land ownership among landlords is not homogenous anymore, how would this affect benchmark results? Intuitively, there are three main changes arising from ownership inequality.

First, heterogeneity in property ownership means the political ruler needs to tailor rent-seeking expenditures to individual owners, which increases the cost of using expropriation and thus reduces its efficacy in comparison to standardized tax collection. As shown in the following Proposition 7, this would indeed lead to an overall lower expenditure in rent-seeking and a higher legal quality than the benchmark case with homogeneous landlords under monarchy. The same logic would also apply to relevant decisions under democracy.

Proposition 7 *The optimal expenditures on informal rent-seeking with unequal land distribution are*

$$(6) \quad s_{tR}^{*H} = \rho \sum_{i=1}^{N-1} s_{ti}^{*H} = s_{tR}^* \frac{\widehat{Y}_t}{Y_t},$$

where $\widehat{Y}_t = \frac{1}{N-1} \left(\sum_{i=1}^{N-1} \sqrt{I_{ti} + \frac{I_{tR}}{N-1}} \right)^2$, and $\widehat{Y}_t < Y_t$ holds by Jensen's Inequality. So s_{tR}^{*H} is smaller than s_{tR}^* in the benchmark case. The percentage of rent-seeking expenditure in total income

$$E_{tL}^{*H} = \frac{\sum_{i=1}^{N-1} s_{ti}^{*H} + s_{tR}^{*H}}{Y_t} = E_{tL}^* \frac{\widehat{Y}_t}{Y_t}$$

is also lower than E_{tL}^* in the benchmark case. The optimal legal quality is determined by

$$\begin{aligned} \omega_{tH} - c'(q_t^{*H}) &= 0 \text{ if } q_t^{*H} > 0, \\ &< 0 \text{ if } q_t^{*H} = 0, \end{aligned}$$

where $\omega_{tH} = (\tau_0 - \theta\tau_l\mu^2\frac{\widehat{Y}_t}{Y_t})Y_t + (\theta\tau_l - \tau_0)I_{tR}$, and $\omega_{tH} > \omega_{tL}$ holds. The start of legal development is thus earlier and the optimal quality higher than the benchmark case.

The second change is purely on the economic side, where the unequal distribution of land implies that bigger landlords would start to have savings earlier than the homogeneous distribution case in the benchmark model. This induces earlier and larger physical capital investment, and thus also facilitates legal development.

The third change is regarding the political transition, where unequal land distribution may weaken the overall coordination effectiveness of the political challenging force, for example, by dividing the population into several subgroups. When the heterogeneity is sufficiently moderate in that all ruled agents still form one challenging group in the political transition game, this change would have no substantial effect on the evolution path.

To summarize, the overall result of moderate heterogeneity in land and capital ownership is to facilitate the economic, political, and legal development path. The case with large heterogeneity is to be analyzed in the following subsection.

4.2 Variations in Political Transition with High Inequality

In the benchmark case, all landlords constitute one single challenging group against the monarch since land distribution is homogenous. More complex group formation may occur in political fights with highly unequal land ownership. To illustrate a pattern often observed in history, suppose there are N_1 big landlords each owning a sizable land L_1 , while the rest are the majority owning very little land.

These landlords may form three potential challenging groups in the political game: the big-landlords group (i.e., the barons), small-landlords group, and all $N - 1$ landlords together as in the benchmark scenario. When the land size L_1 is large enough and N_1 sufficiently small, the barons tend to have the highest coercive power. In contrast, the group of small landlords, though with the greatest numbers of individuals, has the lowest coercive power due to small land size and difficulty in collective actions. The joint group of all $N - 1$ landlords is in the middle. This is captured by condition

$$(7) \quad \psi(N_1)N_1L_1 > \psi(N - 1)(L - L_R) > \psi(N - N_1 - 1)(L - L_R - N_1L_1),$$

which is assumed true.

The barons as the strongest group may challenge the monarch and cause political instability occasionally, but as long as the monarch owns the dominant size of land, that is, when $\psi(1)L_R > \psi(N_1)N_1L_1$ holds following the logic in Proposition 3, the political order will remain stable.

This power structure, however, will permanently change once physical capital starts to accumulate. The presence of physical capital adds a new dimension to heterogeneity in property holding under monarchy. Depending on whether large landlords engage in physical capital investment or not, there are two types of development paths, which are analyzed in the following.

4.2.1 Type 1: Land versus Capital

Suppose the N_1 big landlords, labelled as the barons, spend their savings in conspicuous consumption and do not invest in physical capital, while the other small landowners start to engage in business enterprises such as trading and craftsmanship. As the stock of physical capital increases over time, the coercive power of the capital owners goes up, which would eventually change the balance of power.

The baron group, which poses no credible threat before, now can collaborate with capital owners to challenge the monarch; realizing this potential danger, however, the monarch may choose to co-opt the barons group (Bertocchi and Spagat 2001) by offering them a better legal protection that they can't refuse. This can be implemented as high quality law enforcement over land, while adopting an inferior legal protection for other business owners.¹⁹

In this co-optation case, the conflict of interests is represented by large landlords versus capital owners, rather than monarch versus other property owners. The alliance between the monarch and barons boosts up

¹⁹There is indeed historical evidence that land security was already high before democratic transition and didn't experience dramatic increase afterwards.

the monarch's coercive power and weakens that of capital owners, which, together with worse legal protection of capital, will greatly delay the political transition timing compared with the benchmark case.

Proposition 8 *The best time for the monarch to co-opt the big landlords is period T_D as in condition (5), and then the legal quality for land would be higher than that for capital. Revolt by capital owners against the landlords occurs after T_C , which is determined by*

$$(8) \quad K_{T_C} = (\phi_c x^* + 1)(L_R + N_1 L_1) - L,$$

where $\phi_c = \frac{\psi(N_1+1)}{\psi(N-1-N_1)}$. This leads to democracy. Since $T_C > T_D$ holds when L_1 is large enough, the political transition from monarchy to democracy is delayed by co-optation.

This proposition states that severe land inequality is likely to give rise to co-optation, which would delay the political transition considerably. The overall legal development would thus become slower relative to the benchmark case, though the security of land *per se* may remain similar due to co-optation of large landlords.

It is quite ironic to see that, a better legal protection of land for barons comes not from their own merit *per se*, but from the increasing power of capital owners. Note that the relative coercive power of barons as a single group against the monarch stays constant over time since land distribution remains fixed; the strategic value of barons as a potential force joining together with capital owners to challenge the monarch, however, goes up with capital stock. The smaller number of barons and commonality of land ownership make them a better target for co-optation by the monarch than the group of many small business owners.

4.2.2 Type 2: Rich versus Poor

When the N_1 big landlords also invest in physical capital, this is the case of Type 2. Since physical capital investment is from savings, its stock is positively related to earlier income and thus land ownership; the group of big landlords thus still possess the strongest coercive power among all potential challenging groups under Condition (7).

Different from Type 1 where the barons are incapable of overthrowing the monarch and thus would accept the co-optation arrangement, physical capital investment in the case of Type 2 enables this group to act alone politically to push for transition from monarchy to oligarchy where political power is shared among all big landlords. Co-optation is less attractive to this group since they can gain political power themselves, and also not feasible for the monarch due to its shrinking relative coercive power to maintain control.

As a result, the legal quality would be higher for both land and capital of big property owners, leaving the majority of population, the $N-1-N_1$ small landlords and business owners, with inferior legal protection. For

example, the cost of using court service can be too high for the poor to afford, or the legal enforcement favors rich elites. Full democracy has to wait until the poor's coercive power becomes high enough to challenge the ruling group. The timing of the two political transitions is specified in the following proposition.

Proposition 9 *The transition from monarchy to the oligarchy of big property owners occurs in period T_O where*

$$K_{T_O,1} = \frac{\psi(1)x^*}{\psi(N_1)}L_R - N_1L_1.$$

This can be earlier than T_D in the benchmark case, that is, $T_O < T_D$ holds if L_1 is large enough. The final transition to full democracy for all property owners, if any, occurs at period T_P where

$$K_{T_P} = [\phi_c x^* + 1](L_R + N_1L_1 + K_{T_P,1}) - L.$$

T_P is later than T_D and T_C .

Compared with the benchmark case and Type 1, physical capital investment starts earlier in Type 2 due to higher savings caused by larger land sizes of barons, lower rent-seeking expenditure, and higher legal quality; its transition to oligarchy of large property owners is faster, but to full democracy later.²⁰

Note that in both types, the overall legal quality will eventually converge with the benchmark case since the capital stock increases over time, even though the exact timing of legal and political development varies with property combination and inequality. Another general insight is that the group of property owners with a higher collective coercive power (such as the barons in Type 1 and rich elites in Type 2) enjoys better property security than others. The close correlation between political power and legal protection applies not only to the national level, but also to specific groups. So the main message of the benchmark model remains robust and become enriched by allowing for heterogeneity.

4.3 Degenerations of Democracy with High Inequality

In comparison to the benchmark case, moderate wealth heterogeneity also increases legal quality under democracy, since the rent-seeking expenditure is lower according to Proposition 7. High inequality in wealth and in access to political opportunities, however, may cause more severe consequences, such as elite capture and worse legal quality.

²⁰ Across countries, for example, during the early industrialization eras, continental European countries may fit Type 1, while England Type 2 (Doyle 1992, Blockmans 1997). In current times, oil rich countries can be categorized as Type 1, while some developing countries with authoritarian political regimes and dominant business tycoons Type 2 (Acemoglu and Robinson 2006a, 2006 b).

Suppose there exists an elite group of individuals who are more likely to be selected as the political ruler. For example, the elite school graduates, top law professionals, or rich businessmen have much higher chances in holding key political and legal leadership positions than ordinary people. Specifically, suppose N_1 elite individuals of the population have a higher probability p_E to be selected as the political ruler, while the rest a very low probability p_P , where $p_E > p_P$ holds.

The following Corollary shows that the optimal choice of legal quality by the elites, q_{tE}^* , would be lower than that of the masses, q_{tP}^* , and can be even lower than that under monarchy. This is a direct implication of Proposition 6 where an individual's optimal choice of legal quality decreases with p , her probability of becoming the political ruler.

Corollary 1 *Political elites prefer lower legal quality, since $p_E > p_P$ implies $q_{tE}^* < q_{tP}^*$ by Proposition 6.*

Since the elites prefer a much lower legal quality than the masses, whose choice prevails in the equilibrium will be affected by the political power balance of the two groups. Let I_{ti}^E denote an elite's income and I_{ti}^P a poor's. The following Proposition shows that elite capture may arise when income inequality is sufficiently high, in which case the legal quality would be kept low at q_{tE}^* .

Proposition 10 *Elite Capture:* *When wealth inequality is so high that the following condition*

$$(9) \quad \sum_{i=1}^{N_1} I_{ti}^E > \frac{\psi(N - N_1)}{\psi(N_1)} \sum_{i=1}^{N - N_1} I_{ti}^P$$

holds, the democracy is captured by the elite, and a low legal quality q_{tE}^ is adopted.*

The degeneration of democracy to elite capture and worsening legal protection, however, may occur endogenously, if not inevitably, from an equal income distribution. As analyzed earlier in this paper, the necessary condition for political transition to democracy is the dominant coercive power of the masses. This suggests that democracy typically starts with low wealth inequality where (9) is not true and the legal quality is high. New elites, however, are likely to emerge.

Even when individuals are equal initially in all dimensions, the access to top political and legal positions will always be unequal *ex post*, since the lucky ones who were selected into top offices tend to accumulate more wealth and better skills than others, which may give their offsprings extra advantages in maintaining the privileges even under meritocracy.²¹ This may gradually give rise to a ruling group, whose probability

²¹Piketty (2014) observes that “a market economy based on private property, if left to itself... contains powerful forces of divergence” (p. 571). Similar divergence occurs in communist countries too.

of getting top government positions is so high that they behave like inherited aristocracies. So new elites are likely to be created under democracy even with initial equality across people (Andrias 2015).

The legal quality is assumed to be observable to all in the benchmark case. As long as transparency on real legal quality is maintained, it is difficult for any narrow group of citizens to capture democracy when the initial inequality is moderate. This, however, becomes less tenable when heterogeneity in wealth and information access becomes more severe. Elite capture may creep in and legal protection deteriorates if some groups have much higher chances to take top positions in the state and monopolize key information.²² When situations become glaringly inconsistent with the expectation, the masses might eventually grasp the reality of elite capture, and try to restore their rights through political process or social upheavals.²³

Whether the degeneration of democracy can be reversed, however, depends again upon the balance of coercive force between the elites and masses. When no group has clear dominance in coercive power, either a compromise is maintained where $q_{tD}^* \in (q_{tE}^*, q_{tP}^*)$, or a swing between the two extreme outcomes occurs subject to some random shocks, like in some Latin American countries.²⁴ When legal quality can vary across different types of properties, then a similar political economy analysis as above would suggest that the legal protection of the politically dominant group's property would be higher. For example, under elite capture, big banks and companies may get much better legal treatment than small business owners and employees. If future technological innovations such as AI render the masses more exploitable than before, then it is not impossible for current democracies to permanently degenerate back into oligarchy of elites.

The main message of the analysis, both in the benchmark model and with heterogeneity, is that the bedrock of property rights is essentially one's overall ability to defend them, the ultimate source of which is one's coercive force. This is true for democratic societies too. Even widely accepted constitutional rights have to be carefully examined, reinforced or adjusted by every generation. Given that constitutions were shaped by the power balance at the initial democratic transition period, as long as such balance changes over time, so will the corresponding rights of different groups. Even when the political regime remains the same in the nominal sense, the legal protection of property rights could have gone through dramatic changes (Pistor

²²Gilens (2012) provides evidence that U.S. policy is "strongly tilted toward the most affluent citizens" such that, "under most circumstances, the preferences of the vast majority of Americans appear to have essentially no impact on which policies the government does or doesn't adopt."

²³For example, the recent wave of populism across many countries may reflect the masses' realization that globalization benefits the elites disproportionately to the point that the masses' property rights are seriously weakened in terms of deteriorating public facilities, stagnant wages and high unemployment (Purdy et al 2020).

²⁴A formal analysis of these issues, however, needs to specify the detailed process of political and legal conflict resolution, which is best left for future research. As an example, see Huang (2013) for a detailed analysis of legal quality in contract enforcement.

2019), which, if unchecked in time, may need costly turmoils of social upheavals to restore the equilibrium.

5 Concluding Remarks

Secure property rights are widely recognized as a crucial condition for economic growth. But how the overall security level is determined in a society is such a complex matter that a clear understanding is still elusive. This paper provides a simple analytical framework to understand how property rights security improves over time as the result of increasing legal quality and political democratization in a political economy context, where institutions adapt to evolving factor composition in the dynamic economic development process.

When land is the prominent production factor, property security against state predation is low because land is easy to be expropriated without reducing productivity, and also because a small group can accumulate and manage a big land size. Only when physical capital, as represented by technical know-how and business networks, becomes such a dominant source of wealth that enables its diverse owners to defend themselves in collective actions, would the formal political and legal institutions supporting secure property rights become established and sustainable. This transition, however, is far from automatic, and often associated with open political fights, regular checking on the quality of enforcement, and credible threats whenever security falls below the expected level. The capability to transform economic and other resources into coercive power when necessary is also important.

Another insight emerging from the analysis is a natural hierarchy of institutions: The ruling group's power as embodied by formal political and legal institutions is earned initially and has to be re-confirmed in each period by its dominance in coercive power. So it is very unlikely that the rule of law can function well in a non-democracy where citizens' interests are not represented politically, while a democracy is viable only when most citizens are owners of important production factors and can collectively defend against state predation.

Due to the extremely complex nature of property rights security issues, many important dimensions are not explicitly modeled in this paper. For instance, the interaction between state predation and contract enforcement, though not studied in this paper, seems to be an important topic that deserves further research (Greif 2005). A potentially fruitful idea is that an exogenous increase of commercial activities may, through economy of scale, enable the provision of better legal contract enforcement, and then help facilitate the rule of law to spread to other areas of property rights protection. That is, better institutions in curbing private predation may prove to be a convenient and less painful way than political confrontation to gradually impose

effective constraints on state predation. Another example is about the role of the state's fiscal need and capacity (Tilly 1990), which may vary a lot due to geopolitical conditions, could also be crucial in determining the legal protection of property.

Another possible extension of the paper is to study the unique effects of the increasing importance of human capital (Goldin 2001, Galor and Moav 2006) on the protection formats of property rights. Though human capital is similar to physical capital in that both have to be invested endogenously and are more mobile, their differences are also quite substantial (Barzel 1989). The non-separability of human capital with its owner, for example, imposes more constraints in property rights protection; a full time worker may find it more difficult to become intensively involved in rent-seeking activities due to lack of time, effort, or skills (Huang 2012a). A business owner, in contrast, can delegate some functions to others and actively participate in political activities. These differences and the much larger number of human capital owners may imply substantial changes in political and legal institutions when human capital becomes the dominant source of wealth in economy.

APPENDIX: Proofs

Proposition 1.

Proof. The monarch's FOC w.r.t s_{tR} is

$$(1 - q_{tL})\theta\tau_l Y_t \frac{s_{ti}}{(s_{tR} + s_{ti})^2} - 1/\rho = 0,$$

where $Y_t = [(N - 1)I_{ti} + I_{tR}]$ is the total income of the economy, and $\theta\tau_l Y_t$ is the total amount of rent available in the rent-seeking game.

The FOC for individual i is

$$(1 - q_{tL})\theta\tau_l Y_t \frac{1}{N - 1} \frac{s_{tR}}{(s_{tR} + s_{ti})^2} - 1 = 0.$$

Combining the two FOCs, we get

$$s_{tR}^* = \rho(N - 1)s_{ti}^*,$$

which can be plugged in the above condition to get

$$(1 - q_{tL})\theta\tau_l Y_t \frac{1}{N - 1} \frac{\rho(N - 1)}{(\rho(N - 1) + 1)^2 s_{ti}^*} - 1 = 0.$$

Then the optimal result

$$s_{ti}^* = (1 - q_{tL}^*)\theta\tau_l Y_t \frac{\rho}{(\rho(N - 1) + 1)^2}$$

is obtained. So we have

$$\mu_t^* = \frac{s_{tR}^*}{s_{ti}^* + s_{tR}^*} = \frac{\rho(N - 1)}{1 + \rho(N - 1)},$$

which is constant over time, and increases in both ρ and N :

$$(10) \quad \frac{d\mu_t^*}{d\rho} = \frac{N-1}{[1+\rho(N-1)]^2} > 0.$$

The percentage of rent-seeking expenditure in total Y_t is

$$E_{tL}^* = \frac{(N-1)s_{ti}^* + s_{tR}^*}{Y_t} = (1 - q_{tL}^*)\rho\theta\tau_l \frac{(1+\rho)(N-1)}{(1+\rho(N-1))^2},$$

which increases in ρ since

$$d \frac{(1+\rho)\rho}{(1+\rho(N-1))^2} / d\rho = \frac{1+\rho(N-1)+2\rho^2(N-2)}{(1+\rho(N-1))^3} > 0.$$

■

Proposition 2.

Proof. The monarch chooses the legal quality q_{tL} , anticipating the reaction of individuals in informal rent-seeking capacity investment. The objective function for the ruler becomes

$$\begin{aligned} & \max_{q_{tL}} q_{tL}[I_{tR} + \tau_0(N-1)I_{ti}] + (1 - q_{tL})\theta\{\mu_t^*[I_{tR} + (N-1)\tau_l I_{ti}] + (1 - \mu_t^*)(1 - \tau_l)I_{tR}\} \\ & - (1 - q_{tL})\mu\theta\tau_l Y_t \frac{1}{\rho(N-1) + 1} - c(q_{tL}) \end{aligned}$$

after plugging in s_{ti}^* and s_{tR}^* in equations (3) and (4). The FOC w.r.t to legal quality q_{tL} is

$$(11) \quad \begin{aligned} (\tau_0 - \mu^2\theta\tau_l)Y_t + (\theta\tau_l - \tau_0)I_{tR} - c'(q_{tL}^*) &= 0 \text{ if } q_{tL}^* > 0, \\ &< 0 \text{ if } q_{tL}^* = 0, \end{aligned}$$

where $\omega_{tL} \equiv (\tau_0 - \mu^2\theta\tau_l)Y_t + (\theta\tau_l - \tau_0)I_{tR}$ strictly decreases in μ . To have a positive solution, μ cannot be too large. Let

$$\left[\frac{\tau_0}{\tau_l} + \left(1 - \frac{\tau_0}{\tau_l}\right) \frac{L_R}{L} \right] \equiv \hat{\mu}^2,$$

then $\omega_{tL}(\hat{\mu}) = 0$. Since μ strictly increases in ρ , it means that there exists a threshold $\hat{\rho}$ such that if $\rho \geq \hat{\rho}$, then it is not possible to have a positive legal quality in any period under monarchy when there is only land. The reason is that the potential benefits of expropriation are too large to resist for the monarch. This condition is more easily satisfied when $\hat{\rho}$ is smaller, which occurs when L_R/L and τ_0/τ_l are smaller.

When $\rho < \hat{\rho}$, the benefit of legal quality is strictly increasing over time due to the ever increasing knowledge stock A_t . This means that even if $q_{tL}^* = 0$ holds in the initial periods when A_t is small, eventually the legal quality will be positive after a threshold is reached when the marginal benefit exceeds the marginal cost. The critical period T_q is determined by $\omega_{T_q R} = c'(0)$, where $A_{T_q} = (1+g)^{T_q}$. So

$$T_q = \ln \frac{c'(0)}{\omega_{tL}/A_t} / \ln(1+g).$$

Again a higher ρ will delay the timing of legal investment. The interior solution q_{tL}^* is higher over time because A_t is increasing.

$$\frac{\partial q_{tL}^*}{\partial A_t} = \frac{\omega_R}{c''(q_{tL}^*)} = \frac{c'(q_{tL}^*)}{c''(q_{tL}^*)A_t} > 0.$$

The percentage of rent-seeking expenditure in total exploitable income will thus decrease over time when q_{tL}^* increases. ■

Proposition 3.

Proof. The $N - 1$ landlords constitute the challenging group. Their coercive power is $v_t^C = \psi(N - 1)A_t(L - L_R)$. The monarch's coercive power is $v_t^G = \psi(1)A_tL_R$. Landlords will not challenge the monarch if $x_t \leq x^*$ holds, where $x_t = v_t^C/v_t^G = (L - L_R)/\phi L_R$, where $\phi \equiv \psi(1)/\psi(N - 1)$. So $x_t \leq x^*$ is equivalent to $\frac{(L-L_R)}{\phi L_R} \leq x^*$, which is simplified to $L_R \geq \frac{1}{1+\phi x^*}L$. ■

Proposition 4.

Proof. The equilibrium is solved backwards.

(1) **The Rent-Seeking Stage.** Taking as given the legal quality q_{tK} and the expenditure of others s_{ti} , the monarch's total revenue is

$$\max_{s_{tR}} q_{tK}[\tau_0(N-1)I_{ti} + I_{tR}] + (1 - q_{tK})\theta \left[\frac{s_{tR}}{s_{tR} + s_{ti}} [(N-1)\tau_{ti}I_{ti} + I_{tR}] + (1 - \frac{s_{tR}}{s_{tR} + s_{ti}})(1 - \tau_l)I_{tR} \right] - s_{tR}/\rho - c(q_{tK}).$$

The FOC wrt s_{tR} is

$$(1 - q_{tK}) \frac{s_{ti}}{(s_{tR} + s_{ti})^2} \theta [(N-1)\tau_{ti}I_{ti} + \tau_l I_{tR}] - 1/\rho = 0,$$

which uniquely determines the optimal investment in rent-seeking capacity s_{tR}^{**} :

$$(12) \quad s_{tR}^{**} = \sqrt{(1 - q_{tK})\theta[(N-1)\tau_{ti}I_{ti} + \tau_l I_{tR}]\rho s_{ti} - s_{ti}}.$$

Note that $(N-1)\tau_{ti}I_{ti} + \tau_l I_{tR} = A_t[\tau_l L + \tau_k K_t] = \tau_t Y_t$ is the total exploitable income.

The net income of an individual i is

$$\widehat{I_{ti}^q} \equiv \max_{s_{ti}} q_{tK}(1 - \tau_0)I_{ti} + (1 - q_{tK})\theta \left[(1 - \frac{s_{tR}}{s_{tR} + s_{ti}})(I_{ti} + \frac{\tau_l I_{tR}}{N-1}) + \frac{s_{tR}}{s_{tR} + s_{ti}}(1 - \tau_{ti})I_{ti} \right] - s_{ti},$$

taking as given the expenditure of others. The FOC for interior solution is

$$(1 - q_{tK}) \frac{s_{tR}}{(s_{tR} + s_{ti})^2} \theta (\tau_{ti}I_{ti} + \frac{\tau_l I_{tR}}{N-1}) - 1 = 0,$$

which uniquely determines the optimal investment in rent-seeking capacity s_{ti}^{**} :

$$(13) \quad s_{ti}^{**} = \sqrt{(1 - q_{tK})\theta[(N-1)\tau_{ti}I_{ti} + \tau_l I_{tR}]\frac{s_{tR}}{N-1} - s_{tR}}.$$

Combining the two FOCs (12) and (13), we get two values of $s_{ti}^{**} + s_{tR}^{**}$ that must be equal to each other, and this leads to

$$s_{tR}^{**} = (N-1)\rho s_{ti}^{**},$$

Then we get from (12) that

$$s_{ti}^{**} + s_{tR}^{**} = \sqrt{\rho\theta(1 - q_{tK})[\tau_l L + \tau_k K_t]s_{ti}^{**}} = (\rho(N-1) + 1)s_{ti}^{**},$$

which after some algebra leads to

$$(14) \quad s_{ti}^{**} = (1 - q_{tK})\theta\tau_t Y_t \frac{\rho}{(\rho(N-1) + 1)^2},$$

$$(15) \quad s_{tR}^{**} = (1 - q_{tK})\theta\tau_t Y_t \frac{\rho^2(N-1)}{(\rho(N-1) + 1)^2}.$$

So we have

$$\mu_t^{**} = \frac{s_{tR}^{**}}{s_{ti}^{**} + s_{tR}^{**}} = \frac{\rho(N-1)}{1 + \rho(N-1)} = \mu,$$

which is the same as before. The percentage of rent-seeking expenditure in total income is

$$\frac{(N-1)s_{ti}^{**} + s_{tR}^{**}}{Y_t} = (1 - q_{tK})\rho\theta\tau_t \frac{(1+\rho)(N-1)}{(\rho(N-1)+1)^2}.$$

(2) **The Legal Investment Stage.** Anticipating the reaction of individuals in rent-seeking capacity investment, the monarch chooses the optimal legal quality q_{tK}^* . The objective function for the ruler becomes

$$\begin{aligned} & \max_{q_{tK}} q_{tK} [\tau_0(N-1)I_{ti} + I_{tR}] + (1 - q_{tK})\theta [\mu_t^* [(N-1)\tau_{ti}I_{ti} + I_{tR}] + (1 - \mu_t^*)(1 - \tau_l)I_{tR}] \\ & - (1 - q_{tK})\mu_t^* \tau_t Y_t \frac{1}{\rho(N-1)+1} - c(q_{tK}), \end{aligned}$$

after plugging in s_{ti}^* and s_{tR}^* in equations (14) and (15). The FOC w.r.t to legal quality q_{tK} is

$$\begin{aligned} (\tau_0 - \mu^2\theta\tau_t)Y_t + (\theta\tau_l - \tau_0)I_{tR} - c'(q_{tK}^*) &= 0 \text{ if } q_{tK}^* > 0, \\ &< 0 \text{ if } q_{tK}^* = 0, \end{aligned}$$

where $\omega_{tK} \equiv (\tau_0 - \mu^2\theta\tau_t)Y_t + (\theta\tau_l - \tau_0)I_{tR}$. This condition is similar to (11) except that $\omega_{tK} > \omega_{tL}$ holds due to $\tau_t < \tau_l$; it implies that the marginal benefit of improving legal quality is higher when physical capital stock is larger, and thus $q_{tK}^* > q_{tL}^*$.

The percentage of rent-seeking expenditure in total income is thus

$$E_{tK}^* = (1 - q_{tK}^*)\rho\theta\tau_t \frac{(1+\rho)(N-1)}{(\rho(N-1)+1)^2} = \frac{\tau_t(1 - q_{tK}^*)}{\tau_l(1 - q_{tL}^*)} E_{tL}^*.$$

It is easy to see $E_{tK}^* < E_{tL}^*$ holds due to $\tau_t < \tau_l$ and $q_{tK}^* > q_{tL}^*$. ■

Proposition 5

Proof. The challenging group's coercive power is $v_t^C = \psi(N-1)A_t(L - L_R + K_t)$, where $K_t = (N-1)[\widehat{I}_{t-1,i}^* - Z]$ and $\widehat{I}_{t-1,i}^*$ is the disposable income of a typical landowner. The monarch's coercive power is $v_t^G = \psi(1)A_tL_R$. They will challenge the monarch once $x_t = x^*$ is reached in period T_D , where $x_t = v_t^C/v_t^G = (L - L_R + K_t)/\phi L_R$. So $x_t = x^*$ is equivalent to $\frac{L - L_R + K_{T_D}}{\phi L_R} = x^*$, which is simplified to $K_{T_D} = (1 + \phi x^*)L_R - L$ that determines T_D . ■

Proposition 6.

Proof. The equilibrium is solved backwards.

(1) **The Rent-Seeking Stage.** Taking as given the legal quality q_{tD} and the expenditure of others s_{ti} , the elected ruler's total revenue is

$$\widehat{I}_{tr}^q \equiv \max_{s_{tR}} q_{tD}I_{ti} + (1 - q_{tD})\theta \left[\frac{s_{tR}}{s_{tR} + s_{ti}} [(N-1)\tau_{ti}I_{ti} + I_{ti}] + \left(1 - \frac{s_{tR}}{s_{tR} + s_{ti}}\right)(1 - \tau_{ti})I_{ti} \right] - s_{tR}/\rho - c(q_{tD})/N.$$

Now the benefit of legal system does not include exploitative tax revenue, only protection of one's own income. The FOC w.r.t s_{tR} is

$$(1 - q_{tD}) \frac{s_{ti}}{(s_{tR} + s_{ti})^2} \theta \tau_{ti} Y_t - 1/\rho = 0,$$

The net income of an individual i is

$$\widehat{I}_{ti}^q \equiv \max_{s_{ti}} q_{tD} I_{ti} + (1 - q_{tD}) \theta \left[\left(1 - \frac{s_{tR}}{s_{tR} + s_{ti}}\right) (I_{ti} + \frac{\tau_{ti} I_{ti}}{N-1}) + \frac{s_{tR}}{s_{tR} + s_{ti}} (1 - \tau_{ti}) I_{ti} \right] - s_{ti} - c(q_{tD})/N.$$

taking as given the expenditure of others. The FOC for interior solution is

$$(1 - q_{tD}) \frac{s_{tR}}{(s_{tR} + s_{ti})^2} \theta \tau_{ti} Y_t \frac{1}{N-1} - 1 = 0.$$

Combining the two FOCs, we get the same optimal solutions as in Proposition 4.

(2) **The Legal Investment Stage.** The legal quality is chosen in the voting process before the ruler's identity is revealed. Anticipating the reaction of individuals in rent-seeking capacity investment, the objective function of a typical voter is

$$I_{tD}^q = \max_{q_{tD}} p \widehat{I}_{tr}^q + (1 - p) \widehat{I}_{ti}^q,$$

where, after plugging in the rent-seeking expenditures,

$$\widehat{I}_{tr}^q = q_{tD} I_{ti} + (1 - q_{tD}) \theta [\mu \tau_t Y_t + (1 - \tau_t) I_{ti}] - (1 - q_{tD}) \mu \theta \tau_t Y_t \frac{1}{\rho(N-1) + 1} - c(q_{tD})/N,$$

$$\widehat{I}_{ti}^q = q_{tD} I_{ti} + (1 - q_{tD}) \theta \left[\left(1 + \frac{\tau_t}{N-1}\right) I_{ti} - \frac{1}{N-1} \mu \tau_t Y_t \right] - (1 - q_{tD}) \mu \theta \tau_t Y_t \frac{1}{\rho(N-1) + 1} \frac{1}{N-1} - c(q_{tD})/N.$$

So we get the net marginal benefits of legal quality for the ruler and citizens:

$$\begin{aligned} \frac{d\widehat{I}_{tr}^q}{dq_t} &= \left(\frac{1}{N} - \mu^2\right) \theta \tau_t Y_t - c'(q_{tD}^*)/N < 0, \\ \frac{d\widehat{I}_{ti}^q}{dq_t} &= \frac{1}{N-1} \left[\left(\frac{2}{\rho(N-1)} + 1\right) \mu^2 - \frac{1}{N} \right] \theta \tau_t Y_t - c'(q_{tD}^*)/N, \end{aligned}$$

The FOC

$$\frac{dI_{tD}^q}{dq_t} = p \frac{d\widehat{I}_{tr}^q}{dq_t} + (1 - p) \frac{d\widehat{I}_{ti}^q}{dq_t} = 0$$

is thus the weighted sum of them, and after some algebra becomes

$$\frac{dI_{tD}^q}{dq_t} = \frac{N}{(N-1)} \left\{ \left(\mu^2 - \frac{1}{N}\right) (1 - Np) + \mu^2 \frac{2}{\rho(N-1)} (1 - p) \right\} \theta \tau_t Y_t - c'(q_{tD}^*) = 0.$$

So q_{tD}^* is higher when p is lower.

Three extreme cases of p are worth considering.

(i) When $p = \frac{1}{N}$, the above FOC becomes

$$\frac{2}{\rho(N-1)} \mu^2 \theta \tau_t Y_t - c'(q_{tD}^*) = 0.$$

This is the social welfare maximizing solution.

(ii) When $p = 0$, the above FOC coincides with the ordinary citizen's best choice, which is

$$\frac{d\widehat{I}_{ti}^q}{dq_t} = \frac{N}{(N-1)} \left[\left(1 + \frac{2}{\rho(N-1)}\right) \mu^2 - \frac{1}{N} \right] \theta \tau_t Y_t - c'(q_{tD}^*) = 0.$$

This suggests that q_{tD}^* is higher when ρ is higher since

$$(16) \quad \frac{d\mu^2(1 + \frac{2}{\rho(N-1)})}{d\rho} = \frac{N-1}{[1 + \rho(N-1)]^3} > 0.$$

(iii) When $p = 1$, the above FOC coincides with the ruler's best choice, which is

$$\frac{d\widehat{I}_{tr}^q}{dq_t} = -N \left[\mu^2 - \frac{1}{N} \right] \theta \tau_t Y_t - c'(q_{tD}^*) < 0.$$

This suggests that under democracy, the ruler's ex post best choice of legal quality is always zero, which is worse than the monarch. Recall that the marginal benefits of improving legal quality under monarchy is

$$\omega_{tL} \equiv \left(\frac{\tau_0}{\tau_t} - \mu^2 \right) \theta \tau_t Y_t + (\theta \tau_l - \tau_0) I_{tR}.$$

The reason is that the democratic ruler, unlike the monarch, does not get the legal tax as its own income. The only extra gain of being ruler is the expropriation opportunity represented by ρ as provided by a strong state machinery under its control.

So the dynamic inconsistency of legal quality under democracy can only be mitigated when p is sufficient low. A sufficient condition for the marginal benefit under democracy with $p = \frac{1}{N}$ to be higher than that under monarchy is

$$\mu^2 \left(1 + \frac{2}{\rho(N-1)} \right) > \frac{\tau_0}{\tau_k} + \left(\frac{\tau_l}{\tau_0} - 1 \right) \frac{L_R}{L}$$

which is true when ρ is large enough, since the left-hand-side strictly increases in ρ by equation (16).

And q_{tD}^* strictly increases in ρ when p is sufficient low; specifically,

$$\frac{d\left(\frac{dI_{tD}^q}{dq_t}\right)}{d\rho} = p \frac{d\left(\frac{d\widehat{I}_{tr}^q}{dq_t}\right)}{d\rho} + (1-p) \frac{d\left(\frac{d\widehat{I}_{ti}^q}{dq_t}\right)}{d\rho} = \left\{ \frac{1-p[1+\rho(N-1)^2]}{[1+\rho(N-1)]^3} \right\} 2N\tau_t Y_t > 0$$

holds when $p < \frac{1}{1+\rho(N-1)^2}$, where $\frac{1}{1+\rho(N-1)^2} < \frac{1}{N}$. ■

Proposition 7.

Proof. (1) **The Rent-Seeking Stage.** With heterogenous land holding, the monarch's objective function is

$$\max_{s_{tR}} q_t [I_{tR} + \tau_0(Y_{ti} - I_{tR})] + (1 - q_t) \theta \left\{ \sum_{i=1}^{N-1} \mu_{ti} \left[\tau_l I_{ti} + \frac{I_{tR}}{N-1} \right] + \sum_{i=1}^{N-1} (1 - \mu_{ti})(1 - \tau_l) \frac{I_{tR}}{N-1} \right\} - s_{tR}/\rho - c(q_t),$$

which can be simplified as

$$\max_{s_{tR}} q_t [I_{tR} + \tau_0(Y_{ti} - I_{tR})] + (1 - q_t) \theta \left\{ \sum_{i=1}^{N-1} \frac{s_{tR}}{s_{tR} + s_{ti}} \left[\tau_l I_{ti} + \frac{\tau_l I_{tR}}{N-1} \right] + (1 - \tau_l) I_{tR} \right\} - s_{tR}/\rho - c(q_t).$$

The monarch's FOC w.r.t s_{tR} is

$$(17) \quad (1 - q_t) \theta \tau_l \sum_{i=1}^{N-1} \frac{s_{ti}}{(s_{tR} + s_{ti})^2} \left[I_{ti} + \frac{I_{tR}}{N-1} \right] - 1/\rho = 0,$$

The objective function of an individual i in the rent-seeking stage is

$$\max_{s_{ti}} q_t(1 - \tau_0)I_{ti} + (1 - q_t)\theta \left[(1 - \mu_{ti})(I_{ti} + \frac{\tau_l I_{tR}}{N - 1}) + \mu_{ti}(1 - \tau_l)I_{ti} \right] - s_{ti},$$

which is simplified to

$$\max_{s_{ti}} q_t(1 - \tau_0)I_{ti} + (1 - q_t)\theta \left[I_{ti} + \frac{\tau_l I_{tR}}{N - 1} - \frac{s_{tR}}{s_{tR} + s_{ti}}\tau_l \left[I_{ti} + \frac{I_{tR}}{N - 1} \right] \right] - s_{ti}.$$

The FOC for individual i is

$$(1 - q_t)\theta\tau_l \left[I_{ti} + \frac{I_{tR}}{N - 1} \right] \frac{s_{tR}}{(s_{tR} + s_{ti})^2} - 1 = 0,$$

which implies that

$$(18) \quad (s_{tR} + s_{ti})^2 = (1 - q_t)\theta\tau_l \left[I_{ti} + \frac{I_{tR}}{N - 1} \right] s_{tR}.$$

Plug this condition into the monarch's FOC (17), we get

$$s_{tR}^{*H} = \sum_{i=1}^{N-1} \rho s_{ti}^{*H}.$$

where s_{tR}^{*H} and s_{ti}^{*H} are used to label the optimal rent-seeking investment in the heterogenous case. Putting this in condition (18), after some algebra we get

$$s_{tR}^{*H} = (1 - q_t)\theta\tau_l \frac{\rho^2(N - 1)}{(\rho(N - 1) + 1)^2} \widehat{Y}_t,$$

where

$$\widehat{Y}_t = \frac{1}{N - 1} \left(\sum_{i=1}^{N-1} \sqrt{I_{ti} + \frac{I_{tR}}{N - 1}} \right)^2,$$

and $\widehat{Y}_t < Y_t$ holds, since by Jensen's inequality

$$\left(\frac{1}{N - 1} \sum_{i=1}^{N-1} \sqrt{I_{ti} + \frac{I_{tm}}{N - 1}} \right)^2 < \frac{1}{N - 1} \sum_{i=1}^{N-1} \left(\sqrt{I_{ti} + \frac{I_{tm}}{N - 1}} \right)^2$$

holds, while the left-hand-side of the above inequality is equal to $\frac{\widehat{Y}_t}{N - 1}$, and the right-hand-side $\frac{Y_t}{N - 1}$. So the monarch's rent-seeking expenditure is smaller when individual incomes are more heterogenous since

$$s_{tR}^{*H} = s_{tR}^* \frac{\widehat{Y}_t}{Y_t} < s_{tR}^*.$$

The percentage of rent-seeking expenditure in total income $\tau_l Y_t$ is

$$E_{tL}^{*H} = \frac{\sum_{i=1}^{N-1} s_{ti}^{*H} + s_{tR}^{*H}}{Y_t} = \frac{s_{tR}^*(1 + 1/\rho)}{Y_t} = E_{tL}^* \frac{\widehat{Y}_t}{Y_t}.$$

again smaller than the benchmark case due to $\widehat{Y}_t < Y_t$.

$$s_{ti}^{*H} = \sqrt{(1 - q_t)\theta\tau_l \left[I_{ti} + \frac{I_{tR}}{N - 1} \right] s_{tR}^{*H}} - s_{tR}^{*H}$$

So we have

$$\mu_{ti}^{*H} = \frac{s_{tR}^{*H}}{s_{ti}^{*H} + s_{tR}^{*H}} = \frac{\sqrt{s_{tR}^{*H}}}{\sqrt{(1-q_t)\theta\tau_l(I_{ti} + \frac{I_{tR}}{N-1})}} = \frac{\sum_{i=1}^{N-1} \sqrt{I_{ti} + \frac{I_{tR}}{N-1}}}{(N-1 + \frac{1}{\rho})\sqrt{I_{ti} + \frac{I_{tR}}{N-1}}},$$

which again increases in ρ as before, but varies across individuals. This expression boils down to the benchmark condition μ when incomes are homogenous.

(2) **The Legal Investment Stage.** The monarch chooses the legal quality q_t , anticipating the reaction of individuals in informal rent-seeking capacity investment. The objective function for the ruler becomes

$$\max_{s_{tR}} q_t [I_{tR} + \tau_0(Y_{ti} - I_{tR})] + (1 - q_t)\theta \left\{ \sum_{i=1}^{N-1} \frac{s_{tR}^{*H}}{s_{ti}^{*H} + s_{tR}^{*H}} [\tau_l I_{ti} + \frac{\tau_l I_{tR}}{N-1}] + (1 - \tau_l)I_{tR} \right\} - s_{tR}^{*H}/\rho - c(q_t),$$

The FOC w.r.t to the optimal legal quality q_t^{*H} in the heterogeneity case is

$$(19) \quad \begin{aligned} \omega_{tH} - c'(q_t^{*H}) &= 0 \text{ if } q_t^{*H} > 0, \\ &< 0 \text{ if } q_t^{*H} = 0, \end{aligned}$$

where the marginal benefit $\omega_{tH} = (\tau_0 - \theta\tau_l\mu^2\frac{\hat{Y}_t}{Y_t})Y_t + (\theta\tau_l - \tau_0)I_{tR}$ strictly decreases in ρ . Since $\hat{Y}_t < Y_t$, the optimal legal quality with heterogenous incomes is higher than the benchmark if I_{tR} is the same.

(3) **The Political Regime Stage.** As long as the barons do not have enough coercive power to challenge the monarch, the political order is stable. The monarch's coercive power is $v_t^G = \psi(1)A_tL_R$. Landlords will not challenge the monarch if $x_t \leq x^*$ holds, where $x_t = v_t^C/v_t^G = \psi(N_1)N_1L_1/\psi(1)L_R$. So $x_t \leq x^*$ is equivalent to $\frac{\psi(N_1)N_1L_1}{\psi(1)L_R} \leq x^*$, which is simplified to $L_R \geq \frac{\psi(N_1)}{\psi(1)x^*}N_1L_1$. This is more stringent than the homogenous benchmark case since $\psi(N_1)N_1L_1 > \psi(N-1)(L - L_R)$ holds by condition (7). ■

Proposition 8.

Proof. Since cooptation is costly for the monarch, it is best to delay it until the period when the joint coercive power of $N - 1$ property owners is almost high enough to challenge the monarch, which is period T_D as defined by condition (5).

Then the only challenging group in the political game is the $N - 1 - N_1$ small landlords and business owners, whose coercive power is $\psi(N - 1 - N_1)(L - L_R - N_1L_1 + K_t)$. The ruling group's coercive power is $\psi(1 + N_1)(L_R + N_1L_1)$. The challenging group's relative coercive power

$$x_t = \frac{\psi(N - 1 - N_1)(L - L_R - N_1L_1 + K_t)}{\psi(1 + N_1)(L_R + N_1L_1)}$$

has to be larger than the threshold x^* for political transition to occur. $x_t \geq x^*$ implies (8). $K_{T_C} > K_{T_D}$ holds if

$$\frac{N_1L_1}{L_R} \geq \frac{\phi - \phi_c}{\phi_c + (x^*)^{-1}},$$

where $\phi_c = \frac{\psi(N_1+1)}{\psi(N-1-N_1)}$. This condition is satisfied when L_1 is large enough. ■

Proposition 9.

Proof. The group of large property owners' coercive power, $\psi(N_1)(N_1L_1 + K_{t1})$, is the highest among all potential challenging groups, since an individual's capital stock is positively linked with his land size.

Then it may act alone as the challenging group in the political game to push for a transition to the oligarchy of large property owners in period T_O when

$$x_t = \frac{\psi(N_1)(N_1L_1 + K_{t1})}{\psi(1)L_R} \geq x^*$$

holds in the first time. This leads to

$$K_{T_O,1} = \frac{\psi(1)}{\psi(N_1)}x^*L_R - N_1L_1.$$

It is easy to see that $K_{T_O,1} < K_{T_D}$ holds as long as $N_1L_1 > L - L_R[1 + (\phi - \frac{\psi(1)}{\psi(N_1)})x^*]$, since $K_{T_D} = (1 + \phi x^*)L_R - L$.

Full democracy has to wait until the coercive power of small property owners, $\psi(N - 1 - N_1)(L - L_R - N_1L_1 + K_t - K_{t1})$, becomes high enough to challenge the ruling group, whose coercive power is $\psi(1 + N_1)(L_R + N_1L_1 + K_{t1})$. The challenging group's relative coercive power is

$$x_t = \frac{\psi(N - 1 - N_1)(L - L_R - N_1L_1 + K_t - K_{t1})}{\psi(1 + N_1)(L_R + N_1L_1 + K_{t1})}$$

in this case, which has to be larger than the threshold x^* for political transition to occur. $x_t \geq x^*$ implies

$$K_t \geq [\phi_c x^* + 1](L_R + N_1L_1 + K_{t1}) - L.$$

This gives rise to the specification of transition period T_P

$$K_{T_{D_O}} = [\phi_c x^* + 1](L_R + N_1L_1 + K_{T_{D_O},1}) - L.$$

It is easy to see that $K_{T_P} > K_{T_C}$ holds due to $K_{t1} > 0$. ■

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