A Pendulum Model of Economic Growth*

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Abstract

This paper develops a "pendulum model" of economic growth to explain the recurrent oscillations between state control and market liberalization observed in major economies. We posit that policymakers face a fundamental trade-off between promoting growth and maintaining political or systemic control over the accumulation of private wealth or capital. Using a dynamic framework where a policymaker balances these competing objectives, we show that high growth targets endogenously generate cycles: periods of pro-market expansion are necessary to meet growth targets but inevitably increase the share of private resources, triggering a retrenchment phase to restore control. We provide empirical evidence supporting this mechanism, focusing primarily on China's post-reform history, where policy swings between "pro-private" and "pro-state" regimes align closely with the model's predictions. To demonstrate the broader applicability of the trade-off between efficiency and stability, we present supplementary evidence from the United States, illustrating similar cyclical patterns in financial regulation and credit cycles. Our findings suggest that the volatility of economic policy is not merely a response to exogenous shocks but an inherent feature of governance under binding growth constraints.

Keywords: growth targets, endogenous cycles, financial frictions

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1. Introduction

The trajectory of modern economic development is rarely linear. Instead, it is often characterized by distinct phases of acceleration and deceleration, accompanied by alternating policy regimes of state intervention and market liberalization. In China, for instance, the post-1978 reform era has witnessed recurring "pendulum" swings: periods of vigorous non-state sector expansion in the 1980s and product and labor market liberalization between 2001 and 2007 were followed by phases of retrenchment and state consolidation, such as the "governance and rectification" campaign of the early 1990s and the recent reassertion of state control over the platform economy. Similarly, in the United States, the financial market experiences cycles of deregulation and regulatory tightening, often synchronized with credit expansions and financial crises. These observations raise a central question: What drives these systematic oscillations in economic policy, and how do they interact with macroeconomic dynamics?

In this paper, we propose a theoretical framework—which we call the "pendulum model"—to explain these patterns. We argue that policy oscillations are endogenous outcomes when a policymaker attempts to reconcile two conflicting objectives: meeting explicit growth mandates and maintaining control over the distribution of economic resources. In our model, the policymaker faces both a hard constraint on the share of private wealth (or capital) to ensure political or systemic stability and a penalty for failing to meet a specified growth target. The private sector are typically more productive, but they also accumulate wealth faster. Thus, meeting high growth targets requires relaxing controls on private activities, which inevitably increases the private wealth share. The economy eventually hits the control constraint, forcing the policymaker to retrench. This cycle of expansion and retrenchment generates endogenous fluctuations in economic growth and policy stance, even in the absence of exogenous shocks.

We motivate this theoretical framework with stylized facts from China and the United States. First, we document the policy pendulum in China by analyzing the gap in the investment growth rate between private firms and state-owned enterprises (SOEs) from 1981 to 2024. We show that investment cycles coincide with major policy shifts, such as the pro-market reforms of the 1980s and the resurgence of SOE-led investment after 2008. Second, we examine the role of GDP growth targets. During the high-growth period before 2011, the growth targets announced by the central government served mainly as soft lower bounds. In contrast, during the "New Normal" after 2011, these targets have become binding constraints, and the government has gradually lowered them to manage the slowdown. Using regional case studies, we also highlight the risks of forcibly maintaining high growth targets, as unsustainable growth targets can lead to sharp economic contractions. Third, we provide cross-country evidence from the U.S. We show that financial deregulation often coincides with credit expansions and asset price bubbles, while financial crises are often followed by tighter regulations, suggesting the universal trade-off between efficiency and stability.

Our quantitative analysis demonstrates that the pendulum model can replicate the key features of China's growth experience. Calibrated to match historical data, the model generates endogenous

cycles, where periods of high growth and rising private wealth shares are followed by periods of slower growth and state consolidation. We further explore the implications of the model for policy design. Aggressive growth targets increase the mean growth rate but also make growth more volatile, generating a mean-volatility trade-off. Importantly, we find that a "soft landing"—a smooth transition to lower growth—is possible if the policymaker gradually lowers the growth mandate before the control constraint becomes binding. This avoids the sharp contraction from defending unsustainable targets.

To establish the robustness of our mechanism, we extend the analysis to a standard neoclassical growth model. We show that the introduction of a growth mandate into a textbook framework with diminishing returns to capital can also generate endogenous investment cycles. In this setting, there is no concern about maintaining state control, but the underlying logic is similar. More investment raises growth. But when capital is abundant, meeting a growth target requires even more investment, eventually making the target too difficult to meet. Consequently, the economy exhibits cycles of over- and under-investment relative to an economy without the growth target.

Related literature. This paper contributes to the literature on political economy and macroeconomic policy by providing a unified framework for understanding policy cycles in both authoritarian and democratic contexts. Existing studies often attribute policy swings to exogenous shocks or political turnover (Nordhaus, 1975; Hibbs, 1977; Alesina, 1987; Rogoff, 1990; Persson and Tabellini, 1990). In contrast, we highlight that these swings can be endogenously driven by the structural tension between growth and control. By linking theoretical analysis to empirical evidence from China and the U.S., we offer new insights into the dynamics of economic governance and the challenges of managing long-term growth transitions.

Our paper is also related to the literature on the theory of endogenous cycles. See, e.g., Benhabib and Nishimura (1979); Cass and Shell (1983); Woodford (1991); Benhabib and Farmer (1994); Boldrin and Rustichini (1994); Christiano and Harrison (1999); Beaudry et al. (2020). We differ from these studies by emphasizing that cycles are driven by endogenous swings in government policy, and the emergence of cycles in our environment does not hinge on knife-edge parameter choices.

This paper is most closely related to studies on policy cycles in China (Lin et al., 1996; Naughton, 1996; Brandt and Zhu, 2000; Wang, 2021; Cheremukhin et al., 2024; Xu et al., 2025). Our work complements this literature by providing a unified framework that features perpetual cycles that do not converge to a steady state and quantifying its role in shaping China's economic fluctuations and growth. We also highlight a trade-off between volatility and growth rate faced by the policymaker.

Finally, our paper is also related to recent work on the Mandarin model of growth, where market mechanisms coexist with active government intervention through public investment, growth targets, and monetary policy (Song and Xiong, 2026; Chang et al., 2025; Chang and Xiong, 2026). Relative to them, we focus on how the interaction between state control over the private sector and growth targets can generate endogenous cycles in policy and economic growth.

The remainder of the paper is organized as follows. Section 2 presents the motivating evidence from China and the U.S. Section 3 develops the theoretical model. Section 4 provides quantitative explorations of the Chinese case. Section 5 extends the analysis to a neoclassical framework. Section 6 concludes.

2. Motivating Evidence

This section documents the stylized facts that motivate our theoretical framework. We provide empirical evidence on the cyclicality of economic policy, namely the oscillation between state control and market liberalization. While our primary focus is on the Chinese economy, we also provide evidence from the United States to illustrate that similar patterns appear across different institutional settings.

2.1 The Policy Pendulum in China

We first document the presence of policy cycles in China, characterized by alternating phases of "pro-private" and "pro-state" interventions. Figure 1 plots three series for 1981–2024: the spread between the growth rate of private fixed asset investment and that of state-owned enterprises (SOEs) (shaded area), the aggregate GDP growth rate (gray bars), and a timeline of major policy changes and reforms (labeled boxes). The shaded regions indicate the direction of the spread. Red areas denote periods in which private investment outpaced SOE investment, which we use as a proxy for pro-private regimes. In contrast, blue areas denote periods in which private investment lagged behind. We interpret them as periods of pro-state interventions.

Specifically, this figure suggests a "pendulum" pattern that accompanies major policy shifts:

- **Rise of TVEs (1980s)** The early reform era saw the explosion of Township and Village Enterprises (TVEs). During that time, many entities operated as "Red Hat" firms, which were nominally collective entities to obtain political protection but effectively private. They led to a surge in non-state activities.

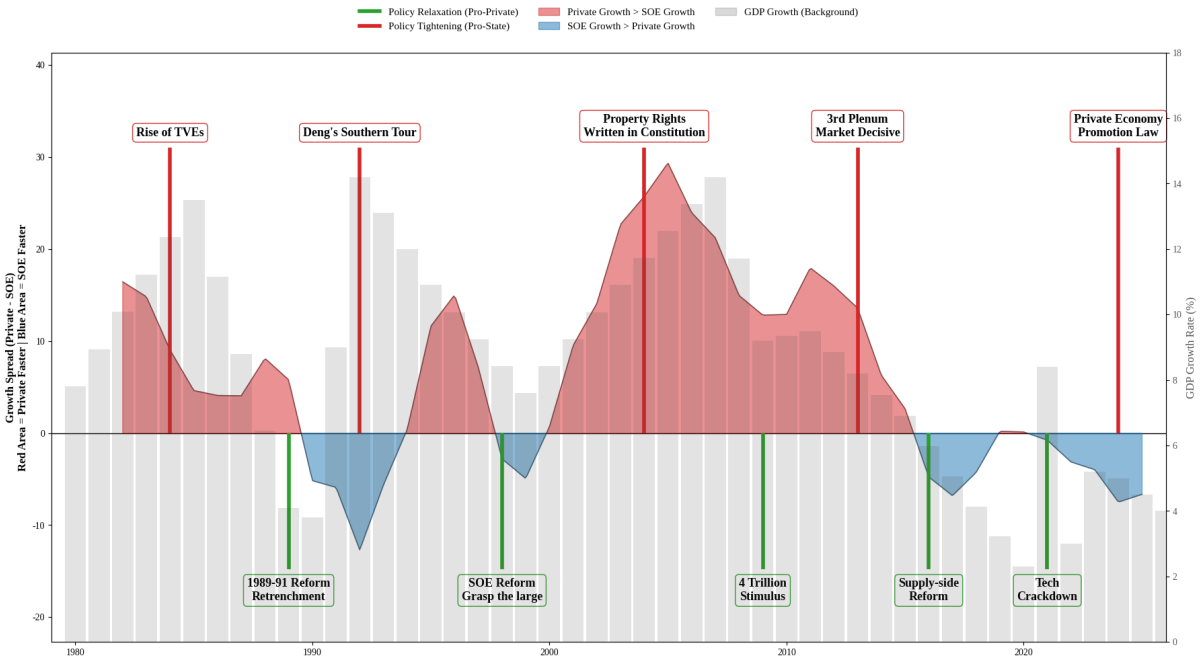
- **Retrenchment (1989–1991)** Following the political turmoil during the late 1980s, the government implemented a "governance and rectification" program, which led to a shift in the ideological climate against private firms. Private credit was also tightened. Consequently, the spread between private-SOE investment experienced a sharp contraction (the first blue trough).

- **The Pro-Market Boom (1992–2000s)** Deng Xiaoping's "Southern Tour" in 1992 renewed support for market reforms. This was then followed by writing "inviolability of private property" into the Constitution in 2004. These reforms strengthened confidence in the private sector, leading to a decade-long dominance of private growth.[12]

[1] We label "Grasp the Large" as strengthening state control. Although it privatized small firms, it aimed to strengthen state control over key strategic sectors ("National Champions"). Therefore, the state retained its control over those "commanding heights", even as the number of state-owned firms declined.

[2] SOE investment grew faster again than private investment around 1998 during the Asian Financial Crisis. To meet

Figure 1: Policy Cycles in China's Pro-SOE and Pro-Private Policies



Notes: The figure displays the spread between the growth rate of private fixed asset investment and that of state-owned enterprises (SOEs) (left axis, shaded areas), alongside the real GDP growth rate (background bars). Data are from the National Bureau of Statistics (NBS). Due to changes in the statistical standards, the series is constructed in two phases separately: (1) for 1981–2003 we use "Non-State" vs. "State-owned Units" investment; (2) for 2004–2024, we use officially published "Private" vs. "State-owned and State-holding" investment. We smooth the spread series using a three-year moving average. Red (blue) shaded areas indicate periods where private (state) investment growth exceeds state (private) investment growth. Text boxes denote major policy events. See footnotes 1 and 2 for the classification of "Grasp the Large" and the blue trough circa 1998.

- **The Reversal (Post-2008)** The "pendulum" became pro-state again after the Global Financial Crisis. To stabilize the economy, the government initiated the "Four Trillion Yuan" stimulus. However, it was implemented primarily through SOEs. Moreover, despite the declaration to let the "market play a decisive role" in 2013 during the Third Plenum, subsequent policies have re-asserted state control. Prominent examples include the "Supply-Side Structural Reform", which reduced capacity largely in private SMEs, and the recent crackdown on the platform economy and technology sectors (e.g., Alibaba, Tencent) to prevent the "disorderly expansion of capital".

- **Recent Stabilization (2025-)** Most recently, in response to the intensified downward pressure on GDP growth, policy exhibits a tendency to shift again toward supporting the private sector, which is exemplified by the drafting of the Private Economy Promotion Law.

This historical trajectory highlights a recurring oscillation that periods of deregulation and private sector expansion are often followed by periods of re-regulation and state consolidation.

the growth mandate and maintain the currency peg, the government launched a large fiscal stimulus program focused on infrastructure investments. Those investments were primarily carried out by SOEs. Thus, the increase in SOE investment during this period reflected the government's effort to stabilize the economy instead of a shift in ideology.

2.2 Growth Mandates and the "Soft Landing"

A second key feature of the Chinese economy is the role of explicit GDP growth targets. Figure 2 plots the annual growth target announced by the central government against the realized GDP growth rate from 1985 to 2025.

Figure 2: China's GDP Growth Targets and the Realized Growth Rates

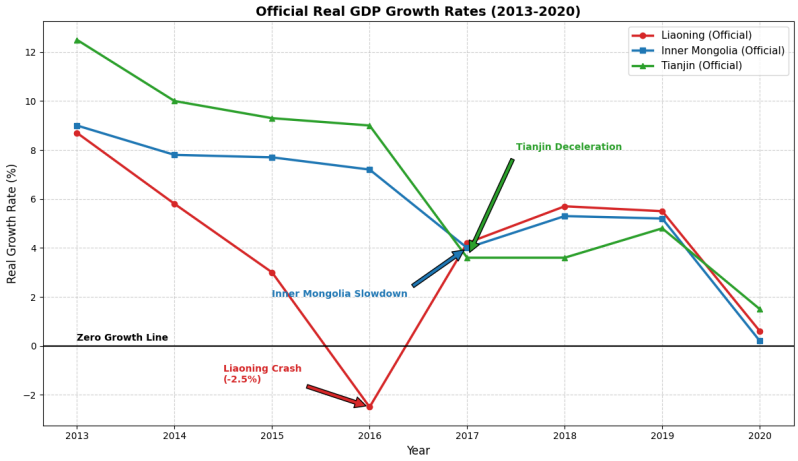


Notes: The solid line represents the official real GDP growth target announced by the central government in the annual Government Work Report. The bars represent the realized annual real GDP growth rate reported by the NBS. The figure illustrates the evolution from a "high-growth" regime (pre-2011), where targets acted as soft lower bounds, to a "New Normal" regime (post-2011), where targets function as binding constraints characterized by managed deceleration and high compliance.

The relationship between the target and the realized growth can be divided into two phases. In the high-growth era (prior to 2011), the growth target mostly functioned as a soft lower bound, and the realized growth rate frequently exceeded the target substantially (e.g., during the "Keep Eight" era). However, as the economy entered a phase of slower potential growth (the "New Normal" after 2011), the target became a binding constraint. The realized growth rate in this latter period has tracked the target closely.

Furthermore, the data suggests a managed deceleration after 2011 at the national level. As shown in Figure 2, the official target has been gradually lowered from 8% to around 5%. Figure 3 provides regional evidence on the potential risks from forcibly maintaining high growth rates. Provinces such as Liaoning and Inner Mongolia, which tried to maintain high growth rates despite deteriorating fundamentals, eventually experienced sharp economic contractions.

Figure 3: Regional Sudden Stops



Notes: The figure plots the nominal GDP growth rates for Liaoning and Inner Mongolia provinces, using data from Provincial Statistical Yearbooks. The sharp declines observed (statistical "sudden stops") illustrate the consequences of maintaining high growth rates that are inconsistent with deteriorating local economic fundamentals, eventually necessitating drastic corrections.

2.3 Cross-Country Evidence: U.S. Financial Cycles

Finally, we provide suggestive evidence that similar patterns of policy oscillation between tightening and loosening are not unique to China. Figure 4 provides an analogous depiction for the U.S. since 1980, which plots a measure of credit expansion/tightening (shaded area), the detrended S&P 500 index (dashed line), and major policy changes in financial regulation and deregulation (labeled). It also marks financial crises explicitly (black crosses).

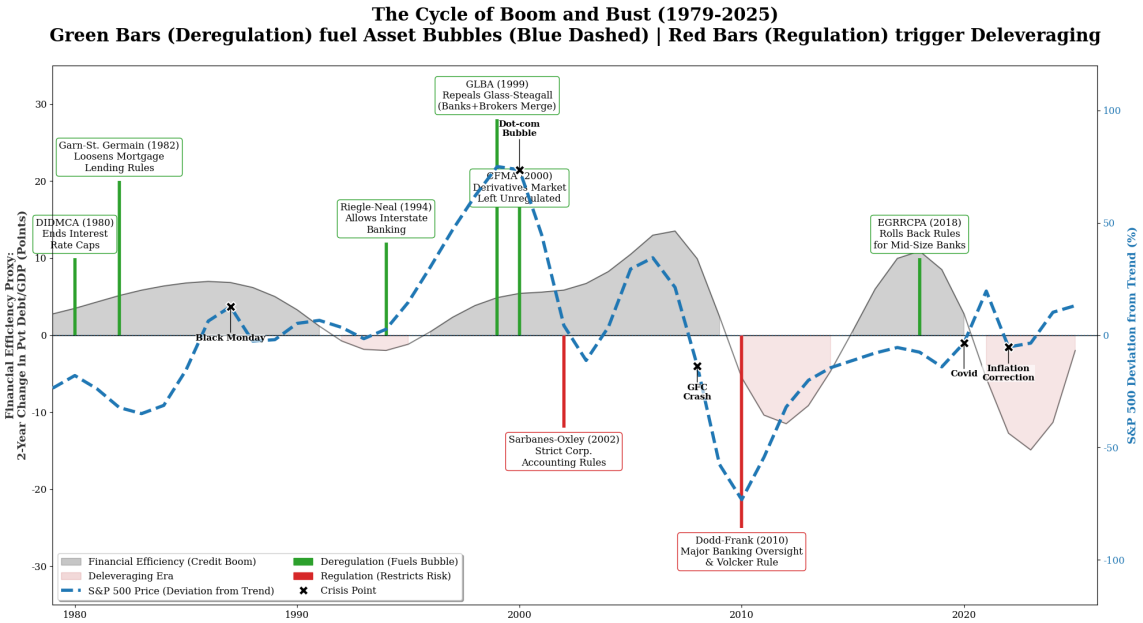
The U.S. financial system exhibits a similar cycle. Periods of deregulation, such as the repeal of the Glass-Steagall Act (1999), often coincide with credit and asset price expansions. Although this may enhance economic efficiency, it also introduces potential bubbles in asset prices. Conversely, after a financial crisis, policy tends to swing back towards tighter control of the financial market, exemplified by the Sarbanes-Oxley Act (2002) and the Dodd-Frank Act (2010).

Together, these patterns suggest a potential tradeoff between economic efficiency and stability / state control. We next formalize this tradeoff and show that it can generate the policy "pendulum" endogenously.

3. Theory

In this section, we provide a framework which can be viewed as an AK growth model with financial frictions. Importantly, the degree of the friction can be influenced by the policymaker. We then illustrate the tradeoff faced by the policymaker that leads to a perpetual policy swing.

Figure 4: Policy Cycle in the US Financial Regulations and Deregulations



Notes: The figure plots suggestive evidence of financial cycles and changes in U.S. financial regulation using data from FRED and S&P Global. The blue dashed line shows the percentage deviation of the real S&P 500 index from its long-run trend (fitted using a log-linear specification). The shaded areas show the credit impulse, measured as the two-year change in the debt-to-GDP ratio in the U.S. private non-financial sector. Grey areas indicate credit expansion, while red areas indicate deleveraging. Vertical bars show major policy changes. Green bars indicate deregulation, such as the 1999 Gramm-Leach-Bliley Act, while red bars indicate regulatory tightening, such as the 2010 Dodd-Frank Act. Black crosses mark major financial crises.

3.1 Environment

Households. The economy is populated by two representative households, a private household p and a state household s. Each household is forward looking and takes the return on its wealth as given. Household $j \in \{p, s\}$ accumulates wealth by solving

$$\max_{\{c_{j,t}, a_{j,t+1}\}_{t\geq 0}} \sum_{t=0}^{\infty} \beta_j^t \log c_{j,t}$$
$$s.t. \quad c_{j,t} + a_{j,t+1} = R_{j,t} a_{j,t}$$

where $a_{j,t}$ is the beginning-of-period wealth, β_j is the discount factor, and the type-specific return $R_{j,t}$ is taken as given by the household.

Household $j \in \{p, s\}$ has access to a linear production technology through a representative firm also labeled as j. In particular, firm j produces the final good Y using capital according to

$$Y_{j,t} = z_j K_{j,t}$$

where z_j is the productivity of firm j. Household j does not have access to the other production

technology. We assume that the private firm is more productive than the state firm, i.e., $z_p > z_s$.

Policymaker. The policymaker controls the amount of capital that the private household can invest in the private firm. In particular, the policymaker sets λ_t such that

$$K_{p,t} \leq \lambda_t a_{p,t}.$$

In the baseline model, we assume that $\lambda_t \in [0, 1]$. Therefore, the private household can only use part of its wealth to produce in the private firm. It lends the rest of its wealth to the state household through a competitive lending market, and the state household can use that to produce in the state firm. A higher λ_t means the private household can direct more of its wealth to the private firm.

The policymaker faces two objectives in this economy: containing the accumulation of private wealth and maintaining a sufficiently high growth rate. Denote by μ_t the private wealth share, i.e.,

$$\mu_t = \frac{a_{p,t}}{a_{p,t} + a_{s,t}},$$

and denote by g_t the output growth rate, i.e.,

$$g_t = \frac{Y_{p,t} + Y_{s,t}}{Y_{p,t-1} + Y_{s,t-1}}.$$

In addition to the general preference for higher growth, the policymaker also faces an explicit growth mandate: a payoff loss will incur if $g_t < \overline{g}$. This captures the idea that an explicit growth target is often imposed on different levels of governments.

In this section, we focus on the case where the policymaker is myopic, which allows us to obtain analytical tractability. We will extend the analysis to the full rational forward-looking case in Section 4. In particular, we assume that the policymaker's objective function is

$$\max_{\lambda_t} \alpha \log(g_t) + (1 - \alpha) \log(\bar{\mu} - \mu_{t+1}) - \chi \mathbb{I}(g_t < \bar{g}),$$

subject to the laws of motion of $\{\mu_{t+1}, g_t\}$ induced by policy instrument λ_t in the decentralized economy. In this objective function, $\alpha \in (0, 1)$ captures the relative weight the policymaker puts on growth and on the private wealth share, $\bar{\mu} \in (0, 1)$ is an upper bound for the private wealth share and captures the state control over private wealth, and χ is the per-period punishment if the policymaker fails to meet the growth mandate, indicated by the indicator function. However, unlike the growth mandate, the ceiling of the private wealth share is a hard constraint that the policymaker can never violate.

3.2 The Decentralized Economy

We first characterize the decentralized economy for a given path of the policy instrument. In period t, given the capital cap λ_t and the wealth of the two households $\{a_{p,t}, a_{s,t}\}$, the private firm uses

$K_{p,t} = \lambda_t a_{p,t}$ in production, while the state firm uses $K_{s,t} = a_{s,t} + (1 - \lambda_t)a_{p,t}$ in production. The implied total output is

$$Y_t = z_p K_{p,t} + z_s K_{s,t} = z_s K_t + \lambda_t (z_p - z_s) a_{p,t},$$

where $K_t = K_{p,t} + K_{s,t}$ is the total capital stock in period t.

Since the state household puts all of its capital in the state firm, their capital return is simplify

$$R_s = z_s.$$

For the private household, a fraction λ_t of their wealth earns return z_p, and the rest earns return z_s. As a result, the effective wealth return is

$$R_p(\lambda_t) = \lambda_t z_p + (1 - \lambda_t) z_s$$

Further more, the consumption-saving decision is particularly simple: households choose a constant saving rate that equals to their discount factor β_j.

Lemma 3.1. *Given the capital cap λ_t and the beginning-of-period wealth, the evolution of wealth satisfies*

$$a_{p,t+1} = \beta_p R_p(\lambda_t) a_{p,t}, \quad a_{s,t+1} = \beta_s R_s a_{s,t}$$

With Lemma 3.1, the policymaker's two targets, private wealth share in the next period μ_{t+1}, and the output growth rate g_t, can be written as functions of the current private wealth share μ_t, and the policy λ_t.

Lemma 3.2. *Given the current private wealth share μ_t and policy λ_t, the private wealth share next period and the output growth rate are*

$$\mu_{t+1} = \mathcal{M}(\mu_t, \lambda_t) \equiv \frac{\mu_t \beta_p R_p(\lambda_t)}{(1 - \mu_t)\beta_s R_s + \mu_t \beta_p R_p(\lambda_t)} \tag{3.1}$$

$$g_t = \mathcal{G}(\mu_t, \lambda_t) \equiv \beta_s \beta_p \frac{z_s + (z_p - z_s)\lambda_t \mu_t}{\beta_p + (\beta_s - \beta_p)\mu_t} \tag{3.2}$$

Moreover, μ_{t+1} increases with both μ_t and λ_t, and g_t increases with λ_t.

Lemma 3.2 already hints at a policy tradeoff the policymaker faces. On the one hand, a looser private capital restriction (higher λ_t) raises the private wealth share next period, as the private household gets a higher capital return. This is not desirable to the policymaker as it makes μ_t closer to its binding ceiling $\overline{\mu}$. On the other hand, a higher λ_t leads to a higher output growth rate, as more capital is directed to the more efficient private firm, which helps policymaker to meet the growth mandate.

3.3 Characterization of Myopic Policymaker

With the myopic policymaker, the choice of λ_t only to maximize the current-period payoff, taking the current private wealth share μ_t as given. To simplify notation, in this subsection we drop the time subscript and write

$$U(\mu, \lambda) = \alpha \log \mathcal{G}(\mu, \lambda) + (1 - \alpha) \log (\bar{\mu} - \mathcal{M}(\mu, \lambda)) - \chi \mathbb{I}(\mathcal{G}(\mu, \lambda) < \bar{g})$$

Denote by $\Lambda(\mu)$ the feasible set when the current private wealth share is μ, which is

$$\Lambda(\mu) = \{\lambda \in [0, 1] : \mathcal{M}(\mu, \lambda) < \bar{\mu}\}$$

Denote $\lambda^*(\mu)$ as the optimal myopic policy rule, and $\Phi(\mu)$ the resulting private wealth share next period following that policy,[3] i.e.,

$$\lambda^*(\mu) = \arg \max_{\lambda \in \Lambda(\mu)} U(\mu, \lambda), \qquad \Phi(\mu) = \mathcal{M}(\mu, \lambda^*(\mu))$$

The function Φ characterizes the law of motion of the private wealth share induced by the myopic policymaker. The rest of this subsection builds the mechanism in three steps. First, we characterize the policy threshold that keeps the private wealth share constant. Second, we show that a nontrivial growth mandate forces the policymaker to choose above that policy threshold whenever it wants to satisfy the mandate. Third, we show why this growth mandate is not sustainable all the way to the control cap on the private wealth share. The policy pendulum is the result of putting these two forces together.

3.3.1 Assumptions and Useful Objects

Before analyzing the problem of the myopic policymaker, we first state some assumptions and define a few useful objects.

We impose two restrictions that make the problem economically meaningful. The first one says that the private firm has a higher productivity than the state firm, while the second one says that the growth target is neither trivially high nor trivially low.

Assumption 1. *Private firms are more productive, but private households are more impatient:*

$$\beta_p z_s < \beta_s z_s < \beta_p z_p$$

This assumption makes the policy instrument nontrivial. If private wealth is operated by the state firm, private wealth grows more slowly than state wealth, because the private household is less pa-

[3] We assume that whenever the policymaker is indifferent between meeting the mandate and missing it, the policymaker chooses to meet the mandate. Under this tie-breaking rule, one can show that the optimal policy is unique for all $\mu \in [0, \bar{\mu})$.

tient. If private wealth is operated by the private firm, private wealth grows faster than state wealth, because the private firm has a higher productivity. This implies that there is an interior policy that keeps the private wealth share constant.

Assumption 2. *The growth mandate is nontrivial:*

$$\beta_s z_s < \bar{g} < \mathcal{G}(\bar{\mu}, 1)$$

The lower bound means that the policymaker cannot satisfy the mandate by channeling all resources to the public household, because in that case, the maximal growth rate is $\beta_s z_s$. The upper bound rules out the case in which the mandate is never attainable even under the loosest private capital restriction. Thus the mandate is feasible in principle, but it needs the help from the private firm.

Define Three Policy Thresholds. We define three thresholds for the policy choice λ, which facilitate our analysis.

The first one, denoted by $\lambda^c(\mu)$, is the policy threshold at which the private wealth share next period exactly reaches the cap $\bar{\mu}$, i.e.,

$$\mathcal{M}(\mu, \lambda^c(\mu)) = \bar{\mu}$$

For any current state μ, the feasible policy choice must be lower than $\lambda^c(\mu)$. That is, for $\mu \in (0, \bar{\mu})$, the feasible set can be written as $\Lambda(\mu) = [0, 1] \cap [0, \lambda^c(\mu))$.

The second one, denoted by $\bar{\lambda}$, is the policy threshold at which private wealth and public wealth grow at the same rate. It satisfies

$$\beta_p R_p(\bar{\lambda}) = \beta_s R_s$$

Since $R_p(\lambda) = z_s + \lambda(z_p - z_s)$ and $R_s = z_s$, Lemma 3.1 implies that policies above $\bar{\lambda}$ make private wealth grow faster, while policies below $\bar{\lambda}$ make it grow more slowly. Also notice that $\bar{\lambda}$ is independent of the current private wealth share μ.

The third one, denoted by $\lambda^g(\mu)$, is the policy threshold that can exactly meet the growth mandate $\bar{g}$. It therefore satisfies

$$\mathcal{G}(\mu, \lambda^g(\mu)) = \bar{g}$$

When $\lambda^g(\mu) \in [0, 1]$, the mandate can be met at state μ. When $\lambda^g(\mu) > 1$, the current private sector is too small to meet the mandate.

The no-mandate benchmark. The final preparation before we analyze the problem of a myopic policymaker is to define the benchmark without the growth mandate. One can also think of it as the special case where the cost of missing the mandate is zero. Define

$$u^0(\mu, \lambda) = \alpha \log \mathcal{G}(\mu, \lambda) + (1 - \alpha) \log (\bar{\mu} - \mathcal{M}(\mu, \lambda))$$

and

$$\lambda^0(\mu) = \arg\max_{\lambda \in \Lambda(\mu)} u^0(\mu, \lambda)$$

Without the nonlinearity introduced by the growth mandate, the problem is smooth. It is not difficult to show that this no-mandate benchmark cannot generate endogenous cycles. Instead, the economy will converge to a steady state in which $\lambda = \bar{\lambda}$, and the share of private wealth stays constant. As we will show shortly, the growth mandate is necessary to generate endogenous cycles.

3.3.2 Characterization

The next lemma shows the dynamics of the private wealth share and the output growth rate when policy is set to $\bar{\lambda}$. There, since private and public wealth grow at the same rate, the private wealth share exactly stays constant. Consequently, policies above $\bar{\lambda}$ lead the economy to private expansion, while policies below it lead the economy back to state control.

Lemma 3.3. *For any $\mu \in (0, \bar{\mu})$, when policy $\lambda = \bar{\lambda}$, the private wealth share stays unchanged, and the output growth rate is $\beta_s z_s$. Namely,*

$$\mathcal{M}(\mu, \bar{\lambda}) = \mu, \qquad \mathcal{G}(\mu, \bar{\lambda}) = \beta_s z_s$$

Proof. At $\bar{\lambda}$, private and state wealth grow at the same rate: $\beta_p R_p(\bar{\lambda}) = \beta_s R_s = \beta_s z_s$. Substituting this equality into the law of motion for the private wealth share (3.1), we have $\mathcal{M}(\mu, \bar{\lambda}) = \mu$. Substituting the same equality in the growth rate (3.2) and simplifying terms, we obtain that the aggregate output grows at rate $\beta_s z_s$. □

Given Assumption 2, Lemma 3.3 shows that the policy $\bar{\lambda}$ that keeps the private wealth share constant cannot meet the growth mandate. There, the output growth rate looks as if the public firm owns and operates all the capital. In order to meet the growth mandate, however, the policymaker must allow the private firm to have more access to the financial market, which necessarily allows the private wealth share to grow. This leads to the central tradeoff in the next proposition.

Proposition 1. *Under Assumptions 1 and 2, any feasible policy that meets the growth mandate must lie above $\bar{\lambda}$ that keeps the private wealth share constant. As a result, the private wealth share must grow. Namely, whenever $\lambda^g(\mu) \in \Lambda(\mu)$, we have*

$$\lambda^g(\mu) > \bar{\lambda}, \qquad \mathcal{M}(\mu, \lambda^g(\mu)) > \mu.$$

Proof. By Lemma 3.3, at $\bar{\lambda}$, the growth is $\beta_s z_s$, which is lower than the growth mandate $\bar{g}$ according to Assumption 2. Since $\mathcal{G}(\mu, \lambda)$ is strictly increasing in λ for $\mu > 0$, meeting the mandate requires $\lambda^g(\mu) > \bar{\lambda}$. Since $\mathcal{M}(\mu, \lambda)$ is also strictly increasing in λ, the policy that meets the growth mandate must raise the private wealth share in the next period. □

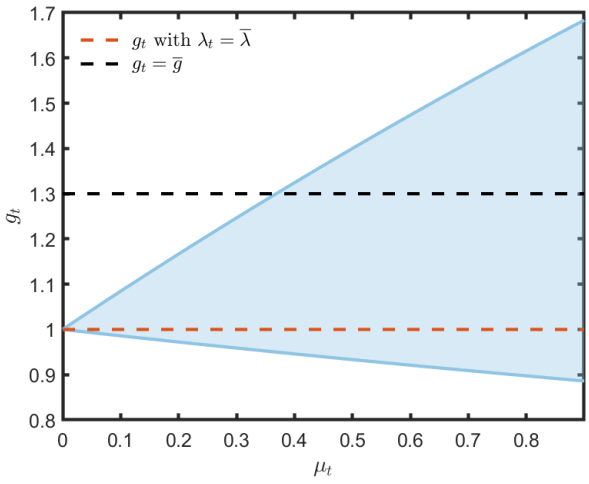
Here, the conflict in the policy objective is that the policymaker has only one instrument for two competing goals. Giving the private sector more access to the financial market raises the current

growth rate. However, it also allows it to accumulate capital more rapidly than the public sector, which raises the private wealth share in the future.

Figure 5 illustrates Proposition 1 in a more transparent way. The shaded area corresponds to the attainable growth rates for each value of the private wealth share μ_t. The upper bound is obtained by setting $\lambda_t = 1$ and the lower bound is obtained by setting $\lambda_t = 0$. With a higher share of private wealth, a higher growth rate level can be potentially achieved. When setting $\lambda_t = \bar{\lambda}$, the level that ensures a constant share of private wealth, the growth rate is equal to $\beta_s z_s$. This level corresponds to the red dashed line in Figure 5, which is generally at the lower end of the growth potential.

Consider the case in which the policymaker wants to achieve a growth rate $\bar{g} > \beta_s z_s$. Notice that this is possible only if μ_t is sufficiently high and λ_t is above $\bar{\lambda}$. However, setting $\lambda_t > \bar{\lambda}$ for sufficiently long will eventually push μ_t towards one. This is the challenge that the policymaker faces: It is impossible to maintain a relatively high growth rate and a relatively high share of state wealth at the same time.

Figure 5: Growth Rates



While Proposition 1 shows that the policymaker must allow the private wealth share to increase if she chooses to meet the growth mandate, it does not tell us whether the policymaker is willing to do that. The latter depends on how large the punishment χ is if the policymaker misses the mandate. When χ is small, the policymaker may not even care about it and focus on maintaining state control. When χ is large, however, the policymaker may have an incentive to meet the mandate, especially when the shadow cost of allowing the private wealth share to grow is small relative to the punishment. The next result formalizes the above reasoning.

Proposition 2. *Suppose meeting the growth mandate is feasible but not optimal without the punishment at the current private wealth share μ, i.e., $\mathcal{G}(\mu, \lambda^0(\mu)) < \bar{g}$ and $\lambda^g(\mu) \in \Lambda(\mu)$. Then there exists a finite $\chi^*(\mu)$ such that the myopic policymaker sets $\lambda = \lambda^g(\mu)$ to exactly meet the growth mandate whenever the punishment $\chi \geq \chi^*(\mu)$.*

Proof. If the policymaker chooses to miss the mandate, the optimal choice of λ would be the same as in the no-mandate benchmark. Therefore, the best payoff from missing the mandate is $u^0(\mu, \lambda^0(\mu)) - \chi$. If the policymaker chooses to meet the mandate, the best payoff is then

$$W^g(\mu) = \sup_{\lambda \in \Lambda(\mu),\ \mathcal{G}(\mu,\lambda) \geq \bar{g}} u^0(\mu, \lambda)$$

Thus the policymaker chooses to satisfy the growth mandate whenever

$$\chi \geq u^0(\mu, \lambda^0(\mu)) - W^g(\mu) \equiv \chi^*(\mu)$$

□

Combining Propositions 1 and 2, for any given $\mu \in [0, \bar{\mu})$, the growth mandate under some cost χ can give the policymaker an incentive to set a relatively loose policy $\lambda^m(\mu) > \bar{\lambda}$. This has an implication for the dynamics of the economy. Without the growth mandate or $\chi = 0$, under some regularity conditions, the economy settles in an interior steady state where $\lambda = \bar{\lambda}$. In a phase diagram, it is the intersection of the law of motion $\Phi(\mu)$ of the private wealth share with the $45°$ line. With an active growth mandate, meeting the mandate at some μ means lifting $\Phi(\mu)$ above the $45°$ line. By carefully choosing the cost χ, one can eliminate the steady state by lifting that point (and a neighborhood of it, by a continuity argument) above the $45°$ line, while keeping the rest of $\Phi(\mu)$ unchanged. The left panel of Figure 6 illustrates this, in which the interior steady state is eliminated.

However, for any given cost χ, the policymaker's incentive to meet the growth mandate no longer exists when the private wealth share is sufficiently large. When μ is close to the cap $\bar{\mu}$, the marginal cost of allowing a marginal increase in μ would be too large for the policymaker to sustain, relative to the fixed punishment of missing the mandate. The next proposition formalizes this idea.

Proposition 3. *For any given punishment χ, the policymaker would optimally choose $\lambda < \bar{\lambda}$ when the private wealth share μ is sufficiently large. Namely, there exists $\varepsilon > 0$ such that for all $\mu \in (\bar{\mu} - \varepsilon, \bar{\mu})$*

$$\lambda^m(\mu) < \bar{\lambda} \quad \textit{and} \quad \Phi(\mu) < \mu$$

Proof. We sketch the outline of the proof here and leave the complete proof in Appendix 6. We show that when μ is sufficiently close to $\bar{\mu}$, setting $\lambda = 0$ yields higher value than any $\lambda > \bar{\lambda}$. Under Assumption 1, the policy $\lambda = 0$ is feasible and reduces the private wealth share in the next period, moving it away from $\bar{\mu}$. By contrast, for any $\lambda \geq \bar{\lambda}$, Lemma 3.3 and the monotonicity of $\mathcal{M}$ imply $\mathcal{M}(\mu, \lambda) \geq \mu$. Therefore $\bar{\mu} - \mathcal{M}(\mu, \lambda) \leq \bar{\mu} - \mu$, and the $\log(\bar{\mu} - \mu)$ term goes to $-\infty$ as μ approaches $\bar{\mu}$. Since the gain from growth and the penalty for missing the mandate are bounded, all policies with $\lambda \geq \bar{\lambda}$ are dominated by $\lambda = 0$ when μ is sufficiently close to the cap. Thus $\lambda^m(\mu) < \bar{\lambda}$ and $\Phi(\mu) < \mu$ in a neighborhood of $\bar{\mu}$. □

Propositions 2 and 3 together imply that the incentive to meet the growth mandate depends on the state μ. The incentive is strong when the private wealth share is relatively low, because the policymaker can achieve growth relatively easily. Although this raises μ, the policymaker does not have to worry about losing state control immediately. Near the cap, however, the incentive to restore state control dominates the incentive to maintain a high growth rate. The policymaker retrenches by lowering λ, generating lower growth but pushing μ away from $\bar{\mu}$. Notice Proposition 3 applies to the no-mandate benchmark as well ($\chi = 0$). Namely, there exists some ε^0 such that $\lambda^0(\mu) < \bar{\lambda}$ for all $\mu \in (\bar{\mu} - \varepsilon^0, \bar{\mu})$. This property will be useful next.

Now, we are ready to state the policy pendulum by putting these pieces together.

Proposition 4. *Suppose there exists $\mu^e \in (\bar{\mu} - \varepsilon^0, \bar{\mu})$ and $\lambda^e \in \Lambda(\mu^e)$ such that*

$$\mathcal{G}(\mu^e, \lambda^e) > \bar{g}, \qquad \mathcal{G}(\mu^e, \lambda^0(\mu^e)) < \bar{g}$$

Then, there exists some $\bar{\chi}$ such that, for every finite $\chi \geq \bar{\chi}$, there exist $\mu_L < \mu_M < \mu_H(\chi) < \bar{\mu}$ such that

$$\lambda^m(\mu) > \bar{\lambda}, \Phi(\mu) > \mu, \quad \forall \mu \in (\mu_L, \mu_M),$$

$$\lambda^m(\mu) \neq \bar{\lambda}, \Phi(\mu) \neq \mu, \quad \forall \mu \in (\mu_M, \mu_H(\chi)),$$

and

$$\lambda^m(\mu) < \bar{\lambda}, \Phi(\mu) < \mu, \quad \forall \mu \in (\mu_H(\chi), \bar{\mu}).$$

The condition says that there is at least one interior state where the growth mandate is genuinely relevant and causes a conflict between growth and control. It is attainable, because some feasible policy λ^e reaches the target with slack and without violating the control cap. It is also not automatically satisfied, because the smooth no-mandate policy $\lambda^0(\mu^e)$ would miss the target. By continuity, the same economic situation holds in a small interval around μ^e. On this interval, a large enough mandate penalty makes the policymaker cross the growth threshold. In addition, absent the growth mandate, this point lies in a region where the policymaker wants to reduce the private wealth share.

Proof. By continuity, there exists $\eta > 0$ such that $I = [\mu^e - \eta, \mu^e + \eta] \subset (\bar{\mu} - \varepsilon^0, \bar{\mu})$ and, for every $\mu \in I$, the mandate is feasible with slack and $\mathcal{G}(\mu, \lambda^0(\mu)) < \bar{g}$. For each $\mu \in I$, Proposition 2 gives a finite threshold $\chi^*(\mu)$ above which the policymaker chooses a target-meeting policy. Since I is compact, the payoff objects are continuous away from the cap, and the mandate is feasible with slack throughout I, $\bar{\chi} = \sup_{\mu \in I} \chi^*(\mu)$ is finite. For every $\chi \geq \bar{\chi}$, the policymaker meets the mandate throughout I. Proposition 1 then implies $\lambda^m(\mu) \geq \lambda^g(\mu) > \bar{\lambda}$, and Lemma 3.3 implies $\Phi(\mu) > \mu$, for all $\mu \in I$. Set $\mu_L = \mu^e - \eta$ and $\mu_M = \mu^e + \eta$.

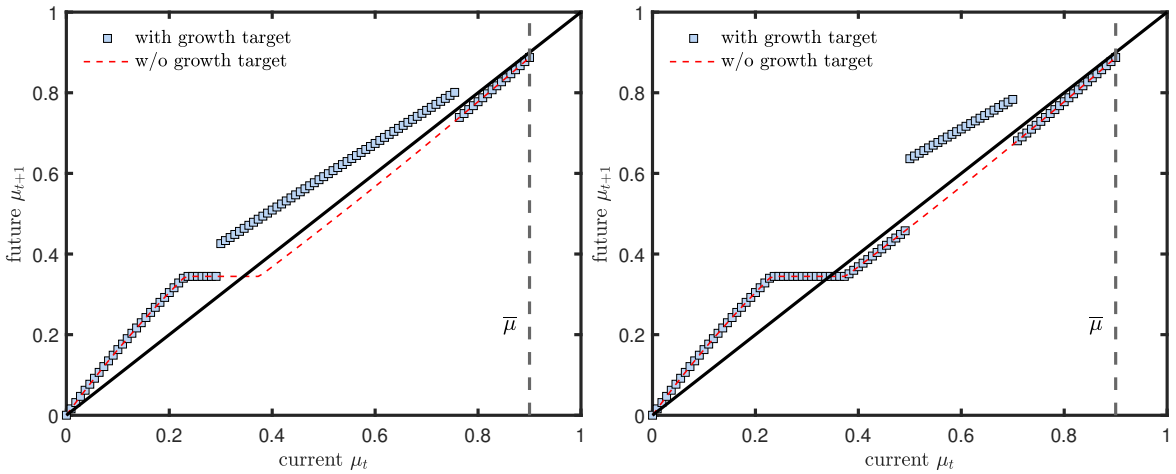
Then, for all $\mu \in (\mu_M, \mu_H(\chi))$, we still have $\mu \in (\bar{\mu} - \varepsilon^0, \bar{\mu})$, so the no-mandate policy satisfies $\lambda^0(\mu) < \bar{\lambda}$. If the policymaker chooses to miss the growth mandate, the penalty term is fixed and the best missing policy is the no-mandate maximizer $\lambda^0(\mu)$. This policy indeed misses the mandate,

because $\lambda^0(\mu) < \bar{\lambda}$, $\mathcal{G}$ is increasing in λ, and $\mathcal{G}(\mu, \bar{\lambda}) = \beta_s z_s < \bar{g}$. Hence giving up the mandate implies $\lambda^m(\mu) = \lambda^0(\mu) < \bar{\lambda}$. If instead the policymaker chooses to meet the target, Proposition 1 implies $\lambda^m(\mu) > \bar{\lambda}$. In neither case does the policymaker set $\lambda^m(\mu)$ to $\bar{\lambda}$.

It remains to show that retrenchment must occur near the cap. For any finite $\chi \geq \bar{\chi}$, this follows directly from Proposition 3. It gives an $\varepsilon(\chi) > 0$ such that retrenchment holds for all $\mu \in (\bar{\mu} - \varepsilon(\chi), \bar{\mu})$. Choose $\mu_H(\chi) \in (\max\{\mu_M, \bar{\mu} - \varepsilon(\chi)\}, \bar{\mu})$. Then $\lambda^m(\mu) < \bar{\lambda}$ and $\Phi(\mu) < \mu$ for all $\mu \in (\mu_H(\chi), \bar{\mu})$. □

This is the policy pendulum. The mandate creates an expansionary interval for the private wealth share in which $\Phi(\mu) > \mu$, while the control motive creates a retrenchment interval near the cap in which $\Phi(\mu) < \mu$. Together, these statements rule out an interior resting point where $\lambda^m(\mu) = \bar{\lambda}$ for $\mu \in (\mu_L, \bar{\mu})$, and the two boundary points are not absorbing states either. By the feasibility constraint, it must be that $\Phi(\mu) < \bar{\mu}$. Otherwise, the policymaker will receive infinite punishment because of the log functional form. Therefore, if $\Phi(\mu)$ remains in $(\mu_L, \bar{\mu})$ for all $\mu \in (\mu_M, \bar{\mu})$, the economy must oscillate in this interval. A sufficient condition for this to be true is $\mathcal{M}(\mu_M, 0) > \mu_L$. [4] A characterization based on primitives is not easy to find, but by following the idea of this proposition to choose an appropriate χ, we can almost always generate oscillation in this economy numerically.

Figure 6: Evolution of Wealth Share with Growth Rate Mandate



Note: The left panel displays the law of motion with a relatively low level of $\bar{g}$ and there does not exist a steady state. The right panel displays the law of motion with a relatively high level of $\bar{g}$ and there exists a steady state.

The economic interpretation of this policy pendulum is now clear. A pro-private policy provides the private sector more access to the financial market, which raises the output growth rate to meet the growth target. Meanwhile, the same policy also raises the future private wealth share, moving the economy closer to the control constraint. Once the economy gets sufficiently close to the control cap, the policy stance reverses and becomes pro-state. It now suppresses the private sector. This restores the state control, but it also lowers growth, eventually recreating the pressure to expand.

[4] Because on the one hand, any feasible choice makes sure $\mathcal{M}(\mu, \lambda) < \bar{\mu}$; on the other hand, $\mathcal{M}(\mu, \lambda)$ increases with both μ and λ , and therefore, $\mathcal{M}(\mu, \lambda) \geq \mathcal{M}(\mu_M, 0) > \mu_L$ for all $\mu \in (\mu_M, \bar{\mu}), \lambda \geq 0$.

Figure 6 displays the possible dynamics. The red dashed line in both panels is the law of motion of the private wealth share in the no-mandate benchmark. Under Assumption 1, the no-mandate benchmark has a unique interior steady state where $\lambda = \bar{\lambda}$. With a growth mandate, in the left panel, there is no interior steady state. When starting from a relatively low level of μ_t, the economy first experiences a monotonic increase in μ_t, followed by an endogenous cycle.

In the right panel, though there is an interior steady state, there are two possible regimes. If the economy starts with a relatively low level of μ_t, it will converge to μ^* monotonically. However, if the economy starts from a relatively high level of μ_t, an endogenous cycle will emerge and the economy never converges.

To connect with China's economic history, one may interpret that before China's economic reform, the economy was stuck at the low steady state μ^*. After the economic reform, the economy started to experience an expansion of private firms' wealth share. However, once this share is high enough, the economy starts to alternate between favoring the state firms and private firms.

4. Quantitative Exploration

In the last section, we theoretically analyze the policy tradeoff of a myopic policymaker: a high growth mandate pushes the policymaker toward pro-private policies, while the control motive eventually forces retrenchment once the private wealth share becomes too high. This generates the growth pendulum: periods of private-sector expansion are followed by episodes of renewed state control. This section goes back to the forward-looking policymaker and asks whether a disciplined parameterization can generate the observed pattern of the Chinese economy, i.e., persistent growth management and recurrent swings between private-sector expansion and retrenchment.

The baseline calibration is summarized in Table 1. We set the private-sector discount factor to 0.8, the public-sector discount factor and the policymaker's discount factor to 0.95. Public-sector productivity is normalized so that the public technology delivers a gross growth rate of 1.045 if the public sector owns all the wealth, and private-sector productivity is 25% higher than public-sector productivity. The policy parameters are a private wealth-share cap of 0.8, a growth weight of 0.60, a mandate penalty of 2, and a baseline gross growth mandate of 1.06. In the simulations below, the policymaker is allowed a small amount of public lending to the private technology, with the policy instrument bounded above by 1.05 (i.e., $\lambda < 1.05$). This extension gives the policymaker more room to achieve a higher growth rate, but the central tension between growth and control remains.

4.1 Endogenous Growth Cycles

We first compare the model-implied path of output with the actual path of GDP in China that we documented in the motivating evidence. We choose an initial private wealth share μ_0 that is well below the control cap $\bar{\mu}$, and then simulate the model forward according to the policy function solved

Table 1: Parameterization

Param.	Value	Description
Fundamental Parameters		
β_p	0.8	Private sector discount factor
β_s	0.95	State sector discount factor
β_g	0.95	Planner discount factor
z_s	$1.045/\beta_s$	Public sector TFP
z_p	$1.25z_s$	Private sector TFP
Policy Parameters		
$\bar{\mu}$	0.8	Private sector wealth share cap
α	0.60	Weights on growth in the planner's objective
χ	2.00	Punishment for not meeting growth mandate
$\bar{g}$	1.06	Growth mandate

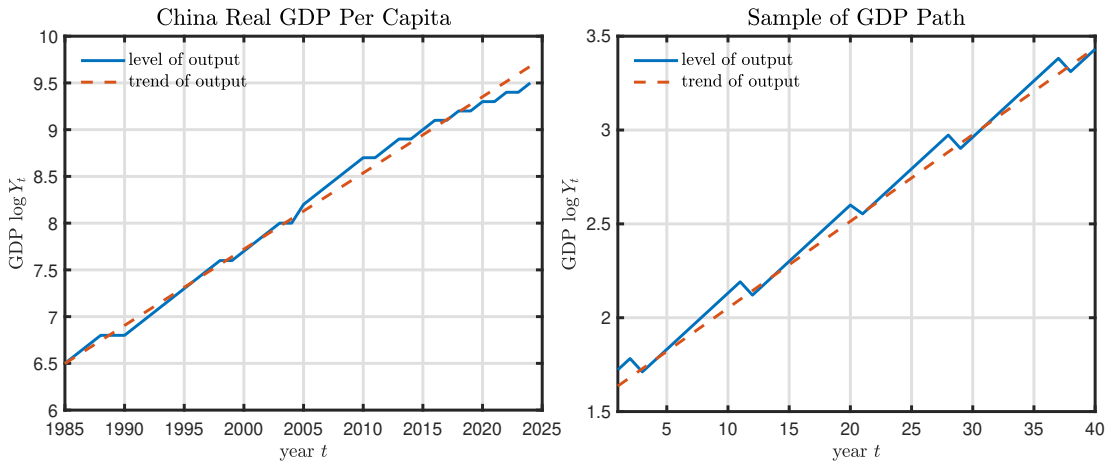
Notes: This table summarizes the model parameterization based on the fundamental and policy parameters used in the baseline calibration.

from the baseline calibration. Notice that there are no exogenous shocks in our economy. The model dynamics are generated purely by the endogenous movement of the state variable. However, unlike a standard neoclassical growth model or an AK model, our model economy does not admit a steady state nor a balanced growth path. Instead, the policymaker's changing incentives between meeting the growth mandate and restoring state control generate endogenous oscillation.

Figure 7 shows that the model reproduces the qualitative feature of the Chinese economy. GDP grows rapidly for a few periods, but it does not converge monotonically to a balanced growth path. Instead, the economy alternates between phases in which the policymaker pushes growth above its long-run level and phases in which the policymaker accepts a slower growth rate in order to restore state control. This confirms the policy pendulum in the analytical model. When the private wealth share is low, the policymaker raises private access to financial resources because doing so delivers higher growth at a relatively small control cost. As the private wealth share increases, however, the economy moves closer to the control cap, causing a retrenchment. This lowers growth and the private wealth share, creating room for the next round of private expansion.

Figure 8 plots the associated path of the private wealth share, the key state variable of the economy. In the model, periods of high output growth are accompanied by a rising private wealth share, as the private sector can better utilize capital and accumulate capital more quickly. As state control becomes an urgent policy objective, retrenchment happens and reverses this process.

Figure 7: China's GDP path and Model-simulated GDP path



Notes: The left panel plots China's realized GDP path, and the right panel plots the simulated output path under the baseline parameterization. The path is constructed from the model-implied sequence of output growth rates. The path is generated without aggregate shocks.

4.2 The Mean-Volatility Tradeoff

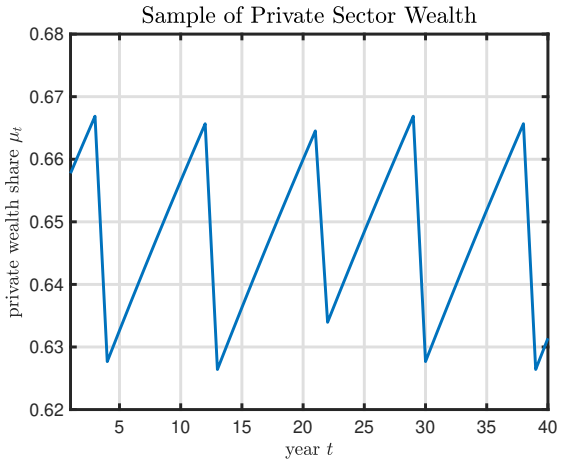
The endogenous growth cycle may generate a tradeoff between the mean and the volatility of the growth rate. A higher growth target gives the policymaker an incentive to relax the private capital restriction more strongly and to tolerate a larger private wealth share. This raises growth but also increases the private wealth share more quickly and for a longer period of time. When it comes to restore state control, however, the policymaker may need to tighten the restriction more sharply, causing a larger decline in growth. Thus, a higher growth target may raise average growth, but it may also lead to larger swings between periods of high and low growth, increasing growth volatility.

Figure 9 formalizes the mean-volatility tradeoff where we vary the growth mandate. Each dot in the figure corresponds to one growth target, and the mean and standard deviation of the growth rate are calculated from the simulated endogenous cycles. These simulations confirm our earlier reasoning: a higher growth target raises both average growth and growth volatility. The result is also consistent with the regional sudden stops documented in Figure 3: maintaining high growth targets for too long may lead to a sharp decline in growth when the policy stance reverses. Notice that these fluctuations arise from the policymaker's optimal policy choices, even without exogenous shocks.

4.3 Soft Landing

The final exercise studies whether lowering the growth target gradually can achieve a soft landing, as suggested by the observed managed deceleration in the Chinese economy after 2011 in Figure 2. In the baseline model, maintaining a high growth target leads to a sharp decline in growth when the policymaker tightens the private capital restriction to restore state control. We examine whether lowering the target before the private wealth share becomes too high can make this decline smoother.

Figure 8: Model-Simulated Private Wealth Share



Notes: The figure plots the simulated private wealth share along the same model path as in the previous figure. The recurrent movement of the private wealth share reflects the alternation between growth-supporting relaxation and control-preserving retrenchment.

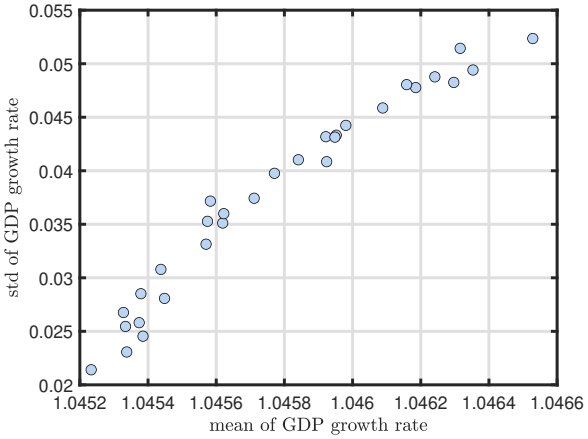
More concretely, we compare two simulated paths: one where the growth target stays high and never changes (hard-landing), the other where the target is lowered gradually before the private wealth share becomes high enough for the policymaker to retrench (soft-landing). For the soft-landing case, we lower the growth targets from 6.5% to 4.5% and solve the model a few times to get the corresponding policy functions. Figure 10 shows the two paths. To meet a lower growth target, the policymaker only needs to relax the private capital restriction to a lesser extent. This slows down the increase in the private wealth share, alleviating the pressure to tighten state control. As a result, growth declines in a more smooth way, avoiding the sharp drop in the hard-landing case.

The soft-landing result provides a possible rationale for the gradual reduction in China's national growth target shown in Figure 2. In the model, lowering the target early allows growth to slow gradually. This avoids a sharp decline later and thus makes the economy less volatile.

5. Investment Cycles in a Neoclassical Growth Model

The analysis so far has used an AK model with private and state sectors. However, the endogenous cycles do not arise from the AK structure. Instead, the growth mandate is the necessary condition. This section shows that a growth mandate can also generate endogenous cycles in a standard neoclassical growth model. Importantly, the policymaker faces a penalty for missing the growth target. The policymaker controls the financial market by setting the saving rate. A higher saving rate raises output growth but also increases the capital stock, making the same growth target harder to meet in the future because of capital's diminishing returns. We show that this tradeoff can generate cycles of over-investment and under-investment relative to the standard model without a growth mandate.

Figure 9: Mean versus Volatility



Notes: The figure reports the mean and standard deviation of simulated growth after the burn-in period as the growth mandate is varied around the baseline calibration. Each point is computed from a newly solved policy rule and a simulated path.

5.1 A Neoclassical Growth Model with a Growth Mandate

Consider a canonical neoclassical growth model in discrete time in which a representative household has log utility, and a representative firm has a Cobb-Douglas production function with full capital depreciation. At the beginning of period t, the economy has capital stock k_t and produces output $y_t = k_t^\alpha$, where $\alpha \in (0, 1)$. The policymaker chooses the saving rate $s_t \in [0, 1]$. Consumption is then $c_t = (1 - s_t)k_t^\alpha$, and the capital stock in the next period is $k_{t+1} = s_t k_t^\alpha$. We define the output growth rate as the log change in output:

$$g(k_t, s_t) = \log y_{t+1} - \log y_t = \alpha \log s_t - \alpha(1 - \alpha) \log k_t$$

Thus, a higher saving rate raises the growth rate, but a higher capital stock reduces it, as the capital has diminishing returns under the concave production function.

The policymaker faces a growth mandate $\bar{g}$ and must pay a fixed penalty χ whenever the realized growth rate does not meet the target. We can write the policymaker's problem recursively as

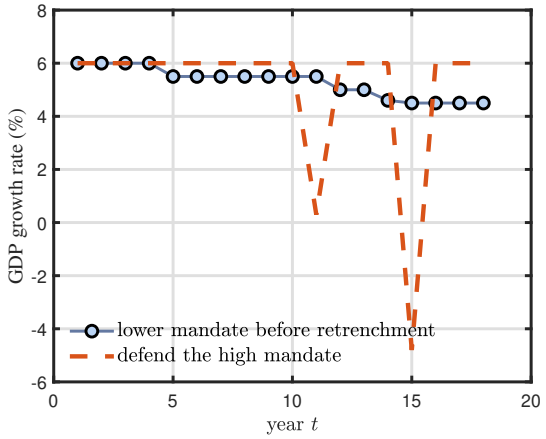
$$V(k) = \max_{s \in [0,1]} \{\log((1 - s)k^\alpha) - \chi \mathbf{1}\{g(k, s) < \bar{g}\} + \beta V(sk^\alpha)\} \tag{5.1}$$

where β is the policymaker's discount factor.

Without the growth mandate, the problem reduces to the standard neoclassical growth model, and the optimal saving rate is constant at $\bar{s} = \alpha\beta$. If the policymaker sets $s = \bar{s}$, then the capital stock converges to a steady state, and output growth converges to zero. We refer to this saving rate as the benchmark saving rate.

If the policymaker chooses to meet the target when the current capital stock is k, the saving rate

Figure 10: Soft Landing through Mandate Adjustment



Notes: The figure compares a path that lowers the growth mandate before retrenchment with a path that defends the high mandate. Growth is reported in percent. The gradual mandate adjustment smooths the transition and avoids the large low-growth episode generated by defending the high target for too long.

must satisfy

$$s \geq \hat{s}(k) \equiv \exp(\bar{g}/\alpha)k^{1-\alpha}.$$

When $\hat{s}(k) < \bar{s}$, the benchmark saving rate can already meet the mandate. When $\hat{s}(k) \in (\bar{s}, 1]$, the benchmark saving rate is too low to meet the mandate. The policymaker must then choose whether to raise the saving rate above the benchmark rate or accept the penalty. When $\hat{s}(k) > 1$, the mandate cannot be met anyway, and the policymaker simply receives the penalty.

Notice that the required saving rate $\hat{s}(k)$ increases with the current capital stock k, again due to diminishing returns to capital. Therefore, raising the saving rate to meet the growth mandate today increases the capital stock in the next period, which in turn implies that meeting the same mandate next period requires an even higher saving rate. Hence, continuing to meet the target requires the policymaker to give up an increasingly large share of current output, which ultimately cannot be sustained. In the next subsection, we show how the policymaker's changing incentives to meet the growth mandate generate endogenous investment cycles.

5.2 Investment Cycles

Given the optimal saving policy $s^*(k)$, the capital stock evolves according to

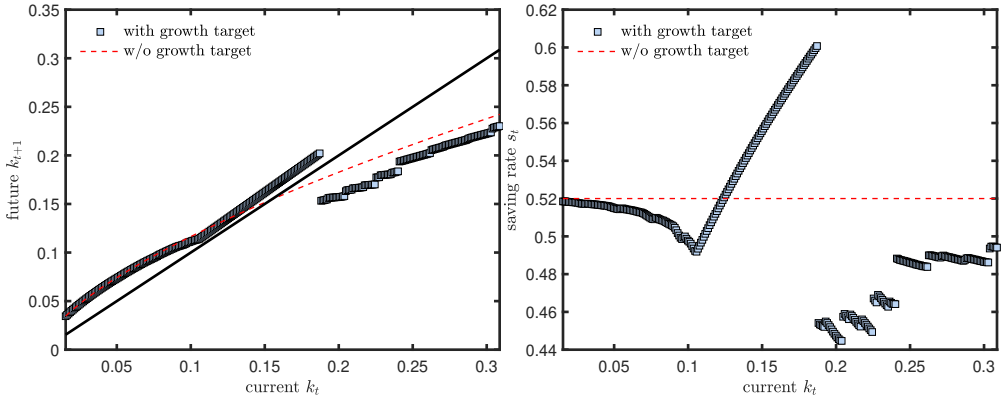
$$K(k) = s^*(k)k^\alpha$$

The left panel of Figure 11 illustrates the law of motion of capital from the numerical simulation. The red dashed line shows the benchmark capital law of motion without the growth mandate. In the benchmark, capital converges to the unique interior steady state. With a sufficiently large penalty for missing the growth mandate, however, the policymaker raises the saving rate around this steady

state to boost growth. Because of that, the economy does not have a steady state and instead exhibits persistent investment cycles similar to the dynamics from Figure 6.

The right panel of Figure 11 plots the optimal saving rate $s^*(k)$ and the constant benchmark saving rate $\bar{s}$. We refer to $s^*(k) > \bar{s}$ as over-investment and $s^*(k) < \bar{s}$ as under-investment. The figure shows that over-investment occurs when the capital stock is at intermediate levels, while under-investment occurs when capital is sufficiently high or low. We examine those scenarios more closely next.

Figure 11: Investment cycle in the neoclassical growth model



Notes: The left panel plots the induced capital law of motion against the 45-degree line. The right panel plots the endogenous saving rate. Red dashed lines report the standard log-utility neoclassical benchmarks: the capital law of motion under $\bar{s} = \alpha\beta$ in the left panel and the constant saving rate $\bar{s} = \alpha\beta$ in the right panel.

When the capital stock is at an intermediate level, the benchmark saving rate is too low for the economy to meet the growth mandate. Thus, if the penalty for missing the target is sufficiently large, the policymaker would raise the saving rate to at least $\hat{s}(k) > \bar{s}$ to meet the mandate, at the cost of current consumption.

When the capital stock is sufficiently high, meeting the mandate requires an extremely large saving rate, if it is feasible at all. This means a big reduction in current consumption. When the loss from lowering consumption exceeds the penalty from missing the mandate, the policymaker optimally chooses to no longer meet the target. Moreover, the optimal saving rate falls below $\bar{s}$, leading to under-investment today. This reflects the dynamic consideration, as less capital stock tomorrow makes it easier for tomorrow's policymaker to meet the growth mandate.

The emergence of under-investment when the capital stock is low reflects similar dynamic concerns. At those points, the current growth mandates can be easily met, even for some saving rates below $\bar{s}$. On the other hand, the policymaker is forward-looking. By choosing a saving rate less than $\bar{s}$, the policymaker slows down the accumulation of capital. This allows the policymaker to postpone the date after which she has to sacrifice current consumption for investment to meet the growth mandate.

As a final remark, the irregular and discrete pieces in the law of motion of capital and the saving policy function result from both the discrete cost of missing the growth mandate and the forward-

looking considerations. At each capital stock k, the policymaker faces a discrete choice: paying the fixed cost of missing the target and choosing a relatively undistorted saving rate, or meeting the target by giving up some current consumption. This discrete choice creates kinks in the current value, irrespective of the continuation value. In turn, because today's saving determines tomorrow's level of capital, kinks in tomorrow's value further complicate today's value. This makes the value function defined in equation (5.1) irregular.

6. Conclusion

This paper develops a unified framework for understanding why economic policy often moves in cycles between market liberalization and state control. The central mechanism is a structural tension between growth and control: policies that relax constraints on more productive private activity help satisfy growth mandates, but they also increase the private wealth share and eventually threaten the policymaker's objective of maintaining control. Once the need for maintaining control becomes sufficiently urgent, the policymaker optimally reverses course and suppresses private expansion. This lowers growth until the pressure for private expansion emerges again. The model shows that such policy cycles need not arise from exogenous shocks or political turnover. Rather, they can be endogenous consequences of optimal governing under binding growth targets. The empirical evidence from the post-reform experience in China, together with supplementary evidence from the financial cycles in the U.S., suggests that this trade-off is relevant across institutional settings. The analysis also highlights an important policy implication: aggressive growth targets may raise average growth only at the cost of greater volatility. However, a gradual reduction in growth mandates can facilitate a smoother transition and reduce the risk of sharp contractions.

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Appendix

Proof of Lemma 3.1

Proof. Fix a household $j \in \{p, s\}$ and take the sequence of returns $\{R_{j,t}\}_{t\geq 0}$ as given. The household's budget constraint is

$$c_{j,t} + a_{j,t+1} = R_{j,t} a_{j,t}.$$

With log utility, the Euler equation for an interior optimum is

$$\frac{1}{c_{j,t}} = \beta_j R_{j,t+1} \frac{1}{c_{j,t+1}}.$$

Consider the policy

$$c_{j,t} = (1-\beta_j) R_{j,t} a_{j,t}, \qquad a_{j,t+1} = \beta_j R_{j,t} a_{j,t}.$$

It satisfies the budget constraint. Moreover, because $c_{j,t+1} = (1-\beta_j) R_{j,t+1} a_{j,t+1}$,

$$\beta_j R_{j,t+1} \frac{1}{c_{j,t+1}} = \frac{\beta_j R_{j,t+1}}{(1-\beta_j) R_{j,t+1} a_{j,t+1}} = \frac{\beta_j}{(1-\beta_j) a_{j,t+1}} = \frac{1}{(1-\beta_j) R_{j,t} a_{j,t}} = \frac{1}{c_{j,t}}.$$

Thus the Euler equation holds, and the usual transversality condition holds under the log-saving rule. Hence each household saves the constant fraction β_j of its end-of-period wealth. For the state household, $R_s = z_s$, so

$$a_{s,t+1} = \beta_s R_s a_{s,t}.$$

For the private household, the effective return on beginning-of-period wealth is

$$R_p(\lambda_t) = \lambda_t z_p + (1-\lambda_t) z_s,$$

because the fraction λ_t is operated with the private technology and the remaining fraction $1-\lambda_t$ earns the state return. Therefore

$$a_{p,t+1} = \beta_p R_p(\lambda_t) a_{p,t}.$$

□

Proof of Lemma 3.2

Proof. Let $K_t = a_{p,t} + a_{s,t}$ and $\mu_t = a_{p,t}/K_t$. By Lemma 3.1,

$$a_{p,t+1} = \beta_p R_p(\lambda_t) a_{p,t}, \qquad a_{s,t+1} = \beta_s R_s a_{s,t}.$$

Therefore

$$\begin{aligned}\mu_{t+1} &= \frac{a_{p,t+1}}{a_{p,t+1} + a_{s,t+1}} \\ &= \frac{\beta_p R_p(\lambda_t) a_{p,t}}{\beta_p R_p(\lambda_t) a_{p,t} + \beta_s R_s a_{s,t}} \\ &= \frac{\mu_t \beta_p R_p(\lambda_t)}{(1-\mu_t)\beta_s R_s + \mu_t \beta_p R_p(\lambda_t)} = \mathcal{M}(\mu_t, \lambda_t).\end{aligned}$$

Next, current output is

$$\begin{aligned}Y_t &= z_p \lambda_t a_{p,t} + z_s \left[a_{s,t} + (1-\lambda_t) a_{p,t}\right] \\ &= \left[z_s + (z_p - z_s)\lambda_t \mu_t\right] K_t.\end{aligned}$$

To express Y_{t-1} in terms of period-t wealth, use the saving rules:

$$a_{p,t} = \beta_p \,\text{income}_{p,t-1}, \qquad a_{s,t} = \beta_s \,\text{income}_{s,t-1}.$$

Since total output in period $t-1$ is total pre-saving income,

$$\begin{aligned}Y_{t-1} &= \frac{a_{p,t}}{\beta_p} + \frac{a_{s,t}}{\beta_s} \\ &= K_t \left(\frac{\mu_t}{\beta_p} + \frac{1-\mu_t}{\beta_s}\right) \\ &= K_t \left(\frac{1}{\beta_s} + \frac{\beta_s - \beta_p}{\beta_s \beta_p} \mu_t\right).\end{aligned}$$

Hence

$$g_t = \frac{Y_t}{Y_{t-1}} = \frac{z_s + (z_p - z_s)\lambda_t \mu_t}{\frac{1}{\beta_s} + \frac{\beta_s - \beta_p}{\beta_s \beta_p} \mu_t} = \mathcal{G}(\mu_t, \lambda_t).$$

It remains to verify the monotonicity statements. Write $A(\lambda) = \beta_p R_p(\lambda)$ and $B = \beta_s R_s$. Then

$$\mathcal{M}(\mu, \lambda) = \frac{\mu A(\lambda)}{(1-\mu)B + \mu A(\lambda)}.$$

Since $A(\lambda) > 0$, $B > 0$, and $A'(\lambda) = \beta_p (z_p - z_s) > 0$,

$$\frac{\partial \mathcal{M}}{\partial \mu} = \frac{A(\lambda) B}{\left[(1-\mu)B + \mu A(\lambda)\right]^2} > 0, \qquad \frac{\partial \mathcal{M}}{\partial \lambda} = \frac{\mu(1-\mu) B A'(\lambda)}{\left[(1-\mu)B + \mu A(\lambda)\right]^2} > 0$$

for $\mu \in (0,1)$. Finally,

$$\frac{\partial \mathcal{G}}{\partial \lambda} = \frac{(z_p - z_s)\mu}{\frac{1}{\beta_s} + \frac{\beta_s - \beta_p}{\beta_s \beta_p} \mu} > 0$$

for $\mu > 0$, because $z_p > z_s$ and the denominator is positive. □

Proof of Proposition 3

Proof. Fix any finite punishment $\chi \geq 0$. We compare the payoff from $\lambda = 0$ with the payoff from any feasible policy $\lambda \geq \bar{\lambda}$. The policy $\lambda = 0$ reduces the private wealth share next period and thus moves it away from the cap $\bar{\mu}$, even when the current share approaches $\bar{\mu}$. By contrast, any policy $\lambda \geq \bar{\lambda}$ keeps the private wealth share unchanged or raises it, making the cost of maintaining such a policy arbitrarily large near the cap. We first find bounds for the payoffs from these policies and then construct an $\varepsilon > 0$ such that $\lambda = 0$ gives a strictly higher payoff than every feasible $\lambda \geq \bar{\lambda}$ whenever $\mu \in (\bar{\mu} - \varepsilon, \bar{\mu})$.

First, consider the policy $\lambda = 0$. Since both types of wealth earn the return z_s under this policy, Lemma 3.2 implies

$$\mathcal{M}(\mu, 0) = \frac{\mu\beta_p}{(1-\mu)\beta_s + \mu\beta_p}$$

Assumption 1 implies $\beta_p < \beta_s$. Define

$$\delta := \bar{\mu} - \mathcal{M}(\bar{\mu}, 0) = \frac{\bar{\mu}(1-\bar{\mu})(\beta_s - \beta_p)}{(1-\bar{\mu})\beta_s + \bar{\mu}\beta_p} > 0$$

Because $\mathcal{M}(\mu, 0)$ is increasing in μ, for every $\mu \in (0, \bar{\mu})$ we have

$$\bar{\mu} - \mathcal{M}(\mu, 0) \geq \delta$$

Thus, $\lambda = 0$ is feasible throughout this interval, and the private wealth share next period remains at least δ below the cap.

To obtain a lower bound on the payoff from $\lambda = 0$, we also need to bound the growth rate. Rewrite the growth formula in Lemma 3.2 as

$$\mathcal{G}(\mu, \lambda) = \frac{z_s + (z_p - z_s)\lambda\mu}{(1-\mu)/\beta_s + \mu/\beta_p}$$

For every $\mu \in (0, \bar{\mu})$ and $\lambda \in [0, 1]$,

$$z_s \leq z_s + (z_p - z_s)\lambda\mu \leq z_p, \qquad \frac{1}{\beta_s} \leq \frac{1-\mu}{\beta_s} + \frac{\mu}{\beta_p} \leq \frac{1}{\beta_p}$$

Consequently,

$$\beta_p z_s \leq \mathcal{G}(\mu, \lambda) \leq \beta_s z_p$$

The punishment for missing the growth mandate reduces the payoff by at most χ. Combining these

bounds, we have that for every $\mu \in (0, \bar{\mu})$

$$U(\mu, 0) \geq \alpha \log\left(\beta_p z_s\right) + (1-\alpha)\log\delta - \chi$$

Second, consider any feasible policy $\lambda \geq \bar{\lambda}$. Lemma 3.4 and the monotonicity of $\mathcal{M}$ in λ imply

$$\mathcal{M}(\mu, \lambda) \geq \mathcal{M}(\mu, \bar{\lambda}) = \mu$$

Since the policy is feasible, it follows that

$$0 < \bar{\mu} - \mathcal{M}(\mu, \lambda) \leq \bar{\mu} - \mu$$

Using the upper bound on growth and dropping the nonpositive punishment term, we obtain

$$U(\mu, \lambda) \leq \alpha \log\left(\beta_s z_p\right) + (1-\alpha)\log(\bar{\mu} - \mu)$$

This upper bound does not depend on λ, so it applies to every feasible policy $\lambda \geq \bar{\lambda}$ at the same current private wealth share μ. Subtracting the lower bound on $U(\mu, 0)$ yields

$$U(\mu, \lambda) - U(\mu, 0) \leq \alpha \log\left(\frac{\beta_s z_p}{\beta_p z_s}\right) + (1-\alpha)\log\left(\frac{\bar{\mu} - \mu}{\delta}\right) + \chi$$

Finally, choose

$$\varepsilon = \delta \left(\frac{\beta_p z_s}{\beta_s z_p}\right)^{\frac{\alpha}{1-\alpha}} \exp\left(-\frac{\chi}{1-\alpha}\right)$$

Since $0 < \alpha < 1$, χ is finite, $0 < \delta < \bar{\mu}$, and $0 < \beta_p z_s / (\beta_s z_p) < 1$, this choice satisfies $0 < \varepsilon < \bar{\mu}$. For any $\mu \in (\bar{\mu} - \varepsilon, \bar{\mu})$, we have $\bar{\mu} - \mu < \varepsilon$. Therefore, for every feasible $\lambda \geq \bar{\lambda}$,

$$\begin{aligned} U(\mu, \lambda) - U(\mu, 0) &\leq \alpha \log\left(\frac{\beta_s z_p}{\beta_p z_s}\right) + (1-\alpha)\log\left(\frac{\bar{\mu} - \mu}{\delta}\right) + \chi \\ &< \alpha \log\left(\frac{\beta_s z_p}{\beta_p z_s}\right) + (1-\alpha)\log\left(\frac{\varepsilon}{\delta}\right) + \chi \\ &= 0 \end{aligned}$$

Thus, none of these policies can be optimal, because the feasible policy $\lambda = 0$ gives a strictly higher payoff. The optimal policy must therefore satisfy

$$\lambda^m(\mu) < \bar{\lambda} \qquad \text{for all } \mu \in (\bar{\mu} - \varepsilon, \bar{\mu})$$

Since $\mathcal{M}(\mu, \lambda)$ is strictly increasing in λ for $\mu > 0$, Lemma 3.4 then implies

$$\Phi(\mu) = \mathcal{M}(\mu, \lambda^m(\mu)) < \mathcal{M}(\mu, \bar{\lambda}) = \mu$$

throughout the same interval. □