NICEP Working Paper: 2024-10

Theory of developmental dictatorship

Hyungmin Park

Nottingham Interdisciplinary Centre for Economic and Political Research

School of Economics, University of Nottingham, Sir Clive Granger Building,
University Park, Nottingham, NG7 2RD
ISSN 2397-9771

A Theory of Developmental Dictatorship*

Hyungmin Park

University of Warwick†

February 2024

Abstract

This article studies the developmental motives of a dictator under the modernisation hypothesis. He faces a trade-off between pursuing higher future gains with growing threats from the rise of the middle class and accepting lower gains for a more stable regime. I show that his optimal strategy is to invest in an underdeveloped economy for higher future returns. As the economy matures, investment declines as the focus shifts toward maintaining the regime. Without this threat, the economy regresses or fully develops depending on the profitability of investment and regime stability. My framework helps explain empirical puzzles about why some underdeveloped autocracies achieve faster economic growth. I also analyse how steady state varies by the length of future horizon under consideration. Contrary to Olson (1993)'s traditional theory that longer horizon concern makes high development, I find that a farsighted decision-making leads to a lower steady state.

Keywords: Dictatorship, Growth, Modernisation Hypothesis, Middle Class, Democratisation, Democratic Values

JEL Classification: D02, D72, O12, O43

*I am grateful for Francesco Squintani and Costas Cavounidis for their invaluable supervision and support. Also, I would like to thank Robert Akerlof, Dan Bernhardt, Peter Buisseret, Nathan Canen, Wioletta Dziuda, Gabriele Gratton, Priyama Majumdar, Luis Martinez, Kirill Pogorelskiy, Debraj Ray, Ronny Razin, Maria Titova, Hye Young You, Julia Zimmermann, and participants at 2023 Max Planck PolEcCon and Warwick PhD forum for helpful comments. Nevertheless, all mistakes are my own.

†Department of Economics, Coventry CV47AL, UK; hyungmin.park@warwick.ac.uk

1 Introduction

The evidence is clear that some dictatorships pursue economic development. The four Asian tigers demonstrated remarkable economic growth, with an annual growth rate of over 6 percent for three decades. Several impoverished nations have escaped poverty under the rule of pro-growth dictators (Glaeser et al., 2004). More interestingly, some autocracies have achieved faster economic growth than democracies over many periods (Luo and Przeworski, 2019).

However, why these developmental dictatorships pursue economic growth has rarely been discussed. In particular, it is not clear why a dictator would pursue economic growth when he might lose power as a result of the economic growth he achieves. For example, numerous studies have highlighted the miraculous economic development of South Korea, but the question remains as to why the South Korean dictators developed the economy that eventually removed them from power, rather than following the North Korean path of maintaining a regime without economic development.[1]

I study the optimal economic development of a dictator in a situation where economic development increases the risk of losing power. Motivated by Olson (1993)'s *stationary bandit*, my focus is on the dictator who is interested in extracting rents while in power. Dictators in poor countries face limitations on extracting rents due to a scarcity of economic resources. Consequently, some dictators may opt to forego immediate rent-seeking and instead invest in the anticipation of larger future rents. While pursuing economic development can potentially bring greater affluence to a dictator, it also exposes him to growing demands for democratisation from a burgeoning middle class. As a result, a natural trade-off emerges between extracting tiny rents from a politically-stable regime and obtaining substantial rents from a resource-abundant, yet politically-insecure, regime.

The emergence of the middle class as a key protagonist in democratic transitions follows the idea of the *modernisation hypothesis*. As Seymour Martin Lipset put it,

> Increased wealth is not only related causally to the development of democracy by changing the social conditions of the workers, but it also affects the political role of the middle class through changing the shape of the stratification structure (Lipset, 1959).

[1] Przeworski and Limongi (1997) suggest that South Korea is a "dream case" of modernisation theory in democratisation from economic development. Cho (2024) provide supporting empirical findings that development under dictatorship in South Korea changed the socio-economic conditions that contributed to democratisation.

This newly emerging class, receiving higher education in a more stable environment, has a greater demand for democratic rights and thus cultivates a democratic political culture and institutions.[2] Historical evidence supports this hypothesis in democracies of all periods. Famous for his statement, "no bourgeois, no democracy," Moore (1966) claims that the formation of a middle class was crucial to the establishment of modern democracy. According to Huntington (1993) and Glaeser et al. (2007), a well-educated citizenry is associated with the emergence of broad-based opposition groups and popular uprisings against monarchies, leading to the downfall of numerous European monarchies. Similar dynamics have been observed in other regions, including East Asia, the former Soviet Union, and Eastern Europe, culminating in the overthrow of dictatorial regimes. More recently, we see that the expansion of the urban middle classes consistently contributed to mass mobilisation during the Arab Spring in Egypt and Tunisia (Haggard and Kaufman, 2016).

Recent empirical results also support this modernisation hypothesis.[3] Economic growth in autocracies increases the probability of democratisation by making regime unstable (Abramson and Montero, 2020). It acts as a catalyst for demanding political freedoms (Kennedy, 2010) and mobilising industrial workers (Rueschemeyer et al., 1992; Collier, 1999; Dahlum et al., 2019). It also provides an environment conducive to democratisation in the event of leadership change or regime fragility (Miller, 2012; Treisman, 2015).[4] However, the literature on the modernisation hypothesis has not addressed what motivates a dictator to pursue economic expansion and how much development he would consider ideal.

I formulate a formal theoretical analysis to address this question. I construct an overlapping generations model with a dictator. The dictator considers current and ex-

[2] Banerjee and Duflo (2008) finds that the middle class tends to have fewer children and invest more in their education and health. According to Inglehart and Welzel (2005), individuals who grew up with less education, economic insecurity, and physical insecurity tend to internalise materialistic values, which are associated with xenophobia and authoritarianism. Conversely, those who grew up with higher levels of education and stable financial and physical circumstances are more likely to embrace post-materialistic values, which are aligned with egalitarian norms and democratic political cultures.

[3] The relationship between economic development and democratisation has long been debated, with no clear consensus. Some studies, such as Barro (1999), Boix and Stokes (2003), Burkhart and Lewis-Beck (1994), and Epstein et al. (2006), report a positive relationship between income and democracy. However, other studies including Acemoglu et al. (2008, 2009) criticise the hypothesis by reporting no causal relationship. Regarding this pessimistic side, Kennedy (2010) points out that their studies neglect the changes in socio-economic conditions brought about by economic growth that contribute to democratisation. In a recent review paper, Treisman (2020) also examines the history of the debate and finds a causal link between development and democratisation, albeit with a medium lag rather than a simultaneous or short-term relationship.

[4] These recent studies are also known as 'conditional modernisation theory', in that development makes democratisation more likely when there is a triggering event, rather than development leading to democratisation naturally.

pected rents in the future periods, decides how much to invest and extract rents, and remains in power until the transition to democracy occurs. In overlapping generations, parents provide education to bequeath a skilled job to their children, and democratic values emerge naturally from education.[5] Young citizens participate in collective action for democratic transition based on a global games framework (Morris and Shin, 1998, 2001). Among them, those who adopt democratic values from education have a stronger demand for democracy.

I find that the dictator's optimal strategy is to invest more when the economy is underdeveloped, and to invest little or nothing when it is developed. In underdeveloped economies, fewer people adopt democratic values due to lower levels of education. As a result, the dictator is more likely to stay in power and has the opportunity to increase future profits through investment. However, as the economy grows and more skilled workers become employed, the average level of education rises and more people adopt democratic values and actively participate in collective action. Faced with a higher probability of losing power, the dictator prioritises immediate gains over long-term investment. The dictator therefore chooses to invest little or nothing. I also highlight the conditions under which the dictatorship becomes a regressive or advanced economy. A dictator becomes a kleptocrat and the economy declines if the regime is unstable regardless of the level of growth or if investment costs are too high to create future value. On the other hand, when the middle class is not a threat to the dictator and the expected return on investment is high, the economy grows constantly.

The optimal investment pattern is exemplified by the Soviet Union dictatorship. In its adolescent phase, Stalin and his inner circle prioritised rapid industrialisation and economic growth to establish a robust socialist state. During this period, the ruling group actively suppressed rent-seeking. However, as the regime transitioned into its mature phase, the focus shifted toward extracting rents for personal gain rather than the common good, leading to a decline in growth (Belova and Gregory, 2002). The case of South Korean dictator Park Chung-hee shows a similar pattern. In his early years in power, he pursued a high level of efficiency, but after constitutional reforms in 1972 to ensure his long-term rule (*yushin* constitutiton), the regime performed worse than before in every aspect. Moreover, obsessed with maintaining power, the government used the intelligence services to repress citizens (Dominguez, 2011).

I conduct comparative statics on (i) fiscal capacity, (ii) the degree of urbanisation and the productivity of the industrial sector, and (iii) the relationship between inequality and democratisation to make predictions with respect to the political economy

[5] I assume that individuals possess either materialistic or democratic values, and that democratic values are correlated with higher levels of education.

literature. Numerous studies have recently discussed these issues, but few theoretical predictions have been made on how these factors can be considered in the context of economic development in autocratic countries. For example, various studies highlight the importance of fiscal capacity for economic development in less developed countries (Besley and Persson, 2013; Dincecco and Prado, 2012; Dincecco and Katz, 2016). But they rarely discuss how low fiscal capacity translates into incentives for economic development in autocracies, even though there are more autocracies than democracies among the underdeveloped economies.

Finally, I analyse how the level of development varies with the distance to the future the dictator takes into account. According to the traditional view of long-lasting dictators with a vested interest in economic performance, a dictator with a farsighted interest is likely to invest more (Olson, 1993; McGuire and Olson, 1996). Contrary to this prediction, I find that dictators facing the potential threat of a rising middle class tend to invest less as they look further into the future. By slowing economic growth, the dictator can avert the increased likelihood of regime collapse and survive for a longer period of time. This finding offers a novel perspective on the interplay between economic development and the length of autocratic leaders' time horizons.

This paper proceeds as follows: After describing the related literature in Section 2, I formulate and solve the model of developmental dictatorship in Sections 3 and 4. I conduct various comparative statics related to the literature on political economy in Section 5. In Section 6, I consider the different forward-looking horizons that the dictator takes into consideration in his optimal investment. Section 8 concludes the paper, and all formal proofs are in the appendix.

2 Contributions to the Literature

This study contributes to the literature on formal models of dictatorships by elucidating a potential mechanism through which dictatorships can foster economic growth. Prior research discuss how dictatorships reinforce the regime stability through repression (Tyson, 2018; Dragu and Przeworski, 2019; Gitmez and Sonin, 2023), power-sharing (Svolik, 2009; Boix and Svolik, 2013), and control of information (Edmond, 2013; Shadmehr and Bernhardt, 2015; Guriev and Treisman, 2019, 2020). It also explores how dictatorships balance competence and regime stability through the appointment of subordinates (Egorov and Sonin, 2011; Zakharov, 2016) and the acceptance of free media (Egorov et al., 2009). However, few theoretical models focus on the interplay between economic growth and regime stability, particularly examining why certain dictatorships accommodate economic growth even though it may weaken the stability. I analyse how a dictatorship may balance growth and stability in its own interest, suggesting that significant development can be made in underdeveloped economies.

The rise of the middle class is crucial to the fall of dictatorships in my model. The middle class supports democratic ideals and works against authoritarian regimes (Luebbert, 1991; Huber et al., 1993; Huntington, 1993; Glassman, 1995, 1997). Haggard and Kaufman (2012) finds that the demands of emerging social classes, such as the bourgeoisie and the urban working class, played an important role in the gradual extension of the franchise.

Their impact on democratic institutions depends on education. Education can transform political culture and create a conducive environment for civil society to flourish, leading to the establishment of democracy. This idea can be traced back to de Tocqueville (1835), who argued that widespread education in America was key to the flourishing of democracy. Several studies examine the empirical plausibility of this idea (Kam and Palmer, 2008; Berinsky and Lenz, 2011; Mayer, 2011). Specific to transitions to democracy, Bourguignon and Verdier (2000) predict that a more equal distribution of education leads to earlier democratisation in oligarchic societies. Glaeser et al. (2007) argues that education increases political participation, leading to transitions, and Murtin and Wacziarg (2014) find that primary education and per capita income lead to democratisation.

Improved education from the rise of the middle class makes citizens more likely to embrace democratic values, which is the main distinction between this study and others on education and democratisation. This assumption is related to the formation of post-materialistic values versus materialistic values (Inglehart and Baker, 2000; Inglehart and Welzel, 2005; Inglehart, 2017, 2018) and the emphasis of affluent voters on values rather than material interest (Enke et al., 2023). The evolution of democratic values through education is relevant to the cultural transmission literature (Bisin and Verdier, 2001, 2011).

This study also contributes to the emerging literature on culture and institutions (Tabellini, 2008b; Bisin and Verdier, 2023b; Besley and Persson, 2019) by examining the emergence of democratic values in democratisation. In particular, this study is closely related to Besley and Persson (2019), who highlight how democratic values beget democratic institutions. The main difference is that this study shows how democratic values arise from economic change, rather than evolving by themselves. Regarding culture and institutions on economic growth, numerous studies discuss how democratic values are a key component of economic growth in democratic institutions (Putnam et al., 1992; Rodrik, 2000; Persson and Tabellini, 2009). This study suggests that democratic values have different effects in dictatorships than in democracies.

Finally, this study contributes to the literature on formal theoretical models of democratic transitions. The existing literature mainly looks at democratisation from the perspective of economic interests. Boix (2003) and Acemoglu and Robinson (2000, 2001, 2006) focus on class conflict and argue that elites must democratise by expanding the franchise to counter the threat of revolt from the poor for redistribution. Leventoğlu (2014) extends the framework of Acemoglu and Robinson (2006) to discuss social mobility in democratisation. Apart from class conflict, Lizzeri and Persico (2004) argue that the cause of enfranchisement lies in the demand for the provision of public goods. However, more than 40 percent of the democratisation was achieved under the leadership of the middle and upper classes, which did not require redistribution (Haggard and Kaufman, 2012). Moreover, Tabellini (2008a) points to the limitations of explaining institutional change solely in terms of economic incentives. In this respect, this study contributes to the literature by focusing on how an increase in the demand for democracy is itself a cause of democratisation, and by explaining how this demand for democracy can be driven by economic change.

3 Model

I build an overlapping generation model with a dictator to describe how economic growth promotes democratic values. A continuum of citizens with unit mass is born in each period and lives for only two periods. I call citizens in their first and second periods "young citizens" and "parents" respectively. Each young citizen $i \in [0, 1]$ acquires education from her parent i, becomes either a democratic type (d) or materialistic type (m), and decides whether to participate in the collective action. In the subsequent period, she earns a wage, consumes for herself, and educates her offspring. The dictator compares extracting the immediate rent to obtaining greater stakes in the future by promoting economic growth, and remains in power until the collective action successfully overthrows him.

Economy. The economy begins with an initial level of infrastructure $A_1 \in \text{int}\mathcal{A}$ where $\mathcal{A} \equiv [0, \bar{A}]$ is the set of infrastructure. Infrastructure is accumulated according to $A_{t+1} = (1 - \delta)A_t + I_t$ where $\delta \in (0, 1]$ is the depreciation rate and I_t is the investment of the dictator in period t. The production of *industrial economy* in period

t is

$$Y_t = 2\pi_h \sqrt{A_t} q_t - \frac{q_t^2}{\varphi} \tag{1}$$

where $q_t \in [0, \bar{q}]$, $\bar{q} < 1$, is the proportion of skilled labour occupation, π_h is a production parameter for skilled labour, and φ is a social cost parameter that is an inverse measure of the cost of providing high-skilled labour jobs.[6] Here, q_t represents the qualitative level of development of the economy and q_t^2/φ reflects social costs incurred by industrialisation and urbanisation. Skilled jobs are provided by competitive firms, so skilled occupations $q_t = \varphi\pi_h\sqrt{A_t}$ are provided with pre-tax wage $\pi_h\sqrt{A_t}$ for $q_t \leq \bar{q}$. This means that an increase in infrastructure increases the share of skilled workers. Assume that $\bar{q} = \varphi\pi_h\sqrt{\bar{A}}$. Those who do not get a skilled occupation work as unskilled labour in the rural economy, with wages $w_{lt} = \pi_l\sqrt{A_t}$. [7]

An exogenous proportional income tax $\tau \in (0, 1)$ is imposed on the industrial economy; production in the rural economy is untaxed. Government revenue G_t is τY_t, which the dictator can divide between personal consumption and investment to modernise the economy to enjoy more resources at his disposal. Post-tax income for skilled workers w_{ht} is $(1-\tau)\pi_h\sqrt{A_t}$. The post-tax income for skilled workers is greater than that for unskilled workers ($0 < \tau < 1 - \pi_l/\pi_h$). The cost of generating 1 unit of infrastructure is $\kappa > 0$. I say that an investment I_t is *feasible* if $\kappa I_t \leq G_t$.

Dictator's Investment Decision. The dictator chooses a feasible investment that maximises his payoffs from immediate rent gain and expected rent gain in the subsequent periods. Let $v_{it} \in \{d, m\}$ denote the value type of young citizen i and let $\bar{d}_t = \int_0^1 \mathbf{1}[v_{it} = d]di$ denote the mass of young citizens who have democratic values in period t where $\mathbf{1}[\cdot]$ is an indicator function. The dictator may or may not continue to the next period depending on the result of collective action. The result of collective action γ_t is 1 or 0 where 1 means collective action succeeds in ruling out the dictator and 0 means collective action fails. The result of collective action is determined by $\bar{d}_t$. The expected payoffs of the dictator are given by

$$\sum_{t=1}^{\infty} \beta^{t-1} \{G_t - \kappa I_t\} \prod_{s=0}^{t-1} \Pr[\gamma_s = 0 | \bar{d}_s] \tag{2}$$

[6] I focus on $q_t < 1$ for both technical and realistic reasons: Even if the society becomes highly industrialised, it is impossible for everyone to work in an industrial sector. And technically, if every citizen can get a skilled job, there are no incentives to provide education. Thus, I denote by $\bar{q} \in (0, 1)$ the maximum proportion of skilled jobs.

[7] Note that unskilled wages in the rural economy is also affected by the level of infrastructure, which can be interpreted as a diffusion of technology and wealth.

where $\Pr[\gamma_1 = 0|\bar{d}_0] = 1$, $\beta \in (0, 1]$ is a time discount rate and $\prod_{s=0}^{t-1} \Pr[\gamma_s = 0|\bar{d}_s]$ is the probability that the dictator survives until period t.

Parental Education. A parent gets either a skilled or unskilled wage and educates her offspring. Let e_{it} denote the provision of education by parent i to young citizen i and let $\bar{e}_t \equiv \int_0^1 e_{it} di$ denote the average education in period t. The preferences of a parent i are given by

$$\left\{ w_{it} - \frac{e_{it}^2}{2} \right\} + \mu \mathbb{E}[w_{it+1}|e_{it}, \bar{e}_t, q_{t+1}] \tag{3}$$

where $\mu > 0$ is an empathy parameter. The first term captures parents' current consumption and the second term captures parents' empathy to their offspring: parents are more satisfied when their children's expected wage is higher. With non-negative consumption, we have $e_{it}^2/2 \leq w_{it}$. The probability of getting a skilled job depends on the number of jobs created in the next period, a citizen's education achievement, and the average education. Specifically, the number of available skilled labour jobs q_{t+1} is rationed by the relative level of education. Define the probability that young citizen i gets a skilled job in the next period, $h(e_{it}, \bar{e}_t, q_{t+1})$, by

$$h(e_{it}, \bar{e}_t, q_{t+1}) = h_1(e_{it}, \bar{e}_t, q_{t+1}) + \{1 - h_1(e_{it}, \bar{e}_t, q_{t+1})\} \, h_2(e_{it}, \bar{e}_t, q_{t+1}) \tag{4}$$

where

$$h_1(e_{it}, \bar{e}_t, q_{t+1}) = \begin{cases} 1 & \text{if } e_{it} > 0 \text{ and } \int_0^1 \mathbf{1}[e_{it}]di < q_{t+1}, \\ \min\{q_{t+1}(e_{it}/\bar{e}_t), 1\} & \text{if } e_{it} > 0 \text{ and } \int_0^1 \mathbf{1}[e_{it}]di \geq q_{t+1}, \\ 0 & \text{if } e_{it} = 0 \end{cases} \tag{5}$$

and $h_2(e_{it}, \bar{e}_t, q_{t+1}) = \{q_{t+1} - \int_0^1 h_1 di\}/\{1 - \int_0^1 h_1 di\}$. In words, the function h_1 means that (a) if there are fewer educated citizens than available high-skilled wage jobs, then all citizens with education get high-skilled wage jobs; (b) if the number of educated citizens exceeds the supply of high-skilled wage jobs, a citizen i with double the education level of citizen j is twice as likely to become a high-skilled wage worker as citizen j; and (c) if a citizen is not educated, she does not receive a high-skilled wage job. The function h_2 means if any high-skilled wage jobs remain after hiring from h_1, they are rationed pro-rata among uneducated workers.[8]

Evolution of Democratic Values. In addition to better job opportunities, a higher level of education increases the likelihood of young citizens embracing democratic values. The probability of embracing democratic values given education is given by $\Pr[v_{it} = d|e_{it}] = \min\{e_{it}^2, \eta\}$. The upper bound η captures the possibility that a citizen with higher education may not embrace democratic values. The literature on cultural transmissions (Bisin and Verdier, 2001, 2023a; Tabellini, 2008b) also explored how values evolve through education. The main difference is that the literature finds educational motivations from instilling specific values in their children, while this study assumes that education decisions are primarily driven by economic factors.

The evolution of values from parents to children through education has been discussed in the literature on cultural transmissions. The main distinction from the literature lies in their assumption that parents intentionally instill specific values in their children. In contrast, I posit that parental decisions are primarily driven by economic factors.

Collective Action. Each young citizen i decides whether to participate, $a_{it} = 1$, or not, $a_{it} = 0$, in collective action that can overthrow the regime. Participation is costly because citizens may be subject to dictatorial repressions as a result of their participation. I assume that democratic citizens have lower participation costs than materialistic citizens. That is, $0 < c_d \leq c_m < 1$ where c_d and c_m are the participation cost for democratic and materialistic citizens, respectively. I denote the average participation cost by $\bar{c}_t = \bar{d}_t c_d + (1 - \bar{d}_t) c_m$.

Regime change is desirable for all citizens: Participants earn positive payoffs when the collective action succeeds. When it fails, they receive negative payoffs due to the participation cost. Citizens who do not participate in the collective action get zero. The preferences of a young citizen i are given by

$$\{\mathbf{1}[M_t > 1 - \theta_t] - c_{it}\}\, a_{it}. \tag{6}$$

Collective action is successful and the regime changes if the mass of participants $M_t = \int_0^1 a_{it} di$ exceeds a threshold $1 - \theta_t$ and it fails otherwise. Here, θ_t represents the regime

[8] To see that the distribution rule h works, note that $0 \leq \int_0^1 h_1 di \leq q_{t+1}$ because $\int_0^1 \min\{q_{t+1}\{e_{it}/\bar{e}_t\}, 1\} di \leq \int_0^1 q_{t+1}\{e_{it}/\bar{e}_t\} di = q_{t+1}$. And $0 \leq h_2 \leq 1$ and $h_2 = 0$ only when $\int_0^1 h_1 di = q_{t+1}$. Therefore, $\int_0^1 h di = q_{t+1}$, i.e., all high-skilled labour jobs are distributed according to the education.

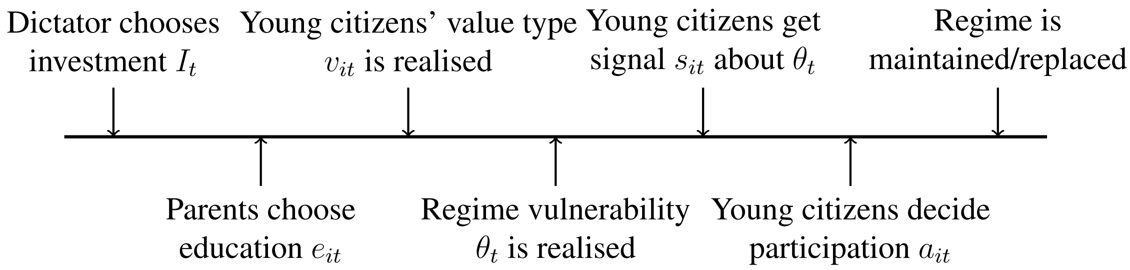

Figure 1: Timeline of events in period t

vulnerability, which is independently and identically distributed over time according to a uniform distribution with its domain $[\underline{\theta}, \bar{\theta}]$ where $\underline{\theta} < -\sigma$ and $\bar{\theta} > 1 + \sigma$ and $\sigma \in (0, 1/2]$. When $\theta_t \geq 1$, the regime naturally collapses on its own, while $\theta_t \leq 0$ means that there is no hope of removing the dictator from power through collective action. The mean $\mathbb{E}[\theta_t]$ is assumed to be between 0 and 1. The dictator knows the distribution of θ_t. Citizens, on the other hand, do not have prior information about θ_t. Instead, they receive a private signal $s_{it} = \theta_t + \sigma\varepsilon_{it}$ where the random error ε_{it} follows a uniform distribution on $[-1, 1]$ and is independent and identically distributed for all $i \in [0, 1]$ and t. Based on the signal received, citizens construct beliefs about the realisation of θ_t, make inferences about the beliefs of others, and decide whether to participate ($a_{it} = 1$) or not ($a_{it} = 0$).

Timing. The timing of events is described as follows (see Figure 1):

(i) Given the government budget G_t, dictator chooses investment I_t.

(ii) After observing I_t, each parent $i \in [0, 1]$ receives wages w_{it} and educates e_{it} the offspring. Young citizens become either democratic or materialistic from the education.

(iii) Nature chooses the regime vulnerability θ_t, each young citizen receives a private signal s_{it} about θ_t and decides whether to participate in collective action.

(iv) If the collective action is successful, democracy begins from period $t + 1$; otherwise the dictator maintains power in period $t + 1$.

In equilibrium, the dictator's investment decision is the optimal action given the best response action choices by parents of education provision and young citizens' participation in the collective action given their realised value type and signal about regime vulnerability.

4 Analysis

Democratic Values and Regime Change. I describe the equilibrium for young citizens' participation in collective action and derive the probability of democratic transition as a function of $\bar{d}_t$. It is well known from the global games literature that the unique Bayes-Nash equilibrium features a cutoff-type strategy in the participation choice, and the different participation cost yields different equilibrium cutoffs for materialistic and democratic types.

Proposition 1. *There is a unique Bayes-Nash equilibrium such that each young citizen with signal s and value $v \in \{d, m\}$ follows a cutoff strategy:*

$$a_{it}(s, v) = \begin{cases} 1 & \textit{if} \quad s \geq s_t^*(v) \\ 0 & \textit{if} \quad s < s_t^*(v) \end{cases} \tag{7}$$

where $s_t^*(d) = \sigma(2c_d - 1) + \bar{c}_t$ and $s_t^*(m) = \sigma(2c_m - 1) + \bar{c}_t$.

Proposition 1 shows that each citizen participates in the collective action only when their signal exceeds a certain type-specific cutoff in equilibrium. This cutoff is lower for democratic type than for materialistic type, which is due to the difference in participation cost. Intuitively, materialistic citizens need more confidence than democratic citizens to join the collective action, as participation is more costly to them. Further, both cutoffs are decreasing in $\bar{d}_t$, i.e., both types are more likely to participate if there are more citizens with democratic type. Because of these positive externalities, the proportion of individuals who have democratic values is crucial for the regime's survival. When the precision of a citizen's signal improves ($\sigma \to 0$), the equilibrium cutoffs for both democratic and materialistic types converge to the same cutoff, which is the average participation cost $\bar{c}_t$.

What is the relationship between $\bar{d}_t$ and the *ex-ante* probability of collective action success, and how is regime vulnerability θ_t related to regime stability and regime change? I propose a threshold for regime vulnerability, above which the regime is to be overthrown.

Proposition 2. *Collective action succeeds in overthrowing the regime if $\theta_t \geq \bar{c}_t$ and fails if $\theta_t < \bar{c}_t$. The ex-ante probability of collective action success $\Pr[\gamma_t = 1|\bar{d}_t]$ is*

$$\Pr[\gamma_t = 1|\bar{d}_t] = \frac{\bar{\theta} - \bar{c}_t}{\bar{\theta} - \underline{\theta}}. \tag{8}$$

According to Proposition 2, the average cost $\bar{c}_t$ serves as the threshold for regime change, and the signal precision σ does not matter for the probability. This indicates that an increase in $\bar{d}_t$ lowers $\bar{c}_t$, thereby reducing the likelihood of the regime's survival. From the dictator's standpoint, the probability of survival from period t to period $t+1$ is $\Pr[\gamma_t = 0|\bar{d}_t] = \{\bar{c}_t - \underline{\theta}\}/\{\bar{\theta} - \underline{\theta}\}$ which lies in $[\underline{p}, \bar{p}]$, for $\bar{p} = \{c_m - \underline{\theta}\}/\{\bar{\theta} - \underline{\theta}\}$ and $\underline{p} = \{\eta c_d + (1-\eta)c_m - \underline{\theta}\}/\{\bar{\theta} - \underline{\theta}\}$. Let $\Delta p = \{c_d - c_m\}/\{\bar{\theta} - \underline{\theta}\}$ denote the marginal effect of democratic values on the dictator's probability of survival. Then $\Pr[\gamma_t = 0|\bar{d}_t]$ can be expressed as $\bar{p} + \bar{d}_t \Delta p$.

This finding aligns with recent studies exploring the modernisation hypothesis (Kennedy, 2010; Miller, 2012; Treisman, 2015). They highlight that economic growth makes democratisation more likely from trigger events due to socio-economic and institutional changes. Regarding the trigger events, Miller (2012) and Kennedy (2010) centre their attention on the period of regime vulnerability and economic crisis. Meanwhile, Treisman (2015) considers leadership turnover, such as the death of Generalisimo Franco in Spain. The average participation cost $\bar{c}_t$ captures the institutional and socio-economic changes, and the realisation of θ_t captures the period of these trigger events.

Parental Education. In my model, education has no real effect on production, but is a means of allocating scarce skilled jobs. Even if education does not accumulate human capital, parents' preference to bequest a skilled occupation leads them to invest in education:

Lemma 1. *There is no equilibrium such that $e_{it} = 0$ for all $i \in [0, 1]$.*

This means that in equilibrium, every citizen invests in the education regardless of the wage. Next, I analyse each parent's choice of education and how it depends on the current and future economic conditions.

Proposition 3. *In equilibrium, average education $\bar{e}_t$ increases in A_t and I_t.*

The result reveals that households are encouraged to provide higher education by increasing infrastructure, as the value of education for a high-skilled job increases both through an increase in wages and an increase in the number of jobs. As a result of increased education, the demand for democracy also increases, as more young citizens adopt democratic values. This describes the emergence of the middle class as correlated with the increasing demand for democracy.

Note that with the high empathy parameter μ, either low-skilled households or all households may expend all their expenditure on education when A_{t+1} is sufficiently high, reflecting a strong interest in their child's future career. To avoid this

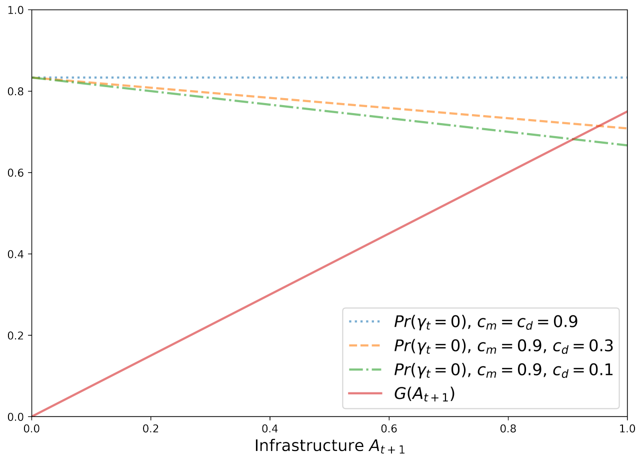

Figure 2: Likelihood of Regime maintenance and Government Revenue

extreme, I restrict my attention to the case where the cost of education in equilibrium is in the interior of their budget constraints, which requires $0 < \mu < 2\kappa\pi_l\{(1-\tau)\pi_h - \pi_l\}^{-1}\{\kappa^2(1-\delta) + \tau\kappa\varphi\pi_h^2\}^{-1/2}$. Then, in equilibrium, all parents in period t make the same investment in education, $\bar{e}_t = \sqrt{\mu\varphi\pi_h\{(1-\tau)\pi_h - \pi_l\}A_{t+1}}$, which increases strictly in A_t and I_t. Letting $\hat{d} = \mu\varphi\pi_h\{(1-\tau)\pi_h - \pi_l\}$, the proportion of democratic citizens $\bar{d}_t$ can be expressed as $\min\{\hat{d}A_t, \eta\}$. I assume that $\hat{d}\bar{A} = \eta$ in the following analyses.

Figure 2 shows the relationship between the infrastructure in the next period and the regime's likelihood of maintaining the regime. This downward shape is similar to the empirical findings from Przeworski et al. (2000) and Abramson and Montero (2020).[9] The probability of regime change depends on the value of c_d. The dotted line indicates that the probability is independent from the level of infrastructure when there is no modernisation effect, i.e., $c_d = c_m$. It decreases rapidly by A_{t+1} as c_d moves further away from c_m. This implies that when the demand for democratic institutions for pro-democratic citizens is strong, the regime is more unlikely to maintain the regime from the economic development. Also, c_d may depend on the state's capacity in coercion and repression.

Dictator's Investment Decision. Economic growth allows for higher expected returns by increasing government revenues. However, as shown in Proposition 3, it also raises the average level of education, leading to strong pressure for regime change. Therefore, the dictator faces a trade-off between a more secure regime with fewer re-

[9] Przeworski et al. (2000) estimate the probability of democracy by per capita income and Abramson and Montero (2020) estimate a learning model of democratisation and show the destabilising effect of growth in autocracies.

sources for rent seeking and a less secure regime with more resources to manage. I now analyse the dictator's optimal investment decision under these trade-offs.

The dictator's optimal investment, $\{I_t^{\text{dict}}\}_{t=1}^{\infty}$, solves the following:

$$
\begin{aligned}
\max_{\{I_t\}_{t=1}^{\infty}\in\mathbb{R}_+^{\infty}} \quad & \sum_{t=1}^{\infty}\beta^{t-1}\left\{G_t-\kappa I_t\right\}\prod_{s=0}^{t-1}\Pr[\gamma_s=0|\bar{d}_s] \\
\text{s.t.} \quad & A_{t+1}=\min\left\{(1-\delta)A_t+I_t,\bar{A}\right\}, \\
& e_{it}=\arg\max_{\tilde{e}_{it}\geq 0}\left\{w_{it}-\frac{e_{it}^2}{2}\right\}+\mu\mathbb{E}[w_{it+1}|e_{it},\bar{e}_t,q_{t+1}], \\
& \bar{d}_t=\int_0^1\min\{e_{it}^2,\eta\}di, \\
& I_t \text{ is feasible}
\end{aligned}
\tag{9}
$$

for all $i\in[0,1]$. The constraints correspond to the infrastructure accumulation, parents' optimal education decision, and the proportion of young citizens who have democratic values, respectively. This problem is equivalent to the recursive problem:

$$
\begin{aligned}
V(A_t)=\max_{I_t\in[0,G_t/\kappa]} & \Pr[\gamma_{t-1}=0|\bar{d}_{t-1}]\left\{G_t-\kappa I_t+\beta V(A_{t+1})\right\} \\
\text{s.t.} \quad & A_{t+1}=(1-\delta)A_t+I_t \\
& e_{it}=\arg\max_{\tilde{e}_{it}\geq 0}\left\{w_{it}-\frac{e_{it}^2}{2}\right\}+\mu\mathbb{E}[w_{it+1}|e_{it},\bar{e}_t,q_{t+1}], \\
& \bar{d}_t=\int_0^1\min\{e_{it}^2,\eta\}di.
\end{aligned}
\tag{10}
$$

for all $i\in[0,1]$.

Depending on the trajectory of the dictator's optimal investments, the economy may evolve into prosperity, decline, or an intermediate state. Based on these potential outcomes, I categorise the dictatorships as follows:

Definition 1. For any A_t, the dictatorship is said to be

(a) *regressive* if $q_t\to 0$,

(b) promoting toward a *moderate economy* if $q_t\to q\in(0,\bar{q})$, and

(c) promoting toward an *advanced economy* if $q_t\to\bar{q}$.

Both the regressive dictatorship and the dictatorship promoting toward advanced economy imply that the modernisation from economic growth does not constrain the

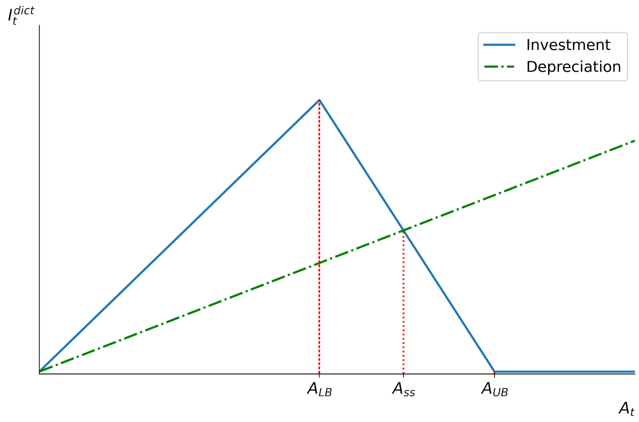

Figure 3: Optimal Investment

dictator's investment plan. Therefore, I prove in the appendix that the optimal investment of a dictator who is constrained by the potential threat of emerging middle class is characterised by the following proposition.

Theorem 1. *The followings are equivalent:*

(a) The dictatorship is promoting toward a moderate economy,

(b) The unit infrastructure cost κ *satisfies*

$$\kappa \in \left(\frac{\beta\tau\varphi\pi_h^2\left[(1-\beta\underline{p})(\eta\Delta p+\underline{p})+\beta\eta\underline{p}\Delta p\right]}{(1-\beta\underline{p})\left\{1+\beta\delta\eta\Delta p-\beta\underline{p}(1-\delta)\right\}+\beta^2\delta\eta\underline{p}\Delta p}, \frac{\beta\bar{p}\tau\varphi\pi_h^2}{1-\beta(1-\delta)\bar{p}} \right),$$

(c) There are thresholds of A_{LB} *and* A_{UB} *such that optimal investment* I_t^{dict} *strictly increases in* A_t *for all* $A_t \leq A_{\mathrm{LB}}$*, strictly decreases in* A_t *for all* $A_t \in [A_{\mathrm{LB}}, A_{\mathrm{UB}}]$*,* $I_t^{\mathrm{dict}} = 0$ *for all* $A_t \geq A_{\mathrm{UB}}$*, and a unique steady state* A_{ss} *in* $(A_{\mathrm{LB}}, A_{\mathrm{UB}})$*.*

When A_t is low, each household invests less in education, resulting in fewer democratic citizens. As a consequence, the regime is very likely to remain in power in the next period. Because investments are profitable, the dictator is strongly motivated to invest in the economy. In contrast, when A_t is high, each household can afford large investments in education, leading to the emergence of a larger population of democratic citizens. Due to the threat posed by these democratic citizens, the regime is less likely to continue in the next period. Despite the profitability of investments, the dictator has a reduced incentive to invest in the economy.

Figure 3 graphically illustrates Proposition 1. The economy grows when investment exceeds depreciation and declines when it falls below. The steady state is the level of A_t that equalises investment and depreciation. Given that the emergence of a middle class has historically been a driver of democratisation in many countries, this finding suggests that the developmental dictatorship would not promote perpetual growth; instead, the dictator stimulates growth for a mediocre economy. This provides a possible mechanism to explain why it is hard to find highly-developed autocracies and why growth is sometimes faster under dictatorships among poorer countries, but slower once development reaches a certain level. (Luo and Przeworski, 2019).

Next, I find the condition under which dictatorship becomes regressive and promotes to the advanced economy. As shown in Lemma A.2 in the appendix, the value function V is strictly concave in the effective domain. Therefore, a regressive dictatorship requires investment to be costly and there is no incentive to invest when the level of infrastructure is close to 0. Similarly, to foster an advanced economy, the unit cost of infrastructure κ must be sufficiently low that the increase in the dictator's expected return on investment outweighs the pressure from the emerging pro-democratic citizens. Under these circumstances, the dictator will facilitate a high level of economic growth, leading the economy to converge to a high level of economic development for as long as the dictatorship lasts.

Corollary 2. *The dictatorship is*

(a) regressive *if and only if*

$$\frac{\beta\bar{p}\tau\varphi\pi_h^2}{1-\beta(1-\delta)\bar{p}} \leq \kappa, \tag{11}$$

(b) promoting toward an advanced economy *if and only if*

$$\kappa \leq \frac{\beta\tau\varphi\pi_h^2\left[(1-\beta\underline{p})(\eta\Delta p+\underline{p})+\beta\eta\underline{p}\Delta p\right]}{(1-\beta\underline{p})\left\{1+\beta\delta\eta\Delta p-\beta\underline{p}(1-\delta)\right\}+\beta^2\delta\eta\underline{p}\Delta p}. \tag{12}$$

Conditions (11) and (12) are obtained from the first-order condition at $A_t = 0$ and $\bar{A}$, respectively. When $c_d = c_m$, i.e., no middle-class-driven-democratisation, the right-hand side of (12) becomes the left-hand side of (11), meaning that the dictatorship only regresses or develops into an advanced economy.

Figure 4 illustrates the types of dictatorship by different participation costs c_m and c_d. When c_m is low, the dictator behaves kleptocratically rather than investing in the economy, and the economy becomes regressive. This is consistent with the findings of Alesina et al. (1996) and Aisen and Veiga (2013) that political instability, which tends to be persistent, significantly reduces economic growth. In contrast, when

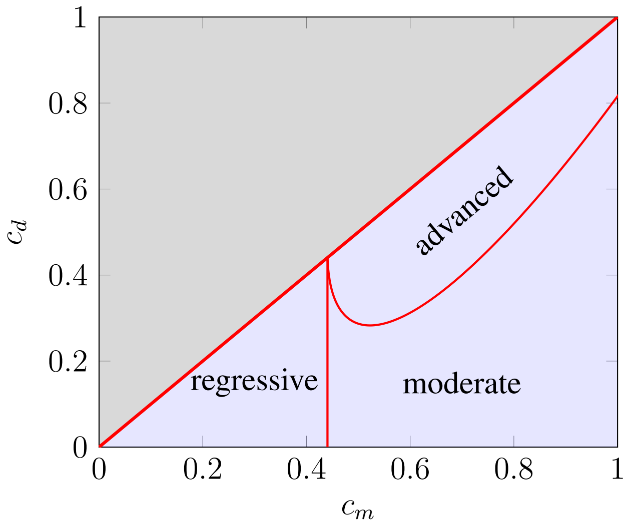

Figure 4: Participation cost and the type of dictatorship

c_m and c_d are high, the dictator is not constrained by the threat of democratisation and continues to pursue economic development. If c_d is sufficiently smaller than c_m, the dictator balances his economic interests with regime maintenance, leading to a moderate economy.

5 Determinants of Economic Growth

So far, I have discussed the conditions under which a dictatorship becomes an advanced, moderate, and regressive economy and have derived the shape of the optimal investment strategy for a dictator under threat from the middle class. In this section, I provide comparative statics and discuss the implications for the literature on political economy.

5.1 Fiscal Capacity

Fiscal capacity, which refers to a government's ability to generate revenue primarily through taxation, is a pivotal determinant of economic growth (Besley and Persson, 2013). It enables investments in infrastructure, education, health, and other sectors, thereby enhancing productivity and elevating living standards. Empirical findings indicate that fiscal capacity increased worker productivity (Dincecco and Prado, 2012), greater state capacity to extract tax revenue improved economic performance among European countries (Dincecco and Katz, 2016), and high fiscal capacity reduces state failure in sub-Saharan Africa (Thies, 2015).

However, it is not obvious how high fiscal capacity in a dictatorship translates into substantial public spending on social welfare. In particular, unlike democracies, a dictator might prioritise short-term interests and reduce the provision of public goods under high public pressure (Przeworski et al., 2000). In line with the discussion, I conduct a comparative static analysis to examine how an exogenously given tax rate influences a dictator's optimal investment path.

The set of possible tax rates is $\mathcal{T} \equiv [0, 1 - \pi_l/\pi_h]$ for which the post-tax skilled income is greater than unskilled income. Using equation (11), I can find a threshold τ^{reg} such that for any dictatorship with $\tau \leq \tau^{\text{reg}}$ the economy is regressive. With such τ, investment is no longer profitable and the dictator focuses on instantaneous gain, leading to a regressive economy. This suggests that the positive correlation between fiscal capacity and economic development may be valid in autocracies.

When $\tau > \tau^{\text{reg}}$, as τ decreases, government revenue $G_t = \tau Y_t$ decreases. At the same time, post-tax income of skilled workers increases, while that of unskilled workers remains unchanged. This increase in the wage differential induces parents to invest more in education, which in turn makes the regime unstable. As a result, the dictator is less incentivised to invest in the infrastructure for the future expected payoffs. If there is τ^{adv} such that the formula (12) holds with equality and τ^{adv} is less than $1 - \pi_l/\pi_h$, the economy converges to $\bar{q}$ for all τ above τ^{adv}.

Proposition 4 (Fiscal Capacity)**.** *The dictatorship is regressive if $\tau \leq \tau^{\text{reg}}$, and is promoting toward an advanced economy if $\tau \geq \tau^{\text{adv}}$. For all $\tau \in \mathcal{T} \cap (\tau^{\text{reg}}, \tau^{\text{adv}})$, the dictatorship with high τ provides a higher investment for all A and converges to a higher steady state.*

5.2 Productivity of Industrial sector and Urbanisation

In the early stages of economic development, industrialisation often accompanies economic growth. This encourages dictators to shift the industrial structure towards high productivity. For instance, the Soviet Union, China, and South Korea all implemented five-year plans that focused on developing heavy industry sectors such as steel, coal, and machinery. During this rapid industrialisation, the dictator takes into account both the productivity gains and the social costs of industrialisation and urbanisation.

On the contrary, industrialisation and urbanisation increase the potential threat to the regime. The formation of the industrial and rural sectors and the degree of urbanisation have long been considered important factors in the democratic movement. Lipset (1959) points out that industrialisation and urbanisation are related to democracy. Rueschemeyer et al. (1992), Collier (1999) and, more recently, Dahlum et al.

(2019) suggest that urbanised societies facilitate organised mass mobilisation of industrial workers. Kennedy (2010) argues that economic development increases political mobilisation for political freedoms, thereby making democratisation more likely.

Following this discussion, I analyse how optimal investment differs depending on the productivity of the industrial economy π_h and the degree of urbanisation φ. Note that an increase in these factors is a mixed blessing for the dictator. An increase in π_h boosts the increase in government revenue from economic growth by increasing the tax paid by each skilled household. On the other hand, it motivates citizens to invest more in education by increasing the wage differential between skilled and unskilled labour, thereby promoting democratic values. Thus, high productivity leads both to increased economic gains and to increased regime instability. Similarly, a high φ reflects the low social costs of industrialisation. Since $q_t = \varphi\pi_h\sqrt{A_t}$ in equilibrium, it leads to a faster transition of jobs from the rural to the industrial economy. This contributes to higher government revenues by increasing the number of taxpayers. However, increasing the supply of skilled jobs leads to an increase in average education, making the regime more unstable.

Proposition 5 (Industrial Productivity and Urbanisation)**.** *Suppose that the dictatorship is not regressive. For some threshold of participation cost for democratic type* $c_d^{\varphi}, c_d^{\pi_h} \in [0, c_m]$*,*

(a) the steady state increases in φ for all $c_d > c_d^{\varphi}$ and decreases in φ for all $c_d < c_d^{\varphi}$,

(b) the steady state increases in π_h for all $c_d > c_d^{\pi_h}$ and decreases in π_h for all $c_d < c_d^{\pi_h}$.

With an increase in either π_h or φ, the marginal expected return on investment increases at lower A_t values, which is attributed to the expansion of the government budget. The marginal expected return falls more sharply as A_t increases, because the average education increases in A_t much faster than before. The steady state may increase or decrease depending on the slope of survival probability Δp. With a fixed c_m, low c_d leads the dictator to converge to the low steady state.

This comparative static provides an insight into how the dictator respond to the emerging threat from the urban middle class in economic growth. In my model, the cost of protest matters. That is, pro-democratic citizens' low participation cost in the collective action makes the democratisation more likely, which may disincentivise the dictator's economic growth even though growth gives much higher economic gains.

Also, because these costs include the demand for democracy, the dictator may potentially reduce this demand by establishing quasi-democratic institutions or granting more property rights. The dictator may also try to win over the middle class by offering government jobs. If the dictator succeeds in weakening the pressure from pro-democracy citizens, he can pursue high economic growth when the productivity of the industrial economy is high. Further research is needed to explore these dynamics.

5.3 Inequality and Democratisation

Formal models of democratic transitions consider distributive conflicts and emphasise inequality as a cause of democratisation. Boix (2003) predicts that unequal societies are more difficult for democratic transitions and consolidation because the rich want to avoid the redistributive consequences. In contrast, Acemoglu and Robinson (2000, 2001, 2006) focus on the increasing incentives for the poor to revolt for redistribution as inequality grows.

However, these distributive conflicts do not explain more than 40 percent of democratisations. Many of the protests that lead to these transitions are dominated by middle- or upper-middle-class groups who do not require redistribution (Haggard and Kaufman, 2012). This prompts the questions: How does income inequality impact democratisation driven by the rising middle class? And how does a dictator respond to this inequality in promoting economic growth?

To answer these questions, I analyse the equilibrium effect of inequality on democratic transition in the absence of distributive conflict. In my model, the output of the rural economy cannot be taxed and has no direct effect on the dictator's payoff. However, it works as a reservation wage for citizens. By varying the value of π_l in the analysis, we can see the effect of income inequality on the equilibrium.

Proposition 6 (Inequality)**.** *Suppose that the dictatorship is non-regressive.*

(a) The steady state A_{ss} increases in π_l.

(b) The probability of democratisation in the steady state does not change from π_l.

The intuition of the first part is straightforward. When π_l is high, the wage disparity between skilled and unskilled jobs narrows, leading to less investment in education. On the other hand, government revenue is the same. As a result, the dictator faces a diminished threat and has an incentive to reach a higher steady state. This finding suggests a potential explanation, in the context of dictatorship, for empirical findings showing an inverse relationship between income inequality and investment in underdeveloped countries (Alesina and Perotti, 1996; Barro, 2000).

Then, how does the stability differ by π_l? Does the high steady state of high π_l make the regime weaker or stronger? The second part of Proposition 6 shows that the dictatorship maintains the same level of stability. This level of probability can be interpreted as a stability threshold such that the dictatorship promotes growth above the threshold and prioritises regime survival below the threshold.

6 Forward-Looking and Development

In autocratic systems, decision-making is heavily shaped by the characteristics of leaders (Jones and Olken, 2005). These regimes centralise power in the hands of either a single leader or a small group. Authoritarian rulers frequently prioritise their own survival and personal interests, often at the cost of social welfare and development. Consequently, the adoption of myopic and inconsistent policies is prevalent.

The question of whether a shortsighted or farsighted dictator contributes more to economic development has been a subject of discussion. Using the well-known analogy of stationary and roving bandits, Olson (1993) argues that dictatorships with long-term interests are more incentivised to promote economic development. He predicts that the longer the horizon the dictator considers, the more prosperity the dictator provides, which I call *Olson's hypothesis*:

> ...the king's subjects ...have more reason to be sincere when they say "long live the king." If the king anticipates and values dynastic succession, that further lengthens the planning horizon and is good for his subjects. (Olson, 1993)

If citizens are obedient under the rule of a dictator, Olson's hypothesis may be valid. However, as this study focuses on, historical evidence shows that as the economy develops, citizens' demand for democratic order also increases. Given the potential threat of democratisation from an emerging middle class, does the dictator offer greater economic prosperity because he has a longer horizon in mind, as Olson suggested? Previous studies have not addressed this question, despite its theoretical importance. Therefore, I revisit Olson's hypothesis by analysing how optimal investment differs by horizon if the modernisation hypothesis holds.

I explore the case of a dictator who makes an optimal investment decision by looking ahead T. This strategy is dynamically inconsistent, as the dictator updates the strategy by taking into account an additional period.

Definition 2. The dictator is *T-period foward-looking* if his expected payoffs are

$$\sum_{k=0}^{T}\beta^k\left\{G_{t+k}-\kappa I_{t+k}\right\}\prod_{s=1}^{k}\Pr[\gamma_{t+s-1}=0|\bar{d}_{t+s-1}] \tag{13}$$

for all $t\in\mathbb{N}$. When $T=\infty$, the dictator is said to be *non-myopic*.

For a given $T\geq 1$ and infrstructure A_t, the T-period forward-looking dictator maximises his expected payoffs subject to the constraints that all parents and young citizens choose their best responses. Denote the value function V_s for period k, $s\geq 1$, with infrastructure A_k as

$$\begin{aligned}
V_s(A_k)=\max_{I_k\in[0,G_k/\kappa]}&\Pr[\gamma_{k-1}=0|\bar{d}_{k-1}]\left\{G_k-\kappa I_k+\beta V_{s-1}(A_{k+1})\right\}\\
\text{s.t.}\quad & A_{k+1}=(1-\delta)A_k+I_k\\
& e_{ik}=\arg\max_{\tilde{e}_{ik}\geq 0}\left\{w_{ik}-\frac{\tilde{e}_{ik}^2}{2}\right\}+\mu\mathbb{E}[w_{ik+1}|\tilde{e}_{it},\bar{e}_t,q_{t+1}],\\
& \bar{d}_k=\int_0^1\min\{e_{ik}^2,\eta\}di.
\end{aligned} \tag{14}$$

for all $i\in[0,1]$ and

$$V_0(A_k)=\max_{I_k\in[0,G_k/\kappa]}\Pr[\gamma_{k-1}=0|\bar{d}_{k-1}]\left\{G_k-\kappa I_k\right\}. \tag{15}$$

Note that the value function V_s indicates the expected payoffs for the $s+1$ remaining periods. Then, the T-period forward-looking dictator chooses I_t^T such that

$$I_t^T=\arg\max_{I_t\in[0,G_t/\kappa]} G_t-\kappa I_t+\beta V_{T-1}(A_{t+1}) \tag{16}$$

where $A_{t+1}=(1-\delta)A_t+I_t$.

The condition for a regressive economy is the same as (11) for all $T\geq 2$, and $\beta\bar{p}\tau\varphi\pi_h^2\leq\kappa$ for $T=1$. Note that the threshold for the regressive economy is higher in $T\geq 2$ than in $T=1$. This means that the dictatorship is more likely to be regressive if it only cares about the current and the next period, ignoring the expected gains for further future periods. This predicts that a (very) short-sighted dictator can be more exploitative.

To see whether the dictator who looks further into the future invests more, I analyse how the steady state in a non-regressive economy varies with forward-looking horizon. For a non-myopic dictator, the optimal investment in a moderate economy follows

Proposition 1. On the other hand, a finite-period forward-looking dictator solves for (16) for each period. The forward-looking dictator's steady state is defined as follows:

Definition 3. For a given $T \geq 1$, infrastructure A_{ss}^T is *T-period forward-looking steady state* if the optimal investment I_t^T is δA_{ss}^T for $A_t = A_{ss}^T$.

This means that the steady state for the forward-looking dictator is the infrastructure sustained by the optimal investment from the forward-looking update in each period. Each value function V_s is strictly concave, the condition for advanced economy for the T-period forward-looking dictator is $\kappa \leq \beta V'_{T-1}(\bar{A})$. In a moderate promoting economy, analogous to Theorem 1, there are thresholds for infrastructure A_{LB}^T and A_{UB}^T for each T such that the forward-looking dictator's investment depends on infrastructure below or above the thresholds, and the steady state lies in between.

Corollary 3. *For a T-period forward-looking dictator promoting toward a moderate economy, optimal investment I_t^T strictly increases in A_t for all $A_t \leq A_{\mathrm{LB}}^T$, strictly decreases in A_t for all $A_t \in [A_{\mathrm{LB}}^T, A_{\mathrm{UB}}^T]$, $I_t^T = 0$ for all $A_t \geq A_{\mathrm{UB}}^T$, and a unique steady state A_{ss}^T in $(A_{\mathrm{LB}}^T, A_{\mathrm{UB}}^T)$.*

There are two qualitative implications in comparing dictatorships by their horizons. First, when $T = 1$, investment is considered only for its effect on increasing government revenue in the next period, and its effect on infrastructure accumulation in subsequent periods is ignored. However, when $T \geq 2$, the dictator also takes into account the accumulation of infrastructure that remains two periods later. This may explain why a myopic view of the dictator may lead to low economic growth from Olson's hypothesis.[10] Second, among the forward-looking dictatorships with $T \geq 2$, those whose T is greater consider obtaining rents for a longer period. Specifically, a farsighted dictator, compared to a short-sighted dictator, may want both the high potential gains he could make and regime stability in future periods when making a current investment.

Theorem 4. *For any $T \geq 2$, the T-period forward-looking steady state is greater than the $T+1$-period forward-looking steady state.*

This finding shows that a farsighted dictator is more concerned with the future stability of the regime than a shortsighted dictator. When balancing economic interests and regime stability, the former places more importance on regime stability. This is

[10]Whether the steady state of the one-period forward looking dictator or that of the higher-period forward looking dictator is higher depends on the accumulation of infrastructure and the stability of the regime in the further future. This is analysed in Appendix A.1.3.

because economic growth threatens the regime through the emergence of a middle class. Therefore, unless the dictator has a very short horizon in mind, he will limit economic growth to avoid regime collapse, which is in contrast to Olson's hypothesis that farsighted dictators are monotonically more likely to lead to high economic growth.

This provides a novel theoretical implication on the economic development of dictatorships in structurally different environments. For instance, North Korea has sustained low economic development under a long-term hereditary dictatorship. In contrast, South Korea experienced substantial economic growth during a period of military dictatorship, which seized power through a coup under the pretext of ensuring social security and temporary control of economic growth. The South Korean dictator was faced with the need to change the constitution in order to prolong his rule, a task that required establishing legitimacy in order to overcome significant public opposition.[11] This may have narrowed the dictator's future horizons. This finding also has implications for recent changes in China's political landscape. Historically, China has operated under a collective leadership system, with the leader serving a maximum of 10 years. Each leader saw this as a limited time frame to promote economic development. However, as Xi Jinping extends his rule, the Chinese dictatorship is expected to consider a longer horizon. The analysis presented here suggests that such changes may result in lower levels of economic development as leaders seek to stabilise their regimes for a longer period in response to these changes.

7 Discussion

Democracy versus Dictatorship. In my model of dictatorship, the rise of democratic citizens as a driving force of democratic transition weakens the regime stability. This leads the dictator to cease economic development. In democracies, on the other hand, this democratic culture has a contrasting effect. Putnam et al. (1992) and Persson and Tabellini (2009) argue that economic performance depends on the social and democratic capital of the society. Also, several studies report that democratic economies exhibit a high growth when certain conditions are met, such as participatory culture (Rodrik, 2000), human capital (Doucouliagos and Ulubaşoğlu, 2008), and secondary education (Acemoglu et al., 2019).

As a benchmark, in Appendix A.3, I describe an economic growth model of

[11] Related to this, when Park Chung-hee, the South Korean dictator, passed a constitutional amendment to allow him to run for a third term, support dropped rapidly and students, intellectuals and workers turned against the government (Kim, 2011).

democracy based on probabilistic voting model by Persson and Tabellini (2002, 2021). The model shows that investment is low when the economy is underdeveloped and high when the economy is developed. This is because economic growth, coupled with higher levels of education, fosters a society with a greater number of policy-oriented democratic citizens who act as a deterrent to rent-seeking behaviour by politicians.[12]

This comparison offers a theoretical response to the question of why certain autocracies experience faster economic growth than democracies. It also provides implications for the debate on whether dictatorships or democracies foster economic growth (Acemoglu et al., 2019; Colagrossi et al., 2020; Doucouliagos and Ulubaşoğlu, 2008; Madsen et al., 2015; Przeworski and Limongi, 1993). Depending on the incentives for future rent extraction, an underdeveloped dictatorship can achieve high economic growth. But as soon as the emerging middle class becomes a potential threat to the regime, it deliberately refrains from developing an advanced economy.

Legitimacy. History shows that the strength of a regime is greater in times of economic growth and weaker in times of economic hardship. For example, the difficult economic situation in France in the late 18th century contributed to the French Revolution. Economic crises with crop failures and high living costs led to widespread poverty and suffering. This, in turn, fuelled the revolutionary fervour that led to the overthrow of the monarchy. Similarly, the Bloody Sunday massacre of 1905 in Russia occurred as the working class suffered from harsh working conditions and low wages leading to widespread poverty. This means that dictators cannot help but look to economic performance to justify their regime.

In particular, some autocracies with rapid economic growth have argued that their system can deliver better economic prosperity than democratic institutions. China's rapid economic growth, for example, gives rise to the so-called "China model", which offers a new vision for many autocracies. To prove its superiority, the Chinese government has to maintain a higher rate of economic growth than democracies. By providing economic prosperity, the regime may be able to stave off demands for democracy based on economic concerns, leaving only political demands for democracy.[13]

Therefore, in Appendix A.4, I provide an extension of the model as follows: if

[12]This pattern is also found in models of democracy in different settings. For example, Bernhardt et al. (2022) shows that when there is a demagogue, the economy shrinks in the long run if the initial level of capital is below a certain threshold.

[13]According to Haggard and Kaufman (1999), sustaining a good performance may not preclude purely political protest; despite successful reforms and significant economic growth, non-crisis transitions occurred in Chile (1990), Korea (1986), Thailand (1983), and Turkey (1983) due to a variety of international and domestic political pressures.

the dictatorship delivers higher investment than democracy as a counterfactual, the public's demand for democratisation is not rooted in economic reasons; rather, they demand democratisation solely for political ones. As a result, investment is seen as crucial to maintaining legitimacy and increasing future revenues. This extension captures contradicting features inherent in the modernisation hypothesis: economic development stabilises the regime while increasing the probability of democratisation due to increased political mobilisation for political liberties (Kennedy, 2010; Cho, 2024).

The result shows that investment initially increases and then decreases as the demand for regime change increases. As investment in democracy increases with the level of infrastructure, the pattern of decreasing investment in dictatorship and increasing investment in democracy coincides. Above this level of infrastructure, the condition for maintaining legitimacy is binding, and the dictatorship allocates the necessary resources to meet these legitimacy demands. This leads to increased investment. However, after a certain level of development, the dictatorship chooses not to invest further because the costs associated with maintaining legitimacy are too high for the regime. This confirms that even if the regime is strengthened in the short run by economic growth, its optimal investment is not to ensure perpetual economic growth.

Skilled labour and democratic values. In my model, when the economy is industrialised and there are many skilled workers, a dictator can enjoy economic prosperity. But, on the other hand, it leads to higher education attainment and increases the demand for democracy, endangering the regime. This indicates that the skilled labour is a double-edged sword in many dictatorships.

In response to the threat, regimes often attempt to retard the growing demand for democracy through intervention in the education system. For example, Alesina et al. (2021) argues that the dictatorship has a stronger incentive to use primary education to create a common national identity under the threat of democratisation. Cantoni et al. (2017) focus on the change in curriculum in China and find that the new curriculum was often successful in changing students' beliefs about the Chinese regime and policy preferences. Also, dictatorships attempt to reduce the pressure on the middle class to change the regime by employing the middle class and keeping them closely connected to the state (Rosenfeld, 2020).

8 Concluding Remarks

I analyse the dictator's optimal investment decisions under the modernisation hypothesis. Economic growth expands job opportunities and skilled job wages. In an environment where education correlates with embracing democratic values over materialistic ones, this growth incentivises citizens to further their education in pursuit of skilled employment, thereby fostering pro-democratic citizens in society. From the dictator's standpoint, economic growth promises greater future revenues. At the same time, it increases the risk of regime instability due to increased demands for democracy. This dilemma exposes the dictator to a trade-off between maintaining a 'stable poor' or venturing into an 'unstable rich' regime.

The findings indicate that the dictator allocates a larger portion of the revenue to investment when the economy is underdeveloped, gradually reducing it to zero as the economy advances. If the potential threat of emerging pro-democratic citizens is not a significant factor in the dictator's decision-making process, the economy either regresses or prospers depending on the regime stability. Also, I explore how economic development varies depending on his length of forward-looking in decision-making. Contrary to Olson (1993)'s hypothesis that longer-term interests yield economic prosperity, I find that a dictator with a longer horizon drives the economy to a lower steady state.

This study contributes to the literature on formal models of non-democracies. It links decision-making under dictatorship to the stylised fact that the emerging middle class significantly influenced democratisation. Also, the model suggests a mechanism for the puzzle of regime and economic growth. It has long been debated whether democracy or dictatorship provides high economic growth. Although recent studies point to positive results for democracy (Acemoglu et al., 2019; Colagrossi et al., 2020; Madsen et al., 2015), it remains a question as to why dictatorships show faster economic growth than democracies among underdeveloped economies and why poor countries tend to be dictatorships (Luo and Przeworski, 2019). My model predicts that a dictator in an underdeveloped economy, facing little demand for democracy, is motivated to invest. This investment continues until it destabilises the regime as a result of rising pro-democratic citizens.

References

Abramson, S. F. and Montero, S. (2020). Learning about growth and democracy. *American Political Science Review*, 114(4):1195–1212.

Acemoglu, D., Johnson, S., Robinson, J. A., and Yared, P. (2008). Income and democracy. *American Economic Review*, 98(3):808–42.

Acemoglu, D., Johnson, S., Robinson, J. A., and Yared, P. (2009). Reevaluating the modernization hypothesis. *Journal of Monetary Economics*, 56(8):1043–1058.

Acemoglu, D., Naidu, S., Restrepo, P., and Robinson, J. A. (2019). Democracy does cause growth. *Journal of Political Economy*, 127(1):47–100.

Acemoglu, D. and Robinson, J. A. (2000). Why did the west extend the franchise? democracy, inequality, and growth in historical perspective. *The Quarterly Journal of Economics*, 115(4):1167–1199.

Acemoglu, D. and Robinson, J. A. (2001). A theory of political transitions. *American Economic Review*, 91(4):938–963.

Acemoglu, D. and Robinson, J. A. (2006). *Economic origins of dictatorship and democracy*. Cambridge University Press.

Aisen, A. and Veiga, F. J. (2013). How does political instability affect economic growth? *European Journal of Political Economy*, 29:151–167.

Alesina, A., Giuliano, P., and Reich, B. (2021). Nation-building and education. *The Economic Journal*, 131(638):2273–2303.

Alesina, A., Özler, S., Roubini, N., and Swagel, P. (1996). Political instability and economic growth. *Journal of Economic growth*, 1:189–211.

Alesina, A. and Perotti, R. (1996). Income distribution, political instability, and investment. *European Economic Review*, 40(6):1203–1228.

Banerjee, A. V. and Duflo, E. (2008). What is middle class about the middle classes around the world? *Journal of Economic Perspectives*, 22(2):3–28.

Barro, R. J. (1999). Determinants of democracy. *Journal of Political Economy*, 107(S6):S158–S183.

Barro, R. J. (2000). Inequality and growth in a panel of countries. *Journal of Economic Growth*, 5:5–32.

Belova, E. and Gregory, P. (2002). Dictator, loyal, and opportunistic agents: The soviet archives on creating the soviet economic system. *Public Choice*, 113:265–286.

Berinsky, A. J. and Lenz, G. S. (2011). Education and political participation: Exploring the causal link. *Political Behavior*, 33(3):357–373.

Bernhardt, D., Krasa, S., and Shadmehr, M. (2022). Demagogues and the economic fragility of democracies. *American Economic Review*, 112(10):3331–3366.

Besley, T. and Persson, T. (2013). Taxation and development. In *Handbook of Public Economics*, volume 5, pages 51–110. Elsevier.

Besley, T. and Persson, T. (2019). Democratic values and institutions. *American Economic Review: Insights*, 1(1):59–76.

Bisin, A. and Verdier, T. (2001). The economics of cultural transmission and the dynamics of preferences. *Journal of Economic Theory*, 97(2):298–319.

Bisin, A. and Verdier, T. (2011). The economics of cultural transmission and socialization. In *Handbook of Social Economics*, volume 1, pages 339–416. Elsevier.

Bisin, A. and Verdier, T. (2023a). Advances in the economic theory of cultural transmission. *Annual Review of Economics*, 15.

Bisin, A. and Verdier, T. (2023b). On the joint evolution of culture and institutions. *Journal of Political Economy*, forthcoming.

Boix, C. (2003). *Democracy and redistribution*. Cambridge University Press.

Boix, C. and Stokes, S. C. (2003). Endogenous democratization. *World politics*, 55(4):517–549.

Boix, C. and Svolik, M. W. (2013). The foundations of limited authoritarian government: Institutions, commitment, and power-sharing in dictatorships. *The Journal of Politics*, 75(2):300–316.

Bourguignon, F. and Verdier, T. (2000). Oligarchy, democracy, inequality and growth. *Journal of Development Economics*, 62(2):285–313.

Burkhart, R. E. and Lewis-Beck, M. S. (1994). Comparative democracy: The economic development thesis. *American political science review*, 88(4):903–910.

Cantoni, D., Chen, Y., Yang, D. Y., Yuchtman, N., and Zhang, Y. J. (2017). Curriculum and ideology. *Journal of Political Economy*, 125(2):338–392.

Cho, J. E. (2024). *Seeds of Mobilization: The Authoritarian Roots of South Korea's Democracy*. University of Michigan Press.

Colagrossi, M., Rossignoli, D., and Maggioni, M. A. (2020). Does democracy cause growth? a meta-analysis (of 2000 regressions). *European Journal of Political Economy*, 61:101824.

Collier, R. B. (1999). *Paths toward democracy: The working class and elites in Western Europe and South America*. Cambridge University Press.

Dahlum, S., Knutsen, C. H., and Wig, T. (2019). Who revolts? empirically revisiting the social origins of democracy. *The Journal of Politics*, 81(4):1494–1499.

de Tocqueville, A. (1835). Government of the democracy in america. *Democracy in America*.

Dincecco, M. and Katz, G. (2016). State capacity and long-run economic performance. *The Economic Journal*, 126(590):189–218.

Dincecco, M. and Prado, M. (2012). Warfare, fiscal capacity, and performance. *Journal of Economic Growth*, 17:171–203.

Dominguez, J. I. (2011). Chapter twenty. the perfect dictatorship? south korea versus argentina, brazil, chile, and mexico. In *The Park Chung Hee Era: The Transformation of South Korea*, pages 573–602. Harvard University Press.

Doucouliagos, H. and Ulubaşoğlu, M. A. (2008). Democracy and economic growth: a meta-analysis. *American Journal of Political Science*, 52(1):61–83.

Dragu, T. and Przeworski, A. (2019). Preventive repression: Two types of moral hazard. *American Political Science Review*, 113(1):77–87.

Edmond, C. (2013). Information manipulation, coordination, and regime change. *Review of Economic studies*, 80(4):1422–1458.

Egorov, G., Guriev, S., and Sonin, K. (2009). Why resource-poor dictators allow freer media: A theory and evidence from panel data. *American Political Science Review*, 103(4):645–668.

Egorov, G. and Sonin, K. (2011). Dictators and their viziers: Endogenizing the loyalty–competence trade-off. *Journal of the European Economic Association*, 9(5):903–930.

Enke, B., Polborn, M., and Wu, A. A. (2023). Values as luxury goods and political behavior. Working paper, National Bureau of Economic Research.

Epstein, D. L., Bates, R., Goldstone, J., Kristensen, I., and O'Halloran, S. (2006). Democratic transitions. *American journal of political science*, 50(3):551–569.

Gitmez, A. A. and Sonin, K. (2023). The dictator's dilemma: A theory of propaganda and repression. Working Paper 2023-67, University of Chicago, Becker Friedman Institute for Economics.

Glaeser, E. L., La Porta, R., Lopez-de Silanes, F., and Shleifer, A. (2004). Do institutions cause growth? *Journal of Economic Growth*, 9(3):271–303.

Glaeser, E. L., Ponzetto, G. A., and Shleifer, A. (2007). Why does democracy need education? *Journal of Economic Growth*, 12(2):77–99.

Glassman, R. M. (1995). *The middle class and democracy in socio-historical perspective*, volume 10. Brill.

Glassman, R. M. (1997). *The new middle class and democracy in global perspective*. Springer.

Guriev, S. and Treisman, D. (2019). Informational autocrats. *Journal of Economic Perspectives*, 33(4):100–127.

Guriev, S. and Treisman, D. (2020). A theory of informational autocracy. *Journal of Public Economics*, 186:104158.

Haggard, S. and Kaufman, R. R. (1999). The political economy of democratic transitions. In *Transitions to democracy*, pages 72–96. Columbia University Press.

Haggard, S. and Kaufman, R. R. (2012). Inequality and regime change: Democratic transitions and the stability of democratic rule. *American Political Science Review*, 106(3):495–516.

Haggard, S. and Kaufman, R. R. (2016). *Dictators and democrats: Masses, elites, and regime change*. Princeton University Press.

Huber, E., Rueschemeyer, D., and Stephens, J. D. (1993). The impact of economic development on democracy. *Journal of economic perspectives*, 7(3):71–86.

Huntington, S. P. (1993). *The third wave: Democratization in the late twentieth century*, volume 4. University of Oklahoma press.

Inglehart, R. (2017). Evolutionary modernization theory: Why people's motivations are changing. *Changing Societies & Personalities. 2017. Vol. 1. Iss. 2*, 1(2):136–151.

Inglehart, R. (2018). *Cultural evolution: People's motivations are changing, and reshaping the world*. Cambridge University Press.

Inglehart, R. and Baker, W. E. (2000). Modernization, cultural change, and the persistence of traditional values. *American Sociological Review*, pages 19–51.

Inglehart, R. and Welzel, C. (2005). *Modernization, Cultural Change, and Democracy:*. Cambridge University Press.

Jones, B. F. and Olken, B. A. (2005). Do leaders matter? national leadership and growth since world war ii. *The Quarterly Journal of Economics*, 120(3):835–864.

Kam, C. D. and Palmer, C. L. (2008). Reconsidering the effects of education on political participation. *The Journal of Politics*, 70(3):612–631.

Kennedy, R. (2010). The contradiction of modernization: A conditional model of endogenous democratization. *The Journal of Politics*, 72(3):785–798.

Kim, H. J. (2011). Political legitimacy in south korea. In *Political Legitimacy in Asia: New Leadership Challenges*, pages 217–237. Springer.

Leventoğlu, B. (2014). Social mobility, middle class, and political transitions. *Journal of Conflict Resolution*, 58(5):825–864.

Lipset, S. M. (1959). Some social requisites of democracy: Economic development and political legitimacy. *American Political Science Review*, 53(1):69–105.

Lizzeri, A. and Persico, N. (2004). Why did the elites extend the suffrage? democracy and the scope of government, with an application to britain's "age of reform". *The Quarterly Journal of Economics*, 119(2):707–765.

Luebbert, G. M. (1991). *Liberalism, fascism, or social democracy: Social classes and the political origins of regimes in interwar Europe*. Oxford University Press.

Luo, Z. and Przeworski, A. (2019). Why are the fastest growing countries autocracies? *The Journal of Politics*, 81(2):663–669.

Madsen, J. B., Raschky, P. A., and Skali, A. (2015). Does democracy drive income in the world, 1500–2000? *European Economic Review*, 78:175–195.

Mayer, A. K. (2011). Does education increase political participation? *The Journal of Politics*, 73(3):633–645.

McGuire, M. C. and Olson, M. (1996). The economics of autocracy and majority rule: The invisible hand and the use of force. *Journal of Economic Literature*, 34(1):72–96.

Miller, M. K. (2012). Economic development, violent leader removal, and democratization. *American Journal of Political Science*, 56(4):1002–1020.

Moore, B. (1966). *Social origins of dictatorship and democracy: Lord and peasant in the making of the modern world*, volume 268. Beacon Press.

Morris, S. and Shin, H. S. (1998). Unique equilibrium in a model of self-fulfilling currency attacks. *American Economic Review*, pages 587–597.

Morris, S. and Shin, H. S. (2001). Global games: Theory and applications.

Murtin, F. and Wacziarg, R. (2014). The democratic transition. *Journal of Economic Growth*, 19:141–181.

Olson, M. (1993). Dictatorship, democracy, and development. *American Political Science Review*, 87(3):567–576.

Persson, T. and Tabellini, G. (2002). *Political economics: explaining economic policy*. MIT press.

Persson, T. and Tabellini, G. (2009). Democratic capital: The nexus of political and economic change. *American Economic Journal: Macroeconomics*, 1(2):88–126.

Persson, T. and Tabellini, G. (2021). Culture, institutions, and policy. In *The Handbook of Historical Economics*, pages 463–489. Elsevier.

Przeworski, A., Alvarez, M. E., Cheibub, J. A., and Limongi, F. (2000). *Democracy and Development: Political Institutions and Well-Being in the World, 1950–1990*. Cambridge Studies in the Theory of Democracy. Cambridge University Press.

Przeworski, A. and Limongi, F. (1993). Political regimes and economic growth. *Journal of economic perspectives*, 7(3):51–69.

Przeworski, A. and Limongi, F. (1997). Modernization: Theories and facts. *World Politics*, 49(2):155–183.

Putnam, R. D., Leonardi, R., and Nanetti, R. Y. (1992). *Making democracy work: Civic traditions in modern Italy*. Princeton university press.

Rodrik, D. (2000). Institutions for high-quality growth: what they are and how to acquire them. *Studies in Comparative International Development*, 35:3–31.

Rosenfeld, B. (2020). *The autocratic middle class: how state dependency reduces the demand for democracy*, volume 26. Princeton University Press.

Rueschemeyer, D., Stephens, E. H., Stephens, J. D., and Stephens, E. H. (1992). *Capitalist development and democracy*, volume 22. Citeseer.

Sakovics, J. and Steiner, J. (2012). Who matters in coordination problems? *American Economic Review*, 102(7):3439–3461.

Shadmehr, M. and Bernhardt, D. (2015). State censorship. *American Economic Journal: Microeconomics*, 7(2):280–307.

Svolik, M. W. (2009). Power sharing and leadership dynamics in authoritarian regimes. *American Journal of Political Science*, 53(2):477–494.

Tabellini, G. (2008a). Institutions and culture. *Journal of the European Economic Association*, 6(2-3):255–294.

Tabellini, G. (2008b). The scope of cooperation: Values and incentives. *The Quarterly Journal of Economics*, 123(3):905–950.

Thies, C. G. (2015). State fiscal capacity and state failure. *European Political Science Review*, 7(2):167–187.

Treisman, D. (2015). Income, democracy, and leader turnover. *American Journal of Political Science*, 59(4):927–942.

Treisman, D. (2020). Economic development and democracy: predispositions and triggers. *Annual Review of Political Science*, 23(1):241–257.

Tyson, S. A. (2018). The agency problem underlying repression. *The Journal of Politics*, 80(4):1297–1310.

Zakharov, A. V. (2016). The loyalty-competence trade-off in dictatorships and outside options for subordinates. *The Journal of Politics*, 78(2):457–466.

A Appendix

A.1 Technical Addendum

A.1.1 Finite-horizon version of the dictator's problem

For the convenience of proof, I introduce a finite-horizon problem of the dictator. Suppose that the dictator takes into account T periods. The optimal investment of the dictator, $\{I_t^{\mathrm{dict}}\}_{t=1}^T$, is the solution to the following:

$$\begin{aligned}
\max_{\{I_t\}_{t=1}^T \in \mathbb{R}_+^T} \quad & \sum_{t=1}^{T} \beta^{t-1} \{G_t - \kappa I_t\} \prod_{s=0}^{t-1} \Pr[\gamma_s = 0 | \bar{d}_s] \\
\text{subject to} \quad & A_{t+1} = \min\left\{(1-\delta)A_t + I_t, \bar{A}\right\}, \\
& e_{it} = \arg\max_{\tilde{e}_{it} \geq 0} \left\{ w_{it} - \frac{e_{it}^2}{2} \right\} + \mu \mathbb{E}[w_{it+1} | e_{it}, \bar{e}_t, q_{t+1}], \quad \forall i \in [0,1], \\
& \bar{d}_t = \int_0^1 \min\{e_{it}^2, \eta\} di, \\
& I_t \text{ is feasible}
\end{aligned} \tag{17}$$

for all $0 \leq t \leq T$. This problem can be expressed recursively as follows: for all $1 \leq t \leq T-1$

$$\begin{aligned}
V_{T-t}(A_t) = & \max_{I_t \in [0, G_t/\kappa]} \Pr[\gamma_{t-1} = 0 | \bar{d}_{t-1}] \{G_t - \kappa I_t + \beta V_{T-t-1}(A_{t+1})\} \\
& \text{subject to} \quad A_{t+1} = (1-\delta)A_t + I_t \\
& \qquad e_{it} = \arg\max_{\tilde{e}_{it} \geq 0} \left\{ w_{it} - \frac{e_{it}^2}{2} \right\} + \mu \mathbb{E}[w_{it+1} | e_{it}, \bar{e}_t, q_{t+1}], \quad \forall i \in [0,1], \\
& \qquad \bar{d}_t = \int_0^1 \min\{e_{it}^2, \eta\} di
\end{aligned} \tag{18}$$

and

$$V_0(A_T) = \max_{I_T \in [0, G_T/\kappa]} \Pr[\gamma_{T-1} = 0 | \bar{d}_{T-1}] \{G_T - \kappa I_T\}. \tag{19}$$

Note that $T-t$ indicates the maximum remaining tenure for the dictator. Substituting the constraints into the objective function and using the equilibrium results,

$$V_{T-t}(A_t) = \max_{I_t \in [0, G_t/\kappa]} p(A_t) \{G_t - \kappa I_t + \beta V_{T-t-1}(A_{t+1})\} \tag{20}$$

and

$$V_0(A_T) = \max_{I_T \in [0, G_T/\kappa]} p(A_T) \{G_T - \kappa I_T\} \tag{21}$$

where $p(A_t) = \bar{p} + \Delta p \mu \varphi \pi_h \{(1-\tau)\pi_h - \pi_l\} A_t$ is the probability of survival to the next period in equilibrium.

The value functions V_k have the following properties:

(a) Monotonicity: For a fixed $A \in (0, \bar{A}]$, $V_s(A)$ is increasing in $s = 1, 2, \cdots, T-1$

(b) Boundedness: V_s is bounded for all $s = 1, 2, \cdots$.

Because these two are the Blackwell conditions for contraction, by the contraction mapping theorem, V_s converges uniformly to V as $s \to \infty$.

A.1.2 Strict concavity of the value function

My analysis of the dictator problem depends on the strict concavity of the value function V. In this section, I construct $\mathcal{A}$ that makes V strictly concave.

Lemma A.1. *Suppose that $V_s'(A) \geq 0$ and $V_s''(A) < 0$ for all $A \in [0, \tilde{A}] \subset \mathcal{A}$. Then $V_{s+1}''(A) < 0$ for all $A \in [0, \min\{\tilde{A}(1-\delta)^{-1}, \bar{A}\}]$.*

Proof. For a given $1 < t \leq T$ and $s = T - t$. suppose that $V_s'(A_t) \geq 0$ and $V_s''(A_t) < 0$ for all $A_t \in [0, \tilde{A}]$. For any $A_{t-1} \leq A_t/(1-\delta)$, the second-derivative is

$$V_{s+1}''(A_{t-1}) = p'(A_{t-1})\left\{g + \beta V_s'\right\} + p(A_t)\beta(1-\delta)V_s'' < 0$$

because $p'(A_{t-1}) <$, $V_S' > 0$, and $V_s'' < 0$. If $V_s'(A) \geq 0$ and $V_s''(A) < 0$ for all $A \in \mathcal{A}$, in the same procedure, we can show that $V_{s+1}''(A') < 0$ for all $A \in \mathcal{A}$. □

Using this lemma, I construct a set of A such that the value functions for both finite and infinite horizons are increasing and strictly concave.

Lemma A.2. *There is $\hat{A} \in \mathcal{A}$ such that the value function V_s is increasing and strictly concave in A for all $A \in [0, \hat{A}]$ and all $s \in \mathbb{N} \cup \{\infty\}$.*

Proof. Let me begin from period T. Differentiating V_0,

$$V_0' = p'(A_T)G_T + p(A_t)G_T'. \tag{22}$$

Because $G_T \to 0$ as $A_T \to 0$, $G_T' = g$ and $p(A_T)$ is strictly increasing, there exists $\hat{A}_0 > 0$ such that $V_0' \geq 0$ for all $A_T \leq \hat{A}_0$. Differentiating V_0 twice,

$$V_0'' = 2p'(A_T)G_T < 0$$

as $p'(A_T) < 0$. This indicates that V_0 is increasing and strictly concave on $\hat{\mathcal{A}} \equiv [0, \hat{A}_0]$.

By Lemma A.1, $V_1''(A) < 0$ for all $A \in [0, \min\{\hat{A}_0(1-\delta)^{-1}, \bar{A}\}]$. Let $\hat{A}_1 \in [0, \min\{\hat{A}_0(1-\delta)^{-1}, \bar{A}\}]$ be such that $V_1' \geq 0$ for all $A_{T-1} \leq \hat{A}_1$. Then V_1 is strictly concave for all $A \in \hat{\mathcal{A}}_1 \equiv [0, \hat{A}_1]$. Iterate this construction, I get $\hat{A}_s$ and $\hat{\mathcal{A}}_s$ such that V_s is concave on $\hat{\mathcal{A}}_s \equiv [0, \hat{A}_s]$. Note that $\hat{A}_s$ exists and is strictly greater than 0 for all s because (i) $V_s'(0) > 0$ for any s and $\hat{A}_0 > 0$, and (ii) $\hat{A}_0(1-\delta)^s$ strictly increases in s. Since $V_s \to V$ uniformly, $\hat{\mathcal{A}}_s \to \hat{\mathcal{A}}$ and V is strictly concave on $\hat{\mathcal{A}}$. □

Note that because $\bar{A}$ is exogenous, by letting $\bar{A} = \hat{A}$, the value function increases and is strictly concave on $\mathcal{A}$.

A.1.3 Shortsighted versus Farsighted Dictatorship

I discussed how the steady state differs by the length of horizon in Section 6. In this appendix, I show that the steady state for the one-period forward looking dictator may be higher or lower than the higher-period forward looking dictators depending on the parameter.

When κ is

$$\kappa \in \left[\beta\bar{p}\tau\varphi\pi_h^2, \frac{\beta\bar{p}\tau\varphi\pi_h^2}{1-\beta(1-\delta)\bar{p}}\right)$$

the one-period forward looking dictator is regressive, while higher-period forward looking dictators are not. Then, it is obvious that this shortsighted dictator will provide lower development.

Next, suppose that $\kappa < \beta\bar{p}\tau\varphi\pi_h^2$. From the first-order conditions,

$$\beta V_0'(A_{ss}^1) = \beta p(A_{ss}^1)g + \beta\Delta p\hat{d}gA_{ss}^1 = \kappa,$$

and $\beta V_{T-1}'(A_{ss}^T) = \kappa$, which is equal to

$$\beta\Delta p\hat{d}\left\{gA_{ss}^T - \kappa A_{ss}^{T-1} + \kappa(1-\delta)A_{ss}^T + \beta V_{T-2}(A_{ss}^{T-1})\right\} + \beta p(A_{ss}^T)\{g+\kappa(1-\delta)\} = \kappa.$$

Hence, because $\beta V_{T-1}'(A_{ss}^T) - \beta V_0'(A_{ss}^1) = 0$,

$$\begin{aligned}
0 =& \beta\Delta p\hat{d}\left\{gA_{ss}^T - \kappa A_{ss}^{T-1} + \kappa(1-\delta)A_{ss}^T + \beta V_{T-2}(A_{ss}^{T-1})\right\} + \beta p(A_{ss}^T)\{g+\kappa(1-\delta)\} \\
&- \beta p(A_{ss}^1)g - \beta\Delta p\hat{d}gA_{ss}^1 \\
=& 2\beta\Delta p\hat{d}\{g+\kappa(1-\delta)\}A_{ss}^T + \beta\Delta p\hat{d}\{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}\} - 2\beta\Delta p\hat{d}gA_{ss}^1 \\
&+ \beta\bar{p}\kappa(1-\delta) \\
=& 2\beta\Delta p\hat{d}g(A_{ss}^T - A_{ss}^1) + \beta p(A_{ss}^T)\kappa(1-\delta) + \beta\Delta p\hat{d}\kappa(1-\delta)A_{ss}^T \\
&+ \beta\Delta p\hat{d}\left\{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}\right\}.
\end{aligned}$$

Expressing the equaltion in terms A_{ss}^1,

$$A_{ss}^1 = A_{ss}^T + \frac{\kappa(1-\delta)}{2g}A_{ss}^T + \frac{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}}{2g} + \frac{\bar{p}\kappa(1-\delta)}{2g\Delta p\hat{d}}.$$

Then, $A_{ss}^1 - A_{ss}^T$ is

$$\begin{aligned}
A_{ss}^1 - A_{ss}^T =& \frac{\kappa(1-\delta)}{2g}A_{ss}^T + \frac{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}}{2g} + \frac{\bar{p}\kappa(1-\delta)}{2g\Delta p\hat{d}} \\
=& \frac{p(A_{ss}^T)\kappa(1-\delta)}{2g\Delta p\hat{d}} + \frac{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}}{2g}.
\end{aligned}$$

Because

$$\frac{\beta V_{T-2}(A_{ss}^{T-1}) - \kappa A_{ss}^{T-1}}{2g} > 0, \quad \frac{p(A_{ss}^T)\kappa(1-\delta)}{2g\Delta p\hat{d}} < 0,$$

it can be either positive or negative depending on the parameters.

For example, if δ is sufficiently high, as

$$\frac{p(A_{ss}^T)\kappa(1-\delta)}{2g\Delta p\hat{d}} \to 0, \tag{23}$$

$A_{ss}^1 - A_{ss}^T$ becomes positive for any $T \geq 2$. To show that it can be negative, suppose $T = 2$.

We need to show that $-\kappa + \beta V_1(A^1_{ss}) > 0$:

$$-\kappa + \beta p(A^1_{ss})\{g + \kappa(1-\delta)\} + \beta\Delta p\hat{d}\{(g - \delta\kappa)A^1_{ss} + \beta V_0(A^1_{ss})\} > 0$$

Using the first-order condition for A^1_{ss}:

$$\beta p(A^1_{ss})g + \beta\Delta p\hat{d}gA^1_{ss} = \kappa, \tag{24}$$

I can rewrite the inequality as

$$\beta p(A^1_{ss})\{\kappa(1-\delta)\} + \beta\Delta p\hat{d}\{-\delta\kappa A^1_{ss} + \beta V_0(A^1_{ss})\} > 0$$

The LHS is

$$\begin{aligned}
&\beta\kappa p(A^1_{ss}) - \beta\delta\kappa p(A^1_{ss}) - \beta\delta\kappa\Delta p\hat{d}A^1_{ss} + \beta^2 p(A^1_{ss})gA^1_{ss}\Delta p\hat{d} \\
&= \beta\kappa p(A^1_{ss}) - \delta\kappa\{\beta p(A^1_{ss}) + \beta\Delta p\hat{d}A^1_{ss}\} + \beta^2 p(A^1_{ss})gA^1_{ss}\Delta p\hat{d} \\
&= \beta\kappa p(A^1_{ss}) - \frac{\delta\kappa^2}{g} + \beta^2 p(A^1_{ss})gA^1_{ss}\Delta p\hat{d}.
\end{aligned}$$

By letting $\delta \to 0$, it becomes

$$\begin{aligned}
&\beta p(A^1_{ss})\left\{\kappa + \beta\Delta p\hat{d}A^1_{ss}g\right\} \\
&= \beta p(A^1_{ss})\left\{2\kappa - \beta p(A^1_{ss})g\right\}
\end{aligned}$$

where the equality comes from (24). We are assuming $\kappa < \beta\bar{p}g$, so there is $\alpha \in (0,1]$ such that $\kappa = \alpha\beta\bar{p}g$. And $p(A) > \bar{p}$ for all $A > 0$. Hence,

$$\beta p(A^1_{ss})\left\{2\kappa - \beta p(A^1_{ss})g\right\} > \beta p(A^1_{ss})\left\{2\kappa - \beta\bar{p}g\right\} = \beta p(A^1_{ss})\beta g\left\{2\alpha - 1\right\} > 0$$

if $\alpha > 1/2$.

A.2 Proofs

Proof of Proposition 1.

Suppose that all citizens use the cutoff strategies with $s^*_t(d)$ and $s^*_t(m)$ depending on their value types. When a citizen i gets signal s_{it}, her posterior belief of θ_t is uniform on $[s_{it} - \sigma, s_{it} + \sigma]$. If $\theta_t > s^*_t(m) + \sigma$, every materialistic citizen gets signal above $s^*_t(m)$. And if $\theta_t < s^*_t(m) - \sigma$, all of them get signals below $s^*_t(m)$. Accordingly, The mass of participants who are $v_{it} = m$ is $1 - \bar{d}_t$ if $\theta_t > s^*_t(m) + \sigma$ and 0 if $\theta_t < s^*_t(m) - \sigma$. If $\theta \in [s^*_t(m) - \sigma, s^*_t(m) + \sigma]$, it is $(1 - \bar{d}_t)\left\{\theta_t + \sigma - s^*_t(m)\right\}/2\sigma$. Similarly, the mass of participants who are $v_{it} = d$ are $\bar{d}_t$ if $\theta_t > s^*_t(d) + \sigma$, 0 if $\theta_t < s^*_t(d) - \sigma$, and $\bar{d}_t\left\{\theta_t + \sigma - s^*_t(d)\right\}/2\sigma$ if $\theta_t \in [s^*_t(d) - \sigma, s^*_t(d) + \sigma]$.

Suppose that materialistic citizen i gets signal $s_{it} = s^*_t(m)$. Materialistic citizen's posterior belief of θ_t is uniform on $[s^*_t(m) - \sigma, s^*_t(m) + \sigma]$. Then choosing $a_{it} = 1$ and $a_{it} = 0$ is indifferent, which means $\Pr[M_t \geq 1 - \theta_t | s_{it} = s^*_t(m), v_{it} = m] = c_m$. Before deriving M_t, I introduce a lemma to explore the distance between the two cutoffs.

Lemma A.3. *The distance between cutoffs $s^*_t(m)$ and $s^*_t(d)$ is less than 2σ.*

Proof. Suppose that the distance between $s^*_t(m)$ and $s^*_t(d)$ is greater than or equal to 2σ. If a materialistic citizen i gets a signal $s_{it} = s^*_t(m)$, $\Pr[M_t > 1 - \theta_t | s_{it} = s^*_t(m), v_{it} =$

$m] = c_m$. Since the distance between the cutoffs is greater than 2σ, $M_t = \bar{d}_t + (1 - \bar{d}_t)\{\theta_t + \sigma - s_t^*(m)\}/2\sigma$, i.e., all democratic citizens participate. This means

$$\begin{aligned}
&\Pr[M_t > 1-\theta_t | s_{it} = s_t^*(m), v_{it} = m] \\
&= \Pr\left[\theta_t > \frac{(1-\bar{d}_t)(\sigma + s_t^*(m))}{1-\bar{d}_t+2\sigma} \middle| s_{it} = s_t^*(m), v_{it} = m\right] \\
&= \frac{1}{2\sigma}\left[s_t^*(m) + \sigma - \frac{(1-\bar{d}_t)(\sigma + s_t^*(m))}{1-\bar{d}_t+2\sigma}\right]
\end{aligned}$$

and it follows that $s_t^*(m) = c_m(1 - \bar{d}_t + 2\sigma) - \sigma$.

Next, assume that a democratic citizen j gets a signal $s_{jt} = s_t^*(d)$. Then it satisfies that $\Pr[M_t > 1-\theta_t | s_{jt} = s_t^*(d), v_{jt} = d] = c_d$ and $M_t = \bar{d}_t\{\theta_t + \sigma - s_t^*(d)\}/2\sigma$. Hence

$$\begin{aligned}
&\Pr[M_t > 1-\theta_t | s_{jt} = s_t^*(d), v_{jt} = d] \\
&= \Pr\left[\theta_t > \frac{\bar{d}_t(s_t^*(d) - \sigma) + 2\sigma}{\bar{d}_t + 2\sigma} \middle| s_{jt} = s_t^*(d), v_{jt} = d\right] \\
&= \frac{1}{2\sigma}\left[s_t^*(d) + \sigma - \frac{\bar{d}_t(s_t^*(d) - \sigma) + 2\sigma}{\bar{d}_t + 2\sigma}\right]
\end{aligned}$$

and I get $s_t^*(d) = c_d(\bar{d}_t + 2\sigma) + 1 - \bar{d}_t - \sigma$.

The cutoffs $s_t^*(d)$ and $s_t^*(m)$ must satisfy $s_t^*(m) - s_t^*(d) \geq 2\sigma$. Substituting the cutoffs and proceeding the calculation,

$$0 \geq (1-c_m)(1-\bar{d}_t) + 2\sigma(1 - c_m + c_d) + d_t c_d \tag{25}$$

which is impossible. Therefore, the distance between the cutoffs is less than 2σ. □

From Lemma A.3, the cutoffs $s_t^*(m)$ and $s_t^*(d)$ are closer than 2σ. So, for given θ_t, the density M_t is

$$M_t = \bar{d}_t\left\{\frac{\theta_t + \sigma - s_t^*(d)}{2\sigma}\right\} + (1-\bar{d}_t)\left\{\frac{\theta_t + \sigma - s_t^*(m)}{2\sigma}\right\}. \tag{26}$$

Hence,

$$\begin{aligned}
&\Pr[M_t \geq 1-\theta_t | s_{it} = s_t^*(m), v_{it} = m] \\
&= \Pr\left[\theta_t \geq \bar{d}_t\left\{\frac{s_t^*(d)+\sigma}{2\sigma+1}\right\} + (1-\bar{d}_t)\left\{\frac{s_t^*(m)+\sigma}{2\sigma+1}\right\} \middle| s_{it} = s_t^*(m), v_{it} = m\right] \\
&= \frac{1}{2\sigma}\left[s_t^*(m) + \sigma - \bar{d}_t\left\{\frac{s_t^*(d)+\sigma}{2\sigma+1}\right\} - (1-\bar{d}_t)\left\{\frac{s_t^*(m)+\sigma}{2\sigma+1}\right\}\right]
\end{aligned}$$

and it follows that $s_t^*(m) = \{2\sigma(2\sigma+1)c_m + \bar{d}_t s_t^*(d) - 2\sigma^2\}/(\bar{d}_t + 2\sigma)$. Similarly, $s_t^*(d)$ is derived as $s_t^*(d) = \{2\sigma(2\sigma+1)c_d + (1-\bar{d}_t)s_t^*(m) - 2\sigma^2\}/(1 - \bar{d}_t + 2\sigma)$. Using these two, the equilibrium cutoffs are $s_t^*(m) = \sigma(2c_m - 1) + \bar{c}_t$ and $s_t^*(d) = \sigma(2c_d - 1) + \bar{c}_t$ where $\bar{c}_t = \bar{d}_t c_d + (1-\bar{d}_t)c_m$ is average participation cost. It is easy to check that $s_t^*(d) < s_t^*(m)$. And it is shown in Morris and Shin (2001) and Sakovics and Steiner (2012) that the cutoff strategy is the unique BNE, which is achieved from iterated elimination of strictly dominated strategies.

Proof of Proposition 2

Suppose that $\bar{d}_t$ is given. For all θ_t weakly smaller than $s^*_t(d) - \sigma$, the probability of collective action success $\Pr[M_t \geq 1 - \theta_t]$ is 0 because all citizens receive signals lower than the cut-off points, so that no one participates. Next, suppose that $\theta_t \in (s^*_t(d) - \sigma, s^*_t(m) - \sigma]$. Then only democratic citizens participate, so the mass of participants M_t is $\bar{d}_t \{\theta_t + \sigma - s^*_t(d)\}/2\sigma$ and

$$\Pr[M_t \geq 1 - \theta_t] = \Pr\left[\theta_t \geq \frac{2\sigma + \bar{d}_t(s^*_t(d) - \sigma)}{2\sigma + \bar{d}_t}\right]. \tag{27}$$

When $\theta_t = s^*_t(m) - \sigma$, the highest value in the interval,

$$\theta_t - \frac{2\sigma + \bar{d}_t(s^*_t(d) - \sigma)}{2\sigma + \bar{d}_t} = -\frac{2\sigma}{2\sigma + \bar{d}_t}\{(2\sigma + 1)(1 - c_m)\} < 0 \tag{28}$$

where the second equality is obtained by substituting the values $s^*_t(m)$ and $s^*_t(d)$. This means that, for any θ_t on the interval, the collective action is not successful. Finally, suppose that $\theta_t \in (s^*_t(m) - \sigma, s^*_t(d) + \sigma]$. On this interval, the mass of participants M_t is $\bar{d}_t \{\theta_t + \sigma - s^*_t(d)\}/2\sigma + (1 - \bar{d}_t)\{\theta_t + \sigma - s^*_t(m)\}/2\sigma$. And the probability of regime change is

$$\Pr[M_t \geq 1 - \theta_t] = \Pr\left[\theta_t \geq \bar{d}_t \left\{\frac{s^*_t(d) + \sigma}{2\sigma + 1}\right\} + (1 - \bar{d}_t)\left\{\frac{s^*_t(m) + \sigma}{2\sigma + 1}\right\}\right]. \tag{29}$$

It is trivial to see that $M_t < 1 - \theta_t$ when $\theta_t = s^*_t(m) - \sigma$. If $\theta_t = s^*_t(d) + \sigma$, substituting $s^*_t(d)$ and $s^*_t(m)$,

$$\theta_t - \bar{d}_t \left\{\frac{s^*_t(d) + \sigma}{2\sigma + 1}\right\} - (1 - \bar{d}_t)\left\{\frac{s^*_t(m) + \sigma}{2\sigma + 1}\right\} = \frac{2\sigma}{2\sigma + 1} c_d(1 + 2\sigma) > 0. \tag{30}$$

The left-hand side of (30) is continuous and strictly increasing in θ_t. By the intermediate value theorem, there is a unique $\bar{\theta}_t$ such that $M_t = 1 - \bar{\theta}_t$. From the algebra, $\bar{\theta}_t = \bar{c}_t$, which means that the regime changes if the regime vulnerability θ_t is greater than the average participation cost $\bar{c}_t$ and continues otherwise.

Proof of Lemma 1.

Suppose that $e_{jt} = 0$ for all $j \neq i$. Then $e_{it} = \varepsilon$ for sufficiently small $\varepsilon > 0$ makes $h(\varepsilon, 0, q_{t+1}) = 1$, which gives greater payoff than choosing $e_{it} = 0$. Therefore, $e_{it} = 0$ for all $i \in [0, 1]$ cannot constitute an equilibrium. Next, suppose that $e_{jt} > 0$ for some $j \neq i$, so that $\bar{e}_t > 0$. Because the marginal utility of the parent i when $e_{it} = 0$ is positive, $e_{it} = 0$ cannot be the best response. Therefore, $e_{it} > 0$ for all $i \in [0, 1]$ in equilibrium.

Proof of Proposition 3

It is shown in Lemma 1 that $e_{it} > 0$ for all $i \in [0, 1]$ in equilibrium. Using the first-order condition, the best response for parent i is derived as

$$e_{it} = \min\left\{\mu(w_{ht+1} - w_{lt+1})\frac{q_{t+1}}{\bar{e}_t}, \sqrt{2w_{it}}\right\} \tag{31}$$

Fix $I_t \geq 0$ and suppose that $A_t' > A_t$. Then $A_{t+1}' = (1-\delta)A_t' + I_t > (1-\delta)A_t + I_t = A_{t+1}$. Let $\bar{e}_t'$ and $\bar{e}_t$ correspond to A_t' and A_t, respectively. Similarly, let w_{ht+1}', w_{lt+1}', q_{t+1}', and w_{it}' correspond to A_t' and w_{ht+1}, w_{lt+1}, q_{t+1}, and w_{it} correspond to A_t. To obtain the contradiction, assume that $\bar{e}_t \geq \bar{e}_t'$. We see that $(w_{ht+1}' - w_{lt+1}')q_{t+1}' > (w_{ht+1} - w_{lt+1})q_{t+1}$ and $w_{it}' > w_{it}$ so that

$$\min\left\{\mu(w_{ht+1}' - w_{lt+1}')\frac{q_{t+1}'}{\bar{e}_t'}, \sqrt{2w_{it}'}\right\} > \min\left\{\mu(w_{ht+1} - w_{lt+1})\frac{q_{t+1}}{\bar{e}_t}, \sqrt{2w_{it}}\right\}$$

so that $e_{it}' > e_{it}$ for any $i \in [0,1]$. It follows that $\bar{e}_t' > \bar{e}_t$, which is a contradiction.

Next, fix A_t and assume that $I_t' > I_t$. If $e_{it} = \sqrt{2w_{it}}$ for all $i \in [0,1]$ from the first-order condition, we trivially get $\bar{e}_t' = \bar{e}_t$. If $\mu(w_{ht+1}' - w_{lt+1}')\frac{q_{t+1}'}{\bar{e}_t} \leq \sqrt{2w_{lt}}$, we get $e_{it} = \bar{e}_t$ and $e_{it}' = \bar{e}_t$. Because

$$\bar{e}_t'^2 = \mu(w_{ht+1}' - w_{lt+1}')q_{t+1}' > \mu(w_{ht+1} - w_{lt+1})q_{t+1} = \bar{e}_t^2$$

so that $\bar{e}_t' > \bar{e}_t$. Finally, if $\sqrt{2w_{lt}} \leq \mu(w_{ht+1}' - w_{lt+1}')\frac{q_{t+1}'}{\bar{e}_t} < \sqrt{2w_{ht}}$, $e_{it} = \sqrt{2w_{lt}}$ for low-skilled households. And $e_{it}' > e_{it}$ for skilled households due to the first-order condition. Therefore, $\bar{e}_t' > \bar{e}_t$.

To conclude, $\bar{e}_t$ strictly increases in A_t and weakly increases in I_t.

Proof of Theorem 1

First, I show that (a) induces (b). Suppose that the economy under dictatorship converges to $q \in (0, \bar{q})$. The derivative of V is

$$\begin{aligned}
V'(A_t) =& p'(A_t)\left\{G_t - \kappa I_t + \beta V(A_{t+1})\right\} \\
&+ p(A_t)\left\{g + \kappa(1-\delta) + \left(-\kappa + \beta(1-\delta)V'(A_{t+1})\right)\frac{\partial A_{t+1}}{A_t}\right\} \\
=& p'(A_t)\left\{G_t - \kappa I_t + \beta V(A_{t+1})\right\} + p(A_t)\left\{g + \beta(1-\delta)V'(A_{t+1})\right\}
\end{aligned}$$

for $g = \tau\varphi\pi_h^2$. Due to strict concavity of V, the dictatorship would never invest if $\beta V'(0) \leq \kappa$. With the smallest κ that satisfies this condition,

$$\kappa = \frac{\beta\bar{p}g}{1 - \beta(1-\delta)\bar{p}}. \tag{32}$$

Therefore, for any κ greater than the RHS, no investment is made and $q_t \to 0$.

Similarly, if $\beta V'(\bar{A}) \geq \kappa$, we have $q_t \to \bar{q}$. When $\beta V'(\bar{A}) = \kappa$, investment in each period is $I_t = \delta\bar{A}$ and the derivative of V at $\bar{A}$ is

$$\begin{aligned}
V'(\bar{A}) =& p'(\bar{A})\left\{g\bar{A} - \kappa\delta\bar{A} + \beta V(\bar{A})\right\} + p(\bar{A})\left\{g + \beta(1-\delta)V'(\bar{A})\right\} \\
=& \Delta p\left\{\eta(g - \delta\kappa) + \beta\hat{d}V(\bar{A})\right\} + \underline{p}\left\{g + (1-\delta)\kappa\right\}.
\end{aligned}$$

With the assumption, $V(\bar{A})$ is derived as

$$V(\bar{A}) = \frac{\underline{p}(g - \delta\kappa)\bar{A}}{1 - \beta\underline{p}}.$$

By substituting $V(\bar{A})$,

$$\Delta p\eta\left\{(g-\delta\kappa)+\beta\frac{\underline{p}(g-\delta\kappa)}{1-\beta\underline{p}}\right\}+\underline{p}\left\{g+(1-\delta)\kappa\right\}=\frac{\kappa}{\beta}.$$

because $\hat{d}\bar{A}=\eta$. Multiplying $\beta(1-\beta\underline{p})$ both sides,

$$\beta\Delta p\eta(1-\beta\underline{p})(g-\kappa\delta)+\beta^2\Delta p\eta\underline{p}(g-\kappa\delta)+\beta\underline{p}(1-\beta\underline{p})(g+(1-\delta)\kappa)=\kappa(1-\beta\underline{p})$$

Rearranging the terms,

$$\kappa=\frac{\beta g\left[(1-\beta\underline{p})(\eta\Delta p+\underline{p})+\beta\eta\underline{p}\Delta p\right]}{(1-\beta\underline{p})\left\{1+\beta\delta\eta\Delta p-\beta\underline{p}(1-\delta)\right\}+\beta^2\delta\eta\underline{p}\Delta p} \tag{33}$$

This means, for all κ weakly less than the RHS, q_t converges to $\bar{q}$. Therefore, it requires that κ is strictly between the values (32) and (33).

Second, I show from (b) to (c). Assume that the condition in (b) holds. Let $I_t=G_t$; the dictator invests in the whole budget. When $A_t\to 0$, $G_t\to 0$ so that $A_{t+1}\to 0$. Then $\bar{c}_t\to c_m$ because $\bar{e}_t\to 0$. The marginal expected utility from the investment at $I_t=G_t$ is positive for a sufficiently small A_t and negative for a sufficiently large A_t. Because the marginal utility is continuous and strictly decreasing in A_t, by the intermediate value theorem, there is a unique A_t, which I denote as A_{LB}, that makes the marginal utility equal to zero.

Next, I discuss the threshold A^{UB}. Because the dictatorship is not promoting toward an advanced economy, $\lim_{A\uparrow\bar{A}}V'(A)<\kappa$ and I_t^{dict} with $A\to\bar{A}^-$ must be strictly smaller than $\delta\kappa\bar{A}$. First, if $I_t^{\text{dict}}>0$, let $A^{\text{UB}}=\bar{A}$. Second, assume that $I_t^{\text{dict}}=0$. Fix $I_t=0$. Marginal utility of investment with $I_t=0$ is positive for a sufficiently low $A_t\in\mathcal{A}$ and negative for a sufficiently high $A_t\in\mathcal{A}$. Therefore, there is a lvel of investment such that the marginal utility becomes zero, which I call A^{UB}.

To check whether the investment decreases in an interval $[A^{\text{LB}},A^{\text{UB}}]$, suppose that $A,A'\in(A_{\text{LB}},A_{\text{UB}})$ and $A'>A$. And let I and I' be the optimal investments for A and A'. To obtain a contradiction, assume that $I'\geq I$. As the optimality condition, the marginal utility of investment at I and A is zero. Because the marginal utility decreases in both I_t and A_t in this interval, the marginal utility at I' and A' must be negative, which violates the assumption that I' is optimal for A'.

To show the existence of a steady state A_{ss}, for $A\in[A_{\text{LB}},A_{\text{UB}}]$, the dictator's budget set is $[0,G_t]$, which is compact and continuous in A_t. By *Berge's maximum theorem*, optimal investment I_t is continuous in A_t; write it as $I(A_t)$. The steady state satisfies $I(A)-\delta A=0$. Because $I(A_{\text{LB}})-\delta\underline{A}>0$ and $I(A_{\text{UB}})-\delta A_{\text{UB}}<0$, by the intermediate value theorem, there is $A_{ss}\in(A_{\text{LB}},A_{\text{UB}})$ such that $I(A_{ss})-\delta A_{ss}=0$. This steady state is unique, as the marginal utility of investment for a fixed I_t is strictly increasing and continuous in A_t on this interval.

Finally, to show from (c) to (a) is obvious: Because there is a unique steady state $A_{ss}\in\text{int}\mathcal{A}$ and V is strictly concave, we have $q_t\to q\in(0,\bar{q})$.

Proof of Proposition 4

By Corollary 2, the necessary and sufficient condition for regressive dictatorship is

$$\frac{\beta\bar{p}g}{1-\beta(1-\delta)\bar{p}} \leq \kappa. \tag{34}$$

Note that $g = \tau\varphi\pi_h^2$ goes to 0 as τ goes to 0. Therefore, there is a threshold τ^{reg} such that the dictatorship is regressive for all $\tau \leq \tau^{\text{reg}}$ in $\mathcal{T}$, where

$$\tau^{\text{reg}} \equiv \frac{\kappa(1-\beta(1-\delta)\bar{p})}{\beta\varphi\pi_h^2\bar{p}}.$$

Suppose that $\tau > \tau^{\text{reg}}$ and let $\tilde{\tau} > \tau$.

First, I show that $V(A)$ increases in the tax rate. Denote infrastructure and investment under τ after the kth period as A_k^τ and I_k^τ. Because $G_t = gA_t$, the value function under τ is denoted as

$$\begin{aligned} V^\tau(A) =& p(A)\left\{gA - \kappa I^\tau\right\} + \beta p(A)p(A_1^\tau)\left\{gA_1^\tau - \kappa I_1^\tau\right\} \\ &+ \beta^2 p(A)p(A_1^\tau)p(A_2^\tau)\left\{gA_2^\tau - \kappa I_2^\tau\right\} + \cdots . \end{aligned}$$

Let $\tilde{g} = \tilde{\tau}\varphi\pi_h^2$ and $\tilde{p}(A)$ be the probability of survival under $\tilde{\tau}$. I claim that $\tilde{p}(A) \geq p(A)$. Because $\bar{d}_t = \min\left\{\mu\varphi\pi_h\{(1-\tau)\pi_h - \pi_l\}A_t, \eta\right\}$, $\bar{d}_t$ is weakly decreasing in τ.

Using I_k^τ, construct $\tilde{V}(A)$ as

$$\begin{aligned} \tilde{V}(A) =& \tilde{p}(A)\{\tilde{g}A - \kappa I^\tau\} + \beta\tilde{p}(A)\tilde{p}(A_1^\tau)\{\tilde{g}A_1^\tau - \kappa I_1^\tau\} \\ &+ \beta^2\tilde{p}(A)\tilde{p}(A_1^\tau)\tilde{p}(A_2^\tau)\{\tilde{g}A_2^\tau - \kappa I_2^\tau\} + \cdots . \end{aligned}$$

Since $\tilde{g} > g$ and $\tilde{p}(A) \geq p(A)$ for all A, $\tilde{V}(A) > V^\tau(A)$. Also, by the principle of optimality, $V^{\tau'}(A) \geq \tilde{V}(A)$. It follows that $V^\tau(A)$ increases in τ.

Second, I show that the steady state is higher under τ' than under τ. In the steady state A_{ss}^τ, the first-order condition is

$$-\kappa + \beta\frac{d}{dA}V^\tau(A_{ss}^\tau) = 0,$$

which is equal to

$$-\kappa + \beta p'(A_{ss}^\tau)\left\{gA_{ss}^\tau - \kappa\delta A_{ss}^\tau + \beta V(A_{ss}^\tau)\right\} + \beta p(A_{ss}^\tau)\left\{g + \kappa(1-\delta)\right\} = 0.$$

Then, evaluating the derivative of the value function under $\hat{\tau}$ at A_{ss}^τ,

$$\begin{aligned} \beta\frac{d}{dA}V^{\tilde{\tau}}(A_{ss}^\tau) =& \beta\tilde{p}'(A_{ss}^\tau)\left\{\tilde{g}A_{ss}^\tau - \kappa\delta A_{ss}^\tau + \beta\tilde{V}(A_{ss}^\tau)\right\} + \beta\tilde{p}(A_{ss}^\tau)\left\{\tilde{g} + \kappa(1-\delta)\right\} \\ &> \beta p'(A_{ss}^\tau)\left\{gA_{ss}^\tau - \kappa\delta A_{ss}^\tau + \beta V(A_{ss}^\tau)\right\} + \beta p(A_{ss}^\tau)\left\{g + \kappa(1-\delta)\right\} = \beta\frac{d}{dA}V^\tau(A_{ss}^\tau) \end{aligned}$$

because $p'(A_{ss}^\tau) = \tilde{p}'(A_{ss}^\tau)$, $\tilde{p}(A_{ss}^\tau) \geq p(A_{ss}^\tau)$, and $\tilde{g} > g$. This means $\beta\frac{d}{dA}V^{\tilde{\tau}}(A_{ss}^\tau) > \kappa$, so the steady state under $\tilde{\tau}$, $A_{ss}^{\tilde{\tau}}$, is strictly greater than A_{ss}^τ.

Third, to claim that $\tilde{\tau}$ leads to a (weakly) higher investment than τ, I will show that, for a finite value function described in Appendix A.1.1, the derivative increases in τ for any finite-horizon value functions. Similarly as before, the value functions under τ is denoted as V_k^τ. Write the infrastructure and investment under τ after the nth period from the beginning as A_s^τ and I_s^τ. I prove by induction. When $k=1$, differentiating with respect to I,

$$-\kappa + p(A_1)g + p' g A_1 < -\kappa + \tilde{p}(A_1)\tilde{g} + \tilde{p}'\tilde{g}A_1 \tag{35}$$

and it follows that

$$\frac{d}{dA}V_1^{\tilde{\tau}} > \frac{d}{dA}V_1^{\tau}.$$

Next, suppose that

$$\frac{d}{dA}V_k^{\tilde{\tau}}(A) \geq \frac{d}{dA}V_k^{\tau}(A)$$

for all $A \in \mathcal{A}$. For $k+1$, by differentiating with respect to I,

$$\begin{aligned}
&-\kappa + \beta p(A_1^\tau)\left(g + \beta(1-\delta)\frac{d}{dA_2}V_k^\tau(A_2^\tau)\right) + p'(A_1^\tau)\left\{gA_1^\tau - \kappa I_1^\tau + \beta V_k^\tau(A_2^\tau)\right\} \\
&< -\kappa + \tilde{p}(A_1^\tau)\left(\tilde{g} + \beta(1-\delta)\frac{d}{dA_2}V_k^{\tilde{\tau}}(A_2^\tau)\right) + \tilde{p}'(A_1^\tau)\left\{\tilde{g}A_1^\tau - \kappa I_1^\tau + \beta V_k^{\tilde{\tau}}(A_2^\tau)\right\}
\end{aligned}$$

at $I = I^\tau$. Note that this investment is also feasible under $\tilde{\tau}$ because the government budget under $\tilde{\tau}$ is greater than that under τ.

If I^τ is in the interior of the budget, from the first-order condition,

$$-\kappa + \beta p(A_1^\tau)\left(g + \beta(1-\delta)\frac{d}{dA_2}V_k^\tau(A_2^\tau)\right) + p'(A_1^\tau)\left\{gA_1^\tau - \kappa I_1^\tau + \beta V_k^\tau(A_2^\tau)\right\} = 0.$$

With this I^τ, because the first-order condition is not satisfied under $\tilde{\tau}$, $I^{\tilde{\tau}}$ must be strictly greater than I^τ. If the budget constraint binds, that is, $\kappa I^\tau = gA$, because $\tilde{g}A > gA$ and marginal expected payoff from investment is greater under $\tilde{\tau}$ than τ, we get $I^{\tilde{\tau}} > I^\tau$. On the other hand, if $I^{\tilde{\tau}} = 0$, then $I^\tau = 0$. Therefore, $I^{\tau'} \geq I^\tau$. Since k is arbitrary and $V_k \to V$ uniformly, the proof is done.

Proof of Proposition 5

The steady state A_{ss} satisfies the first-order condition $\beta V'(A_{ss}) - \kappa = 0$. That is, writing as $p_{ss} = p(A_{ss})$ and $V_{ss} = V(A_{ss})$,

$$\beta p'_{ss}\left\{(g - \delta\kappa)A_{ss} + \beta V_{ss}\right\} + \beta p_{ss}\left\{g + \kappa(1-\delta)\right\} - \kappa = 0.$$

Note that

$$\begin{aligned}
p_{ss} &= \bar{p} + \Delta p \hat{d} A_{ss}, \\
V_{ss} &= \frac{p_{ss} g A_{ss}}{1 - \beta p_{ss}}.
\end{aligned}$$

We want to analyse the sign of $\frac{\partial A_{ss}}{\partial \varphi}$. Let

$$H \equiv \beta p'_{ss}\left\{(g - \delta\kappa)A_{ss} + \beta V_{ss}\right\} + \beta p_{ss}\left\{g + \kappa(1-\delta)\right\} - \kappa.$$

By implicit function theorem,

$$\frac{\partial A_{ss}}{\partial \varphi} = -\frac{\partial H/\partial \varphi}{\partial H/\partial A}.$$

Partially differentiating H with respect to A and simplifying,

$$\frac{\partial H}{\partial A} = \beta \Delta p \hat{d} \left\{ \frac{(1-\beta\bar{p})(g-\delta\kappa)}{(1-\beta p_{ss})^2} + \{g+\kappa(1-\delta)\} \right\}$$

which is negative for all $c_d < c_m$.

Partially differentiating H with respect to φ:

$$\frac{\partial H}{\partial \varphi} = \beta \Delta p \left\{ (1-\beta\bar{p}) \frac{(g-\delta\kappa)A_{ss}}{(1-\beta p_{ss})^2} + (g+\kappa(1-\delta))A_{ss} \right\} \frac{\partial \hat{d}}{\partial \varphi} + \beta \left\{ p_{ss} + \frac{\Delta p \hat{d} A_{ss}}{1-\beta p_{ss}} \right\} \frac{\partial g}{\partial \varphi}$$

where

$$\frac{\partial \hat{d}}{\partial \varphi} = \mu \pi_h \{(1-\tau)\pi_h - \pi_l\}, \quad \frac{\partial g}{\partial \varphi} = \tau \pi_h^2.$$

If $c_d \to c_m$, then $\Delta p \to 0$ and $p_{ss} \to \bar{p}$ so that $\frac{\partial H}{\partial \varphi} \to \frac{\beta \bar{p} g}{\varphi}$, which is positive. It follows that $\frac{\partial A_{ss}}{\partial \varphi} > 0$.

If $\frac{\partial H}{\partial \varphi} > 0$ for all c_d, then A_{ss} increases in φ. Suppose that $\frac{\partial H}{\partial \varphi} < 0$ for sufficiently small c_d. Then, by the intermediate theorem, $\frac{\partial H}{\partial \varphi} = 0$ for some c_d. Denote this c_d as c_d^{φ}. It remains to show that such c_d^{φ} is unique. Partially differentiating with c_d,

$$\begin{aligned} \frac{\partial^2 H}{\partial c_d \partial \varphi} =& (1-\beta\bar{p})^2 \left(\frac{\beta}{\Delta\theta}\right) \frac{(g-\delta\kappa)A_{ss}}{(1-\beta p_{ss})^3} \frac{\partial \hat{d}}{\partial \varphi} + \left(\frac{\beta}{\Delta\theta}\right) \{g+\kappa(1-\delta)\} A_{ss} \frac{\partial \hat{d}}{\partial \varphi} \\ &+ \left(\frac{\beta}{\Delta\theta}\right) \hat{d} A_{ss} \frac{\partial g}{\partial \varphi} + (1-\beta\bar{p}) \left(\frac{\beta}{\Delta\theta}\right) \frac{\hat{d} A_{ss}}{(1-\beta p_{ss})^2} \frac{\partial g}{\partial \varphi} \end{aligned}$$

which is positive. This means that $\frac{\partial H}{\partial \varphi}$ is strictly increasing in c_d. Therefore, this c_d^{φ} is unique. I analyse the steady state with π_h and c_d in the same way and get the desired result.

Proof of Proposition 6

Suppose that the dictatorship is non-regressive. First, I show that the steady state increases in π_l. Let $p_{ss} = p(A_{ss})$. and $V_{ss} = V(A_{ss})$ The first-order condition at the steady state is

$$H = -\kappa + \beta p'_{ss} \{(g-\delta\kappa)A_{ss} + \beta V_{ss}\} + \beta p_{ss} \{g+\kappa(1-\delta)\} = 0.$$

Using

$$p_{ss} = \bar{p} + \Delta p \hat{d} A_{ss}, \quad p'_{ss} = \Delta p \hat{d},$$
$$V_{ss} = \frac{p_{ss}(g-\delta\kappa)A_{ss}}{1-\beta p_{ss}}$$

rewrite H as

$$H = -\kappa + \frac{\beta \Delta p \hat{d}(g - \delta\kappa) A_{ss}}{1 - \beta p_{ss}} + \beta \bar{p}\{g + \kappa(1-\delta)\} + \beta \Delta p \hat{d} A_{ss}\{g + \kappa(1-\delta)\}.$$

By implicit function theorem,

$$\frac{\partial A_{ss}}{\partial \varphi} = -\frac{\partial H/\partial \varphi}{\partial H/\partial A}.$$

Partially differentiating H with respect to A and simplifying,

$$\frac{\partial H}{\partial A} = \beta \Delta p \hat{d} \left\{ \frac{(1-\beta\bar{p})(g-\delta\kappa)}{(1-\beta p_{ss})^2} + \{g + \kappa(1-\delta)\} \right\}$$

which is negative for all $c_d < c_m$. Partially differentiating H with respect to π_l,

$$\begin{aligned}
\frac{\partial H}{\partial \pi_l} =& \beta \Delta p (g - \delta\kappa) A_{ss} \frac{\partial \hat{d}}{\partial \pi_l} \left[2 + \frac{\beta p_{ss}}{1 - \beta p_{ss}} + \frac{\beta \Delta p \hat{d} A_{ss}}{(1-\beta p_{ss})^2} \right] + \beta \Delta p \kappa A_{ss} \frac{\partial \hat{d}}{\partial \pi_l} \\
=& \beta(1-\beta\bar{p}) \frac{\Delta p (g - \delta\kappa)}{(1-\beta p_{ss})^2} A_{ss} \frac{\partial \hat{d}}{\partial \pi_l} + \beta \Delta p \{g + \kappa(1-\delta)\} A_{ss} \frac{\partial \hat{d}}{\partial \pi_l}.
\end{aligned}$$

Because

$$\frac{\partial \hat{d}}{\partial \pi_l} = -\mu \varphi \pi_h < 0, \quad \Delta p = \frac{c_d - c_m}{\Delta \theta} < 0,$$

and the other terms are positive, $\frac{\partial H}{\partial \pi_l} > 0$ and the steady state increases as π_l increases.

Next, I derive the probability of survival. From $p_{ss} = \bar{p} + \Delta p \hat{d} A_{ss}$,

$$\begin{aligned}
\frac{\partial p_{ss}}{\partial \pi_l} =& \Delta p \left(\frac{\partial \hat{d}}{\partial \pi_l} A_{ss} + \hat{d} \frac{\partial A_{ss}}{\partial \pi_l} \right) \\
=& \Delta p \frac{\partial \hat{d}}{\partial \pi_l} A_{ss} - \Delta p \hat{d} \frac{\partial H/\partial \pi_l}{\partial H/\partial A} \\
=& \frac{\Delta p}{\partial H/\partial A} \left(\frac{\partial H}{\partial A} \frac{\partial \hat{d}}{\partial \pi_l} A_{ss} - \hat{d} \frac{\partial H}{\partial \pi_l} \right)
\end{aligned}$$

Because

$$\begin{aligned}
\frac{\partial H}{\partial A} \frac{\partial \hat{d}}{\partial \pi_l} A_{ss} =& -\beta \mu^2 \varphi^2 \pi_h^2 \{(1-\tau)\pi_h - \pi_l\} \Delta p \left\{ \frac{(1-\beta\bar{p})(g-\delta\kappa)}{(1-\beta p_{ss})^2} + \{g + \kappa(1-\delta)\} \right\} A_{ss}, \\
\hat{d} \frac{\partial H}{\partial \pi_l} =& -\beta \mu^2 \varphi^2 \pi_h^2 \{(1-\tau)\pi_h - \pi_l\} \Delta p \left\{ \frac{(1-\beta\bar{p})(g-\delta\kappa)}{(1-\beta p_{ss})^2} + \{g + \kappa(1-\delta)\} \right\} A_{ss}.
\end{aligned}$$

we get

$$\frac{\partial H}{\partial A} \frac{\partial \hat{d}}{\partial \pi_l} A_{ss} - \hat{d} \frac{\partial H}{\partial \pi_l} = 0.$$

This means, the probability of survival at the steady state is the same for π_l and π_l' for $\pi_l \neq \pi_l'$.

Proof of Theorem 4

Let $T \geq 2$ be given. To obtain contradiction, suppose that $A_{ss}^{T+1} \geq A_{ss}^{T}$. From the first-order conditions,

$$\beta V_{T-1}'(A_{ss}^T) = \beta V_T'(A_{ss}^{T+1}) = \kappa.$$

By the strict concavity of V_k, we have $\beta V_T'(A_{ss}^T) \geq \kappa$. Expanding the first-order conditions,

$$\beta V_T'(A_{ss}^T) = \beta p(A_{ss}^T)\{g + \kappa(1-\delta)\} + \beta \frac{p'(A_{ss}^T)}{p(A_{ss}^T)} V_T(A_{ss}^T)$$

and

$$\beta V_{T-1}'(A_{ss}^T) = \beta p(A_{ss}^T)\{g + \kappa(1-\delta)\} + \beta \frac{p'(A_{ss}^T)}{p(A_{ss}^T)} V_{T-1}(A_{ss}^T)$$

By the monotonicity of the value functions, $V_T(A_{ss}^T) > V_{T-1}(A_{ss}^T)$ for all $A_{ss}^T > 0$. Because $p'(A_{ss}^T) = \Delta p \hat{d} < 0$, we get $\beta V_T'(A_{ss}^T) < \beta V_{T-1}'(A_{ss}^T) = \kappa$, which is a contradiction. Since $T \geq 2$ is arbitrary, it holds for all $T \geq 2$.

Next, I show that $A_{ss}^1 < A_{ss}^T$ for any $T \geq 2$. For contradiction, assume that $A_{ss}^1 \geq A_{ss}^T$. The first-order condition for $T = 1$ is

$$-\kappa + \beta V_0'(A_{ss}^1) = -\kappa + \beta p(A_{ss}^1) g + \beta p'(A_{ss}^1)\{g A_{ss}^1\}.$$

A.3 Economic Growth under Democracy

I use a probabilistic voting model of electoral competition following Persson and Tabellini (2021) to describe economic growth in democracy. Right after driving out the dictator through the period $t-1$ collective action, a democratic election is held with two political parties, A and B, competing for the democratic government.

At the beginning of each period $s \geq t$, each party $j \in \{A, B\}$ proposes a policy $\alpha_t^j \in [0,1]$ that indicates the proportion of the budget to be obtained as rent. When policy α_t^j is adopted, the investment made and the rent obtained by party j are $(1-\alpha_t^j)G_t$ and $\alpha_t^j G_t$, respectively. Additionally, party j enjoys a non-materialistic gain $\bar{\alpha} \geq 0$ from holding office. The opponent party gets 0.

Each old citizen $i \in [0,1]$ prefers high investment and has equal vote share. She considers both her partisan preference and the proposed policy. Let the partisan preference of a citizen i for party A in period s is $\xi_{is} = \zeta_s + \varepsilon_{is}$ where ζ_s and ε_{it} captures the average and the variance. I assume that ζ_s and ε_{is} are distributed uniformly on $[-1/2, 1/2]$ and independently and identically for all $i \in [0,1]$ and $s \geq t$. Voters vary in their weight to the proposed policy. Those who have high weight to the policy being are concerned about voting against a party that implicitly proposes high rent-seeking. This policy weight depends on each citizen's value type v_{is-1} obtained in her first period. Let $\lambda_{v_{is-1}} \in \{\lambda_d, \lambda_m\}$ represent this policy weight, and denote the average policy rate in period s as $\bar{\lambda}_s \equiv \int_0^1 \lambda_{v_{is-1}} di$. After observing the proposed policies α_s^j, $j \in \{A, B\}$, citizen i votes for the party A if

$$\lambda_{v_{is-1}} \left\{\alpha_s^B - \alpha_s^A\right\} + \xi_{is} > 0 \tag{36}$$

and for party B if the inequality is reversed. I restrict these parameters to be within a reasonable range, so that no rent extractions and full rent extractions do not constitute equilibrium policy outcomes:

Assumption 1. λ_m, λ_d and $\bar{\alpha}$ satisfy $\{2(1+\bar{\alpha})\}^{-1} < \lambda_m < \lambda_d < \{2\bar{\alpha}\}^{-1}$ and $\bar{\lambda}(\eta) > \bar{\lambda}^{\text{growth}}$ where $\bar{\lambda}^{\text{growth}} = \tau\varphi\pi_h^2\{2\tau\varphi\pi_h^2(1+\bar{\alpha}) - 2(1-\delta)\}^{-1}$.

Party A's winning probability in period s is derived as

$$\mathrm{p}_s^A(\alpha_s^A, \alpha_s^B) = \begin{cases} 1 & \text{if} \quad \alpha_s^A \le \alpha_s^B - 1/2\bar{\lambda}_s, \\ 0 & \text{if} \quad \alpha_s^A \ge \alpha_s^B + 1/2\bar{\lambda}_s, \\ \frac{1}{2} + \bar{\lambda}_s\left\{\alpha_s^B - \alpha_s^A\right\} & \text{otherwise} \end{cases} \tag{37}$$

The preferences of each party j are represented by

$$\mathrm{p}_s^j(\alpha_s^A, \alpha_s^B)\left\{\alpha_s^j + \bar{\alpha}\right\} \tag{38}$$

where $\mathrm{p}_s^j(\alpha_s^A, \alpha_s^B)$ is party j's probability of winning the election. The equilibrium policies proposed by both parties are given by

$$\alpha_s^A = \alpha_s^B = \frac{1}{2\bar{\lambda}(\bar{d}_t)} - \bar{\alpha}. \tag{39}$$

Denote this equilibrium policy by α_s^*. By Assumption 1, α_s^* is in the interior of $[0, 1]$. This solution demonstrates that the proportion of rent extraction is decreasing in $\bar{d}_t$. In the following proposition, I compare economic growth between dictatorship and democracy.

Proposition A.1. *Under Assumption 1 and Theorem 1 (b), consider an economy under dictatorship and a newly democratised economy with the same infrastructure A_t. Then there is a threshold level of infrastructure $\tilde{A}$ such that the equilibrium investment under the dictatorship is higher if $A_t < \tilde{A}$ and lower if $A_t > \tilde{A}$.*

Proof. Suppose that every parent i chooses education as their best response. From Theorem 1, optimal investment for the dictator is G_t for all $A_t \le \underline{A}$, 0 for all $A_t \ge \overline{A}$. And I_t^{dict} is continuous and strictly decreasing in $A_t \in [\underline{A}, \overline{A}]$. By Assumption 1, investment under democracy $I_t^{\text{dem}} = (1 - \alpha_t^*)G_t$ is in the interior of $[0, G_t]$ and strictly increases in A_t. Then $I_t^{\text{dict}} - I_t^{\text{dem}} > 0$ for all $A_t \le \underline{A}$ and $I_t^{\text{dict}} - I_t^{\text{dem}} < 0$ for all $A_t \ge \overline{A}$. On $[\underline{A}, \overline{A}]$, because I_t^{dict} strictly decreases and I_t^{dem} strictly increases in A_t, there is $A_t = \tilde{A}$ such that $I_t^{\text{dict}} - I_t^{\text{dem}} = 0$. Then, $I_t^{\text{dict}} > I_t^{\text{dem}}$ for all $A_t < \tilde{A}$ and $I_t^{\text{dem}} > I_t^{\text{dict}}$ for all $A_t > \tilde{A}$, as desired. □

This proposition implies that, as society democratises, underdeveloped economies lose the vitality of economic growth; with a less institutionalised democratic culture, the policies implemented expend government revenue mostly on rents rather than investment. Conversely,

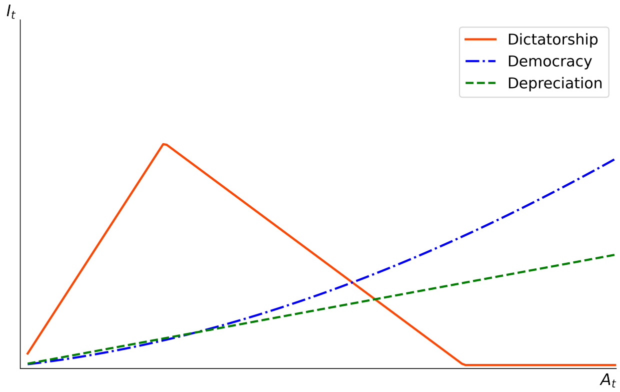

Figure 5: Investment by regime after democratisation

in a developed economy, rent-seeking by politicians is limited by the democratic checks and balances of citizens, represented by policy sensitivity, thus leading to economic prosperity.

In the long-run, democratic economies may lead their paths to downfall or prosperity. When the initial infrastructure after transition is low, depreciation of the existing infrastructure is greater than the new infrastructure created by equilibrium investment. On the contrary, when the initial infrastructure after transition is greater, the implemented policy leads to an increase in the net infrastructure. As there is higher expected income with more skilled jobs, parents are incentivised to give their children more educational opportunities than they had themselves, resulting in a more democratic citizens and increased investment. This result is consistent with Persson and Tabellini (2009): higher democratic capital promotes growth, which in turn consolidates democracy through the accumulation of democratic capital.

A.4 Legitimising the Dictatorship from Economic Growth

In this section, I extend the model to account for the legitimacy that comes from economic growth. Introducing legitimacy provides the dictator another layer of horse race: investing in the economy enhances regime strength in the current period, at the same time it increases the likelihood of regime change in the next period by raising the stock of citizens with democratic values.

The main task of modelling this legitimacy is to divide the economic satisfaction provided by the dictatorship and the public demands of democratic institutions. I analyse the dictator's investment decision with the investment of democracy in Appendix A.3 as a reference point. If the dictatorship promotes higher economic growth than the democracy with the same level of infrastructure, people with a low demand for democracy have no incentive to fight against the regime, and democratic citizens protest for political reasons.

Instead of normalising the satisfaction to 1 and describing the participation cost to c_d and c_m, I normalise the participation cost to 1 regardless of the type. Assume that each young citizen i with value type $v_{it} \in \{d, m\}$ receives a positive satisfaction $\gamma_{v_{it}}$ when she participates in the collective action and it succeeds. This satisfaction, which comes from gaining expanded political rights and living under a democratic regime, is greater for democratic citizens than for materialistic ones: $\gamma_m < 1 < \gamma_d$. Furthermore, participation leading to regime change gives 1 when investment under democracy I_t^{dem} is greater than that under dictatorship I_t^{dict} and 0 otherwise. This means that democratisation is desirable for democratic citizens regardless of the investment, whereas it is desirable for materialistic citizens only if the dictatorship does not provide sufficient economic growth. This setting contrasts with the one in the previous section in that it assumes that regime change is always desirable for any young citizen. The preferences of young citizen i in period t are represented by

$$\left\{\left(\mathbf{1}[I_t^{\text{dem}} > I_t^{\text{dict}}] + \gamma_{v_{it}}\right)\mathbf{1}[M_t > 1-\theta_t] - 1\right\} a_{it} \tag{40}$$

where $a_{it} \in \{0,1\}$ indicates whether or not to participate in the collective action. Assume that the parents' problem and democratic investment are the same as in the previous sections.

To simplify the problem, instead of solving infinite horizon, I consider the 1-period forward looking dictator defined in 6. The dictator's optimal decision I_t^{dict} solves the following problem:

$$\begin{aligned}
\max_{I_t \geq 0} \quad & \{G_t - \kappa I_t\} + \beta \mathbf{1}[I_t^{\text{dem}} > I_t] \Pr[\gamma_t = 0 | \bar{d}_t, I_t \geq I_t^{\text{dem}}] \{G_{t+1} - \kappa I_{t+1}\} \\
& + \beta \left\{1 - \mathbf{1}[I_t^{\text{dem}} > I_t]\right\} \Pr[\gamma_t = 0 | \bar{d}_t, I_t^{\text{dem}} > I_t] \{G_{t+1} - \kappa I_{t+1}\} \\
\text{s.t.} \quad & A_{t+1} = (1-\delta)A_t + I_t \\
& e_{it} = \arg\max_{\tilde{e}_{it} \geq 0} \left\{w_{it} - \frac{e_{it}^2}{2}\right\} + \mu \mathbb{E}[w_{it+1} | e_{it}, \bar{e}_t, q_{t+1}], \quad \forall i \in [0,1], \\
& \bar{d}_t = \int_0^1 \min\{e_{it}^2, \eta\} di, \\
& I_t \text{ is feasible.}
\end{aligned}$$

The main difference from the main model is that the probability of survival depends on whether $I_t^{\text{dict}} \geq I_t^{\text{dem}}$ or not. So, I first analyse the collective action problem for each case, and then describe the shape of optimal investment.

Collective Action. Suppose that $I_t^{\text{dict}} \geq I_t^{\text{dem}}$, i.e., only democratic citizens prefer to initiate a regime change. As the optimal strategy, each materialistic citizen chooses not to participate ($a_{it} = 0$) and each democratic citizen i uses a cutoff strategy such that $a_{it} = 1$ if $s_{it} \geq s_t^*(\bar{d}_t)$ and $a_{it} = 0$ otherwise. The cutoff point is derived as $s_t^*(\bar{d}_t) = \{\bar{d}_t + 2\sigma\}/\gamma_d + (1 - \bar{d}_t - \sigma)$. The dictator's probability of survival to the next period is

$$\Pr[M_t < 1 - \theta_t | \bar{d}_t, I_t^{\text{dict}} \geq I_t^{\text{dem}}] = \frac{\theta^*(\bar{d}_t) - \underline{\theta}}{\bar{\theta} - \underline{\theta}} \tag{41}$$

where the threshold $\theta^*(\bar{d}_t)$ of regime vulnerability is derived as

$$\theta^*(\bar{d}_t) = 1 - \bar{d}_t \left[1 - \frac{1}{\gamma_d}\right]. \tag{42}$$

If the realised regime vulnerability is greater than $\theta_{*(\bar{d}_t)}$ the society becomes democratised. I focus on sufficiently large η and γ_d; otherwise, there will be no threat from emerging democratic citizens.

Next, suppose that $I_t^{\text{dem}} > I_t^{\text{dict}}$, i.e., both materialistic and democratic types now prefer a democratic transition. The collective action problem is equivalent to the problem in the main model with $c_d = (1+\gamma_d)^{-1}$ and $c_m = (1+\gamma_m)^{-1}$. The dictator's probability of survival is

$$\Pr[M_t < 1-\theta_t|\bar{d}_t, I_t^{\mathrm{dem}} > I_t^{\mathrm{dict}}] = \frac{\bar{c}_t - \underline{\theta}}{\bar{\theta} - \underline{\theta}} \tag{43}$$

where $\bar{c}_t = \bar{d}_t c_d + (1-\bar{d}_t)c_m$ is the average participation cost. It is obvious that $\bar{c}_t$ is greater than θ^*. The difference between θ^* and $\bar{c}_t$ can be interpreted as the effect of providing higher economic growth than democracies.

Optimal Investment I first analyse the investment by regime types when the infrastructure is low. It is optimal for the dictator to allocate his entire budget to investment when the level of infrastructure is low. In contrast, democracies have low investment when the infrastructure is low. Thus, $I_t^{\mathrm{dict}} > I_t^{\mathrm{dem}}$ for a sufficiently low A_t.

Next, when A_t becomes higher, proposition 1 suggests that the dictatorship reduces investment as the economy grows, mainly due to the increasing threat from democratic citizens. However, the dictator has a limit on how much investment he can reduce. When investment falls below I_t^{dem}, the regime loses its legitimacy as a developmental dictator and faces significant pressure to democratise. Thus, the dictatorship stops reducing investment and maintains it at the same level as under democracy.

In highly developed economies, however, the democratic citizenry expands, leading the dictatorship to face increased demands for democracy from this segment of the population. In addition, maintaining the same level of investment as in a democratic system becomes increasingly costly as it rises in proportion to the number of democratic citizens. As a result, the dictator chooses to reduce investment and focuses on immediate rent gains.

Proposition A.2. *For a sufficiently high γ_d,*

(a) optimal investment under the dictatorship exceeds the investment under the democracy for all $A_t < \underline{A}^{\mathrm{leg}}$,

(b) investment for both regimes are the same for $A_t \in [\underline{A}^{\mathrm{leg}}, \overline{A}^{\mathrm{leg}}]$, and

(c) optimal investment under the dictatorship is lower than that under the democracy for all $A_t > \overline{A}^{\mathrm{leg}}$.

Proof. Let I_t^{dict} be the optimal investment for the dictator. Let I_t^{α} be the optimal investment for the 1-period forward looking dictator with probability of survival $Pr[M_t < 1 - \theta_t|\bar{d}_t] = \left\{\theta^*(\bar{d}_t) - \underline{\theta}\right\} / \left\{\bar{\theta} - \underline{\theta}\right\}$. Similarly, let I_t^{β} be the optimal investment with probability $Pr[M_t < 1-\theta_t|\bar{d}_t] = \{\bar{c}_t - \underline{\theta}\} / \left\{\bar{\theta} - \underline{\theta}\right\}$. From the first-order condition, I_t^{α} is analogous to Theorem 1: For some thresholds $\underline{A}$ and $\overline{A}$, $I_t^{\alpha} = G_t$ for $A_t \le \underline{A}$, I_t^{α} decreases for $A_t \in [\underline{A}, \overline{A}]$ and then $I_t^{\alpha} = 0$ for $A_t \ge \overline{A}$. On the other hand, I_t^{dem} is low when A_t is low and increases in A_t. There is A_t such that $I_t^{\alpha} = I_t^{\mathrm{dem}}$, denoted as $\underline{A}^{\mathrm{leg}}$. It is obvious that $I_t^{\mathrm{dict}} > I_t^{\mathrm{dem}}$ for all $A_t < \underline{A}^{\mathrm{leg}}$. With $A_t = \underline{A}^{\mathrm{leg}} + \varepsilon$ for a sufficiently small $\varepsilon > 0$, $I_t^{\alpha} < I_t^{\mathrm{dem}}$, which means that I_t^{dem} does not satisfy the first-order condition. However, optimal investment is $I_t^{\mathrm{dict}} = I_t^{\mathrm{dem}}$ because the investment below I_t^{dem} makes the regime unstable from collective action, so that

$$\begin{aligned} &G_t - \kappa I_t^{\mathrm{dem}} + \beta \Pr[M_t < 1-\theta_t|\bar{d}_t, I_t^{\mathrm{dict}} \ge I_t^{\mathrm{dem}}] G_{t+1}^{\alpha} \\ &> G_t - \kappa I_t^{\beta} + \beta q \Pr[M_t < 1-\theta_t|\bar{d}_t, I_t^{\mathrm{dem}} > I_t^{\mathrm{dict}}] G_{t+1}^{\beta} \end{aligned} \tag{44}$$

where G^{α}_{t+1} and G^{β}_{t+1} are government revenues from investments I^{dem}_t and I^{β}_t, respectively. Next, I show that, for a sufficiently large γ_d, there is A_t such that the inequality is reversed. Because $\Pr[M_t < 1-\theta_t|\bar{d}_t, I^{\text{dict}}_t \geq I^{\text{dem}}_t] = \{\theta^* - \underline{\theta}\} \,/\, \{\overline{\theta} - \underline{\theta}\}$ and $\Pr[M_t < 1-\theta_t|\bar{d}_t, I^{\text{dem}}_t > I^{\text{dict}}_t] = \{\bar{c}_t - \underline{\theta}\} \,/\, \{\overline{\theta} - \underline{\theta}\}$, the following is obtained from deducting the right-hand side from the left-hand side:

$$\kappa(I^{\beta}_t - I^{\text{dem}}_t) + \beta \left\{ \frac{\theta^* - \underline{\theta}}{\overline{\theta} - \underline{\theta}} G^{\alpha}_{t+1} - \frac{\bar{c}_t - \underline{\theta}}{\overline{\theta} - \underline{\theta}} G^{\beta}_{t+1} \right\} \tag{45}$$

At $A_t = \bar{A}$, it becomes

$$\begin{aligned}
& -\kappa I^{\text{dem}}_t + \beta \frac{\theta^*(\eta) - \bar{c}_t(\eta)}{\overline{\theta} - \underline{\theta}} G^{\alpha}_{t+1} + \beta \frac{\bar{c}_t(\eta) - \underline{\theta}}{\overline{\theta} - \underline{\theta}} \left\{ G^{\alpha}_{t+1} - G^{\beta}_{t+1} \right\} && (46)\\
& < -\kappa I^{\text{dem}}_t + \beta \frac{\theta^*(\eta) - \bar{c}_t(\eta)}{\overline{\theta} - \underline{\theta}} G^{\alpha}_{t+1} + \frac{\kappa}{\tau \varphi \pi_h^2} \left\{ G^{\alpha}_{t+1} - G^{\beta}_{t+1} \right\} && (47)\\
& < -\kappa I^{\text{dem}}_t + \beta \frac{\theta^*(\eta) - \bar{c}_t(\eta)}{\overline{\theta} - \underline{\theta}} G^{\alpha}_{t+1} + \frac{\kappa \bar{q}}{\varphi \pi_h} \sqrt{I^{\text{dem}}_t} && (48)
\end{aligned}$$

where the first inequality is obtained from $\beta \bar{p} \tau \varphi \pi_h^2 \leq \kappa$ (non-regressive condition). Because $I^{\text{dem}}_t = \{1 - \alpha^*(\eta)\} G_t$, it is equal to

$$\kappa \sqrt{(1 - \alpha^*(\eta)) G_t} \left[-\sqrt{(1 - \alpha^*(\eta)) G_t} + \frac{\bar{q}}{\varphi \pi_h} \right] + \beta \frac{\theta^*(\eta) - \bar{c}_t(\eta)}{\overline{\theta} - \underline{\theta}} G^{\alpha}_{t+1} < 0 \tag{49}$$

when $\theta^*(\eta) - \bar{c}_t(\eta)$ becomes negligible for γ_d sufficiently high and the terms within the bracket for the first term is negative for a high A_t. Thus, there is A_t, denoted by $\overline{A}^{\text{leg}}$, such that (45) becomes 0. Then for all $A_t > \overline{A}^{\text{leg}}$, investing less than I^{dem}_t is optimal for the dictator.

□

The result implies that the dictatorship drives economic growth through economic incentives when the economy is underdeveloped. Subsequently, the dictatorship continues to invest in the economy due to the incentive for legitimacy once it surpasses a certain level of economic development. However, when the economic cost of investment exceeds the legitimacy benefit, the dictatorship transitions away from the developmental phase.

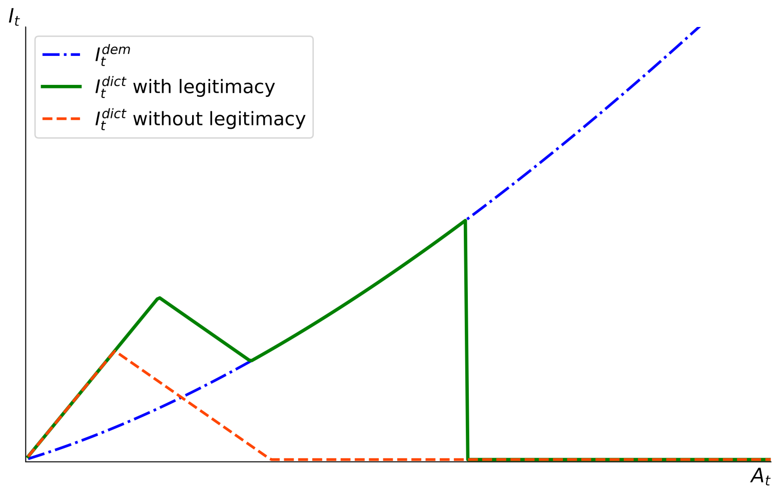

Figure 6: Legitimacy in Investment Decision