The Politics of Financial Development and Capital Accumulation

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25 September 2013

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September 2013

Abstract

This paper proposes a simple analytical model to examine conditions in which a government policy to improve imperfect credit markets is practiced through a democratic political process, and analyzes interactions between the politically implemented policy and economic development. Individuals who support the policy are those who can start new investments only after the implementation of it. High income inequality and the low level of capital make the policy hard to implement, which is likely to cause the economy to fall into a poverty trap.

Keywords: financial development, economic development, income inequality, majority voting

JEL classification: D72, G18, O11, O15, O16

*We are grateful to Akihisa Shibata, Kazuhiro Yuki, Kazuo Mino, and Kenn Ariga for their helpful comments and suggestions. All errors are our own.

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1 Introduction

Financial development has positive impacts on economic growth and poverty alleviation (Levine 2005). Establishing well-functioning credit markets should therefore be a critical role of governments. The level of financial development, however, varies across countries and changes non-monotonically over time. A growing body of literature strongly suggests that these changes are at least partly due to policy changes in financial sectors (e.g., Rajan and Zingales 2003), and some studies have developed theoretical models in which the level of investor protection, a determinant of financial development, is politically chosen. In macroeconomics literature, on the other hand, political processes that formulate policies toward financial development are usually abstracted, and the focus is on the effects of an exogenously given level of financial development on economic growth, income distributions, etc. Building on these two strands of literature, this paper proposes a tractable model to analyze interactions between politically determined financial development and economic development.

Asymmetric information between lenders and borrowers, such as costly state verification and moral hazard, is the source of credit market imperfections, as shown by Bernanke and Gertler (1989), Aghion, Banerjee, and Piketty (1999), Aghion, Howitt, and Mayer-Foulkes (2005), and others.[1] In these theories, the costs of gathering information and monitoring borrowers directly influence the amount entrepreneurs can borrow from financial intermediaries. An important implication is that policies that reduce the costs of financial intermediation can relax borrowing constraints. For example, improving investor protection, establishing public credit registries and providing partial credit guarantee systems to ease asymmetric information can benefit credit markets. The next section reviews theory and evidence on the effectiveness of such policies.

[1] Karlan and Zinman (2009) find evidence of moral hazard and adverse selection in credit markets.

We take the view that the size of policies to improve credit markets is determined in political processes. Credit market imperfections prevent poor individuals from starting businesses, and thus serve as a barrier to entry. Rajan and Zingales (2003) argue that incumbents in industries oppose financial development because new entries create fierce competition and reduce the returns of the incumbents. On the basis of the analysis by Rajan and Zingales (2003), Braun and Raddatz (2008) empirically show that the stronger the relative power of promoters of financial development, the larger financial systems become. Perotti and Volpin (2004) develop a model in which incumbents, who have sufficient wealth to set up firms, engage in lobbying activities in order to lower the level of investor protection.[2]

Although these politico-economic studies identify determinants of financial development, they do not investigate the effects of financial development on the patterns of economic development, which is one of the central issues in the macroeconomic literature (Galor and Zeira 1993, Banerjee and Newman 1993, Aghion and Bolton 1997). We propose a model to examine conditions in which a government policy to improve imperfect credit markets is practiced through a democratic political process and analyze interactions between the politically implemented policy and economic development. With regard to the political process, we consider majority voting as in Pagano and Volpin (2005). This is because most countries adopt generally democratic political systems, and the investigation of politico-economic outcomes under majority voting serves as a benchmark.

The model employs an overlapping generations model inhabited by individuals who live for two periods. The economy produces a single final good by using capital and labor. In the first period, individuals inelastically sup-

[2]The conflicts between incumbents and entrants are not the only factor that matters for financial development, as analyzed by Pagano and Volpin (2005) and Bebchuk and Neeman (2010). In particular, Pagano and Volpin (2005) consider majority voting games, as this paper does. Besley and Persson (2009, 2010) investigate a situation in which a group in power chooses the amount of investment in legal capacity, which determines the severity of borrowing constraints.

ply labor to the final good sector and earn wages, the amount of which is different across the individuals because of the heterogeneity in their labor endowments. Individuals then decide whether to make a fixed size of investment that produces capital in the next period. All individuals, however, face borrowing constraints because credit markets are imperfect, which creates a threshold income level; only individuals with incomes above the threshold can invest in the project. Before making investment decisions, individuals vote for or against a government policy that improves the credit markets. In the second period, the returns from the project are realized and individuals consume their entire resulting wealth.

The imperfect credit markets work as an entry barrier as argued by Rajan and Zingales (2003), and the policy that mitigates the imperfection has different effects on different individuals. On one hand, the policy benefits individuals who can start the project only after the implementation of the policy. Such individuals are likely to be middle income individuals. On the other hand, it decreases the welfare of the rich who do not need to borrow much because the improvement of the credit markets enables more individuals to invest, i.e., facilitates new entry, and reduces the return on the project. Because the poor who are still not able to invest even if the government improves the credit markets do not have any incentive to support the policy, they may vote against it together with the rich who wish to block new entry.[3]

Whether the policy can obtain majority support strongly depends on the extent of income inequality. When income inequality is high and income levels across individuals are widely dispersed, a given level of improvement in the credit markets enables only a small portion of individuals to begin the project. It is therefore difficult for the policy to obtain majority support. As a natural consequence, dynamic analysis of the model shows that the higher income inequality is, the less capital is accumulated, and the more likely it is

[3]Such political conflict, *ends against the middle*, arises in a model by Bellettini and Berti Ceroni (2007), who analyze the provision of public goods that enhance future productivity.

that the economy will fall into poverty traps. This result that high income inequality is harmful to financial and economic development agrees with the evidence by Easterly (2001, 2007).

Our analysis can also be associated with a number of studies that analyzed the effects of income inequality on economic development in political economics frameworks. Alesina and Rodrik (1994) and Persson and Tabellini (1994) developed models in which high income inequality is detrimental to economic growth because the inequality raises demand for redistribution by the median voter; this redistribution discourages private investments. This mechanism is, however, not empirically supported (e.g., Perotti 1996). Although we obtain the result that income inequality is harmful to economic development, the mechanism in this paper is different from that of the redistribution approach shown in the previous studies. This paper therefore proposes a new mechanism to explain the negative relationship between inequality and economic development.

The rest of this paper is organized as follows. Section 2 reviews how governments can improve credit markets. Section 3 describes the model, and Section 4 characterizes the static equilibrium. Section 5 analyzes equilibrium dynamics. Section 6 concludes.

2 Policies toward Financial Development

This section reviews government policies that can improve credit markets. One of the effective policies is improving laws and institutions, as creditor protections and legal enforcement are determinants of financial development (La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1997, Levine 1998, 1999). The importance of the factors has been examined by a vast number of recent studies, both theoretically and empirically. The model developed by Jappelli, Pagano, and Bianco (2005) predicts that improvements of efficiency in judicial enforcement unambiguously reduce credit constraints and increase lending regardless of whether the competition structure in credit markets is perfectly competitive or monopolistic. They also present supporting evidence from panel data on Italian provinces. Using 25 years of data for 129 countries, Djankov, McLiesh, and Shleifer (2007) find that strong creditor protections have a positive impact on the private credit to GDP ratio. Haselmann, Pistor, and Vig (2010) focus on twelve transition economies to investigate how banks respond to legal changes and find, consistent with the conclusions of Djankov, McLiesh, and Shleifer (2007), that improvements in creditor protections promote bank lending.[4]

There are other policies that improve credit markets even in cases where changing the legal environment is difficult. The creation of public credit registries to enforce information sharing among lenders is a promising government intervention, particularly in countries with weak investor protections. Public credit registries are operated by a government authority, usually the central bank or a banking supervisory agency, that collects data on the standing of borrowers and makes it available to financiers.[5] Theories suggest that such credit registries can benefit credit markets. First, information sharing should reduce adverse selection and decrease defaults (Pagano and Jappelli 1993). Second, the exchange of information may reduce informational rents that banks can extract from their clients within credit relationships when the banks have an informational monopoly. The fiercer competition caused by information sharing weakens the bargaining power of banks, which motivates borrowers to exert greater efforts to perform (Padilla and Pagano 1997). Finally, sharing default information among lenders should discipline borrowers to make greater efforts to repay because defaulting is a bad signal to all outside lenders (Padilla and Pagano 2000).

Empirical studies generally support the hypothesis that credit registries

[4]The legal reforms in the transition countries are motivated by pressures from outside their governing bodies, and the timing of the reforms is arguably more exogenous.

[5]Jappelli and Pagano (2002) provide a detailed description of credit registries around the world.

foster credit market performance. Jappelli and Pagano (2002) find that bank lending is larger in countries where lenders share information. More recently, the evidence of Djankov, McLiesh, and Shleifer (2007), to which we have referred above, shows that information-sharing institutions are associated with higher private credit to GDP ratios. For micro evidence, using firm-level data in transition countries, Brown, Jappelli, and Pagano (2009) find that information sharing is associated with credit availability. Moreover, in order to obtain clear confidence on causality between information sharing and credit market performance, Brown and Zehnder (2007) apply experimental methods to examine the effect of the exogenous introduction of a credit registry and show that the credit registry can motivate borrowers to repay their loans. Another policy we are aware of is partial credit guarantee systems. To the extent that they give opportunities to learn how to lend to new borrowers, they are interpreted as subsidies to investments in screening methods (De la Torre, Gozzi, and Schmukler 2007).

Although government direct lending is a possible policy, its performance is generally poor, and the policy leads to lower levels of financial development (La Porta, Lopez-de-Silanes, and Shleifer 2002). Because supporting private financiers is considerably more important than lending by government-owned banks, we focus on a situation in which the government fosters private financial transactions rather than replacing them.

3 Basic Environments

We consider an overlapping generations economy in which individuals live for two periods. They are heterogeneous only with respect to their labor endowments. Labor should be broadly interpreted to include any endowments whose equilibrium values increase with the level of capital, and capital should be broadly interpreted to include human capital and any capital good (Matsuyama 2004). The distribution of the labor endowments does not vary over time and follows a uniform distribution on the support $[\underline{h}, \overline{h}]$. Let $G(h_i)$ denote the cumulative distribution function of h_i. We normalize the average labor endowment to one, which implies $\overline{h} = 2 - \underline{h}$.

3.1 Final good sector

A single final good is produced by using capital and labor as inputs, and the production technology takes the form of a Cobb-Douglas production function:

$$y_t = k_t^{\alpha} l_t^{1-\alpha}, \quad 0 < \alpha < 1, \tag{1}$$

where y_t is the output, k_t and l_t are capital and labor input, respectively, and in equilibrium, $l_t = \int_{\underline{h}}^{\overline{h}} h_i dG(h_i) = 1$ by the normalization. The final good and factor markets are perfectly competitive, which leads to

$$\rho_t = \alpha k_t^{\alpha-1} \equiv \rho(k_t), \tag{2}$$

$$w_t = (1-\alpha) k_t^{\alpha} \equiv w(k_t), \tag{3}$$

where ρ_t and w_t are the price of capital and the wage, respectively. Capital depreciates fully in one period.

3.2 Individuals

Economic environments for individuals are based on Matsuyama (2004). Individuals live for two periods but derive utility only from consumption in the second period of their lives. In the first period, individuals born in period t with h_i supply their labor inelastically and earn $w(k_t)h_i$. Individuals can invest in at most one project. The project is nondivisible and transforms one unit of the final good in the current period into R units of capital in the next period. At the end of the period t, individuals decide whether to invest in the project. They can lend and borrow at the gross interest rate r

determined in international financial markets; we set $r = 1$ for simplicity. In the second period, they retire and consume their entire wealth.

Since the project to produce capital requires one unit of the fixed investment cost, individuals whose income is less than one borrow in order to invest in the project. The amount individual i needs to borrow, b_{it}, in order to invest in the project is given by $b_{it} = 1 - w(k_t)h_i$.

Although individuals can lend and borrow at the world interest rate $r = 1$, there exists a borrowing limit due to information asymmetry between lenders and borrowers. Specifically, any individual is able to borrow only up to a constant, λ_t, times his or her disposable income, as shown by Aghion, Banerjee, and Piketty (1999), and Aghion, Howitt, and Mayer-Foulkes (2005):

$$b_{it} \leq \lambda_t w(k_t) h_i. \tag{4}$$

We call this inequality the *borrowing constraint*. The parameter λ_t is commonly called the credit multiplier, and it represents the extent of financial development. The borrowing constraint disappears as λ_t goes to infinity, whereas $\lambda_t = 0$ corresponds to the other polar case in which credit is totally unavailable and individuals can only invest their own disposable income. Analyzing models with moral hazard, Aghion, Banerjee, and Piketty (1999), and Aghion, Howitt, and Mayer-Foulkes (2005) derive the constant credit multiplier and show that borrowing constraints take the form of (4).[6] In these studies, ex-post moral hazard is the source of credit market imperfections, and lower monitoring costs and stronger investor protections are associated with a larger credit multiplier. The borrowing constraint (4) implies that individuals whose labor endowments are less than the threshold, $\tilde{h}(\lambda_t, k_t)$,

[6] The constant credit multiplier is a standard way to introduce borrowing constraints in the literature. For example, see De Gregorio (1996), Aghion, Banerjee, and Piketty (1999), Aghion, Howitt, and Mayer-Foulkes (2005), Caballé, Jarque, and Michetti (2006), Bellettini and Berti Ceroni (2007), and Antràs and Caballero (2009, 2010).

cannot invest in the project:

$$\tilde{h}(\lambda_t, k_t) \equiv \frac{1}{1+\lambda_t}\frac{1}{w(k_t)}. \tag{5}$$

3.3 Government

The government can practice a policy that improves credit markets as described in Section 2. In concrete terms, the government can improve laws, establish public credit registries, and offer partial credit guarantee systems.[7]

Suppose that the government can raise the credit multiplier, λ_t, from λ_L to λ_H by improving the credit markets. For simplicity, we set $\lambda_L = 0$ and denote $\lambda_H = \lambda > 0$. The thresholds under the improved and unimproved credit markets are respectively given by $\tilde{h}(\lambda, k_t) \equiv 1/[(1+\lambda)w(k_t)]$ and $\tilde{h}(0, k_t) \equiv 1/w(k_t)$. Both thresholds, $\tilde{h}(\lambda, k_t)$ and $\tilde{h}(0, k_t)$, are decreasing in k_t. That is, the higher the capital level is, the more individuals are able to invest in the project since their wages are increasing in capital.

4 Static Analysis

4.1 Market clearing conditions

Individuals who are able to invest in the project are those with labor endowments greater than or equal to $\tilde{h}(0, k_t)$ if the government does not improve the credit markets. Given that all individuals whose labor endowments are $\tilde{h}(0, k_t)$ or above are willing to invest in the project, the capital good market clears if

$$k^0_{t+1} = R\{1 - G[\tilde{h}(0, k_t)]\}, \tag{6}$$

[7]All such policies should reduce screening and monitoring costs of financial intermediaries. For a recent theoretical research that provides implications of the policies on financial development, see Michalopoulos, Laeven, and Levine (2009).

where k^0_{t+1} is the level of capital at period $t+1$ under the condition that the government does not improve the credit markets at period t. Individuals are willing to invest in the project if the return is greater than or equal to the deposit interest rate $r = 1$, i.e.,

$$R\rho(k^0_{t+1}) \geq 1 \quad \Leftrightarrow \quad k^0_{t+1} \leq (\alpha R)^{\frac{1}{1-\alpha}} \equiv \bar{k}. \tag{7}$$

We call this inequality the *profitability condition*. Individuals whose labor endowments are greater than or equal to $\tilde{h}(\lambda, k_t)$ are now able to invest in the project if the government improves the credit markets. The capital good market clearing condition and the profitability condition are respectively given by

$$k^\lambda_{t+1} = R\{1 - G[\tilde{h}(\lambda, k_t)]\}, \tag{8}$$

$$R\rho(k^\lambda_{t+1}) \geq 1 \quad \Leftrightarrow \quad k^\lambda_{t+1} \leq \bar{k}, \tag{9}$$

where k^λ_{t+1} is the level of capital at period $t+1$ under the condition that the government improves the credit markets at period t. Note that the improvement of the credit markets enables more individuals to invest in the project, which increases the level of capital in the next period and reduces the return from capital: $k^\lambda_{t+1} > k^0_{t+1}$ and $\rho(k^\lambda_{t+1}) < \rho(k^0_{t+1})$.

4.2 Voting behavior

Individuals who support financial development are identified by two thresholds, $\tilde{h}(\lambda, k_t)$ and $\tilde{h}(0, k_t)$. First, let us consider the preferences of individuals with $h_i < \tilde{h}(\lambda, k_t)$. They are unable to invest in the project regardless of the government policy and hence do not care about the value of λ_t. We assume that such individuals are against the policy in order to simplify our model analysis.[8] These individuals thus prefer $\lambda_t = 0$. Next, let us investigate the

[8]This assumption can be easily justified by introducing an arbitrary small cost, which must be levied by taxation, to improve the credit markets. Since individuals with $h_i < \tilde{h}(\lambda, k_t)$ cannot invest even if they bear a tax burden to develop the credit markets, they

political preferences of individuals with $\tilde{h}(\lambda, k_t) \le h_i < \tilde{h}(0, k_t)$. These individuals can invest in the project only if the government improves the credit markets. As long as the profitability condition is satisfied, they prefer borrowing funds and investing in the project to lending their own money. We assume the value of the productivity parameter R is sufficiently high that the return of capital exceeds $r = 1$ even if all individuals invest in the project (i.e., $k_{t+1} = R$):

$$R\rho(R) > 1 \quad \Leftrightarrow \quad R > (1/\alpha)^{\frac{1}{\alpha}}. \tag{A.1}$$

Under (A.1), individuals with $\tilde{h}(\lambda, k_t) \le h_i < \tilde{h}(0, k_t)$ always prefer $\lambda_t = \lambda$. Finally, individuals with $h_i \ge \tilde{h}(0, k_t)$ prefer $\lambda_t = 0$. They can invest without the government policy, which only reduces their return on investment because $\rho(k_{t+1}^{\lambda}) < \rho(k_{t+1}^{0})$.

Proposition 1 *Under (A.1), individuals with* $\tilde{h}(\lambda, k_t) \le h_i < \tilde{h}(0, k_t)$ *prefer* $\lambda_t = \lambda$*, while individuals with* $h_i < \tilde{h}(\lambda, k_t)$ *and those with* $h_i \ge \tilde{h}(0, k_t)$ *prefer* $\lambda_t = 0$.

Proposition 1 states that preferences for the policy are not monotonic over income levels and that political conflict, *ends against the middle*, can arise, as in Bellettini and Berti Ceroni (2007).

The attitude of individuals toward the policy is dependent on capital levels since the thresholds, $\tilde{h}(\lambda, k_t)$ and $\tilde{h}(0, k_t)$, are functions of k_t. It is particularly useful to define the following four levels of capital, which summarize the magnitude relation among the two thresholds and the upper and lower limit of labor endowments, $\overline{h}$ and $\underline{h}$, as we will associate the support rate of the policy with capital levels. Comparing the two thresholds, $\overline{h}$ and $\underline{h}$, yields the following results:

$$\tilde{h}(\lambda, k_t) < \underline{h} \quad \Leftrightarrow \quad k_t > [(1+\lambda)(1-\alpha)\underline{h}]^{-\frac{1}{\alpha}} \equiv k(\lambda, \underline{h}), \tag{10}$$

strictly prefer $\lambda_t = 0$. In order to keep the model simple, we abstract the cost and taxation. This does not affect our results.

$$\tilde{h}(\lambda, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \left[(1+\lambda)(1-\alpha)\overline{h}\right]^{-\frac{1}{\alpha}} \equiv k(\lambda, \overline{h}), \tag{11}$$

$$\tilde{h}(0, k_t) < \underline{h} \quad \Leftrightarrow \quad k_t > [(1-\alpha)\underline{h}]^{-\frac{1}{\alpha}} \equiv k(0, \underline{h}), \tag{12}$$

$$\tilde{h}(0, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \left[(1-\alpha)\overline{h}\right]^{-\frac{1}{\alpha}} \equiv k(0, \overline{h}). \tag{13}$$

The inequality $\tilde{h}(\lambda, k_t) < \underline{h}$ in (10) states that even the poorest individuals can invest in the project as long as the government improves the credit markets. Expression (10) hence means that implementation of the policy allows all individuals to invest in the project if the level of capital is higher than $k(\lambda, \underline{h})$. The inequality $\tilde{h}(\lambda, k_t) > \overline{h}$ in (11) states that the richest individuals cannot invest in the project even under the improved credit markets. Expression (11) hence means the policy cannot enable any individuals to invest in the project if the level of capital is lower than $k(\lambda, \overline{h})$. Similarly, expression (12) means that if the level of capital is higher than $k(0, \underline{h})$, all individuals can invest in the project even if the government does not improve the credit markets. Expression (13) means that if the level of capital is lower than $k(0, \overline{h})$, no individual can invest in the project unless the government improves the credit markets. Expressions (10)-(13) imply $k(\lambda, \overline{h}) < k(0, \overline{h})$ and $k(\lambda, \underline{h}) < k(0, \underline{h})$, but the magnitude relation between $k(0, \overline{h})$ and $k(\lambda, \underline{h})$ depends on the value of $\underline{h}$, i.e., $\underline{h} < 2/(2+\lambda)$ implies $k(0, \overline{h}) < k(\lambda, \underline{h})$, and $\underline{h} \geq 2/(2+\lambda)$ implies $k(0, \overline{h}) \geq k(\lambda, \underline{h})$.

4.3 The support rate

Let us discuss the support rate for the policy to improve the credit markets in the case of $\underline{h} < 2/(2+\lambda)$; that is, $k(0, \overline{h}) < k(\lambda, \underline{h})$. Under majority voting, the policy to improve the credit markets is implemented if at least half of young individuals support it, and rejected otherwise.[9] The support rate is a function of capital k_t since $\tilde{h}(\lambda, k_t)$ and $\tilde{h}(0, k_t)$ depend on k_t. It is

[9]Note that old individuals are not interested in the government policy in the current period because they have already chosen whether to invest in the project. We assume that the government policy is implemented if half of young individuals support it.

useful to remember expressions (10)–(13) in order to identify the attitudes of individuals toward the policy. It should be also noted that individuals who can invest in the project only through the implementation of the policy vote in favor of it and the others vote against it.

To calculate the density of individuals who support the policy, or the support rate, five cases need to be considered according to the value of k_t. First, when $0 \leq k_t < k(\lambda, \overline{h})$, the policy enables no individual to invest in the project. Second, when $k(\lambda, \overline{h}) \leq k_t < k(0, \overline{h})$, the policy enables individuals with $\tilde{h}(\lambda, k_t) \leq h_i \leq \overline{h}$ to start the project. Third, when $k(0, \overline{h}) \leq k_t < k(\lambda, \underline{h})$, individuals with $\tilde{h}(\lambda, k_t) \leq h_i < \tilde{h}(0, k_t)$ can invest only with the assistance of the policy. Fourth, when $k(\lambda, \underline{h}) \leq k_t < k(0, \underline{h})$, individuals who can run the project only through the assistance of the policy are those with $\underline{h} \leq h_i < \tilde{h}(0, k_t)$. Finally, when $k(0, \underline{h}) \leq k_t$, all individuals are able to invest in the project regardless of the government policy. Based on the above analysis, the support rate function $S(k)$ is represented as

$$S(k_t) = \begin{cases} 0 \quad \text{if} \quad 0 \leq k_t < k(\lambda, \overline{h}), \\ S_1(k_t) \equiv \int_{\tilde{h}(\lambda,k_t)}^{\overline{h}} dG(h_i) = \frac{1}{2(1-\underline{h})} \left(2 - \underline{h} - \frac{1}{1+\lambda} \frac{1}{1-\alpha} k_t^{-\alpha}\right) \\ \qquad \text{if} \quad k(\lambda, \overline{h}) \leq k_t < k(0, \overline{h}), \\ S_2(k_t) \equiv \int_{\tilde{h}(\lambda,k_t)}^{\tilde{h}(0,k_t)} dG(h_i) = \frac{1}{2(1-\underline{h})} \frac{\lambda}{1+\lambda} \frac{1}{1-\alpha} k_t^{-\alpha} \\ \qquad \text{if} \quad k(0, \overline{h}) \leq k_t < k(\lambda, \underline{h}), \\ S_3(k_t) \equiv \int_{\underline{h}}^{\tilde{h}(0,k_t)} dG(h_i) = \frac{1}{2(1-\underline{h})} \left(\frac{1}{1-\alpha} k_t^{-\alpha} - \underline{h}\right) \\ \qquad \text{if} \quad k(\lambda, \underline{h}) \leq k_t < k(0, \underline{h}), \\ 0 \quad \text{if} \quad k(0, \underline{h}) \leq k_t. \end{cases} \tag{14}$$

Figure 1 depicts the features of the support rate function $S(k)$. The support rate function can be obtained in the case of $2/(2 + \lambda) \leq \underline{h} \leq 1$ in a similar manner, but we omit the derivation.

5 Dynamic Analysis

This section identifies the politically determined government policy by using the support rate function $S(k)$ depicted in Figure 1 and analyzes interactions between the policy and economic development. The level of income inequality plays a crucial role in the analysis of the policy because it affects the shape of the support rate function.[10] Note that the smaller $\underline{h}$, the larger income inequality. In what follows, we consider each of the three cases: low (Case 1), moderate (Case 2), and high (Case 3) levels of income inequality. Figure 2 illustrates these patterns.

Case 1: Low level of income inequality

First, let us consider the politically determined policy under a low level of income inequality. Specifically, the income inequality is so small that $1/(1+\lambda) \leq \underline{h} < 2/(2+\lambda)$. This inequality implies $S_2[k(\lambda, \underline{h})] \geq 1/2$. Let k_A and k_B respectively denote the capital levels satisfying the following equalities:

$$S_1(k_A) = \frac{1}{2} \Leftrightarrow k_A = \left(\frac{1}{1+\lambda}\frac{1}{1-\alpha}\right)^{\frac{1}{\alpha}}, \quad S_3(k_B) = \frac{1}{2} \Leftrightarrow k_B = \left(\frac{1}{1-\alpha}\right)^{\frac{1}{\alpha}}.$$

If $0 \leq k_t < k_A$, the support rate is less than $1/2$, and $\lambda_t = 0$ is chosen. Under the low capital level, the economy is poor as a whole, and most individuals are unable to invest even with the assistance of the policy. The government policy can only benefit a small portion of relatively rich individuals and does not obtain majority support. If $k_A \leq k_t \leq k_B$, in contrast, the support rate is greater than or equal to $1/2$, and $\lambda_t = \lambda$ is realized. Under this capital level, a majority of individuals are able to invest in the project only through improving the credit markets, and they therefore support the policy.

[10] If there is no borrowing constraint but income inequality, all individuals can borrow enough in order to invest in the project, and the level of capital converges to R in one period.

If $k_t > k_B$, the support rate is again less than half, and $\lambda_t = 0$ is chosen. This is because the economy is well-developed and a large portion of individuals can invest regardless of the government policy.

In order to keep the below analysis simple, we impose the following additional assumption on parameters:

$$2k_A < R < k_B. \tag{A.2}$$

The first inequality, $2k_A < R$, means that the improvement of the credit markets makes capital stock in the next period greater than that in the current period if $k_t = k_A$, where the policy begins to obtain majority support. The second inequality, $R < k_B$, implies that the support rate for the government policy becomes more than 1/2, and $\lambda_t = \lambda$ if the economy develops sufficiently that all individuals in the previous period invest in the project. (A.2) implies that $\lambda > 2^\alpha - 1$, and (A.1) and (A.2) imply $\alpha > 1/2$.[11]

Under (A.2), $\lambda_t = 0$ if $0 \leq k_t < k_A$, and $\lambda_t = \lambda$ if $k_A \leq k_t \leq R$. The dynamic equation of capital is given by

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ \frac{R}{2(1-\underline{h})}\left(2 - \underline{h} - \frac{1}{1+\lambda}\frac{1}{1-\alpha}k_t^{-\alpha}\right) \equiv F_1(k_t, \underline{h}) & \text{if} \quad k_A \leq k_t < \min\{R, k(\lambda, \underline{h})\}, \\ R & \text{if} \quad \min\{R, k(\lambda, \underline{h})\} \leq k_t < R. \end{cases} \tag{15}$$

The third line in (15) is valid if the interval $[\min\{R, k(\lambda, \underline{h})\}, R)$ is nonempty. Depending on the values of R and $k(\lambda, \underline{h})$, there are two possible dynamics as depicted in Figure 3. Notice that $k(\lambda, \underline{h})$ is decreasing in $\underline{h}$ and moves from k_B down to $\tilde{k} \equiv (2+\lambda)^{1/\alpha}[2(1+\lambda)(1-\alpha)]^{-1/\alpha} < k_B$ as $\underline{h}$ changes from $1/(1+\lambda)$ to $2/(2+\lambda)$. When $\max\{\tilde{k}, 2k_A\} \leq R$, the dynamics can correspond to Figure 3 (a) or (b). That is, the dynamics correspond to Figure 3 (a) if income inequality is relatively low in Case 1, such that

[11]Since we interpret capital broadly to include human capital and any capital good, as in Matsuyama (2004), $\alpha > 1/2$ is not so restrictive.

$k(\lambda, \underline{h}) \leq R$, and they correspond to Figure 3 (b) if income inequality is relatively high, such that $k(\lambda, \underline{h}) > R$.[12] When $R < \tilde{k}$, $k(\lambda, \underline{h}) > R$ for all $\underline{h}$ in Case 1 and the dynamics correspond to Figure 3 (b). The results in Case 1 may theoretically explain the bilateral causality between financial and economic development found by Calderón and Liu (2003). Capital stock must be at least above k_A for the policy to be supported, which suggests causality from economic development to financial development. Obviously, financial development stimulates investments, which causes economic development. It is easy to show that the dynamic equation of capital is also given by (15) in the case of $2/(2+\lambda) \leq \underline{h} \leq 1$.

Case 2: Moderate level of income inequality

Next, we consider the case in which $\max\{0, 1-\lambda\} \leq \underline{h} < 1/(1+\lambda)$. This inequality implies $S_2[k(\lambda, \underline{h})] < 1/2 \leq S_2[k(0, \overline{h})]$. Let us define $k_C(\underline{h})$ by $S_2[k_C(\underline{h})] = 1/2$. $k_C(\underline{h})$ is increasing in $\underline{h}$ since a rise in $\underline{h}$ increases the density of individuals in the interval $[\tilde{h}(\lambda, k_t), \tilde{h}(0, k_t)]$, who benefit from the policy that improves the credit markets. The support rate consequently becomes higher for a given capital level k_t, and the curve $S_2(k_t)$ shifts upward. Hence, $k_C(\underline{h})$ is increasing in $\underline{h}$. By the same logic discussed in Case 1, $\lambda_t = \lambda$ if $k_A \leq k_t \leq \min\{R, k_C(\underline{h})\}$ and $\lambda_t = 0$ otherwise. The dynamic equation of capital is represented as

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ F_1(k_t, \underline{h}) & \text{if} \quad k_A \leq k_t \leq \min\{k_C(\underline{h}), R\}, \\ \frac{R}{2(1-\underline{h})}\left[2 - \underline{h} - \frac{1}{1-\alpha}k_t^{-\alpha}\right] \equiv F_2(k_t, \underline{h}) & \text{if} \quad \min\{k_C(\underline{h}), R\} < k_t \leq R. \end{cases} \tag{16}$$

The third line in (16) is valid if the interval $(\min\{k_C(\underline{h}), R\}, R]$ is non-empty. Appendix A shows that $F_2(k_t, \underline{h})$ does not intersect with the 45-degree line for all $k_t \in [0, R]$ and $\underline{h} \in [0, 1]$. As long as income inequality is lower in

[12] $2k_A < R$ in (A.2) ensures that $F_1(k_t, \underline{h})$ has a fixed point when $k(\lambda, \underline{h}) \geq R$.

Case 2 and $k_C(\underline{h}) \geq R$, the dynamics described by (16) correspond to those in Figure 3 (b).

When income inequality is higher to the point that $\underline{h}$ is smaller than the threshold $\underline{h}_X$, defined by $k_C(\underline{h}_X) = R$, $k_C(\underline{h}) < R$. Under a relatively high level of current capital stock such that $k_t \in (k_C(\underline{h}), R]$, higher income inequality makes the majority of individuals rich enough to invest without the policy. The policy is thus not practiced, which decreases the capital stock in the next period. Let us define another threshold, $\underline{h}_Y$, by $F_1[k_C(\underline{h}_Y), \underline{h}_Y] = k_C(\underline{h}_Y)$.[13] If $\underline{h}_Y \leq \underline{h} < \underline{h}_X$, $F_1(k_t, \underline{h})$ and the 45-degree line intersect, and the dynamics are illustrated by (a), (b), or (c) in Figure 4. Figure 4 (a) illustrates a case in which $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$. For any $k_0 \geq k_A$, the economy converges to the stable steady state k^*. Figure 4 (b) depicts a case in which $F_2[k_C(\underline{h}), \underline{h}] < k_A \leq F_2(R, \underline{h})$. Once $k_t \in [k_A, k_C]$, the economy converges to k^*, but if $k_t \in (k_C, R]$, then the economy may or may not fall into a poverty trap, depending on the value of $k_t \in (k_C, R]$. Figure 4 (c) illustrates a case in which $F_2(R, \underline{h}) < k_A$. Although the economy has the positive steady state k^*, it is caught in a poverty trap once $k_t \in (k_C, R]$.

If income inequality is higher to such an extent that $\max\{0, 1-\lambda\} \leq \underline{h} < \underline{h}_Y$, $F_1(k_t, \underline{h})$ and the 45-degree line do not intersect, and there are three possible dynamics as shown in Figure 4 (d)-(f).[14] If $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$ and $k_0 \geq k_A$, the economy experiences permanent fluctuations as illustrated in Figure 4 (d). Figure 4 (e) corresponds to a case in which $F_2[k_C(\underline{h}), \underline{h}] < k_A \leq F_2(R, \underline{h})$. The economy may fluctuate permanently, but the condition that $F_2[k_C(\underline{h}), \underline{h}] < k_A$ creates the possibility that it falls into a poverty trap. If $F_2(R, \underline{h}) < k_A$ as depicted in Figure 4 (f), the economy is eventually caught in a trap for any k_0 although the credit markets may be improved for some

[13]Since both $F_1[k_C(\underline{h}), \underline{h}]$ and $k_C(\underline{h})$ are increasing and convex in $\underline{h}$, $F_1[k_C(1-\lambda), 1-\lambda] = R/2 > k_A = k_C(1-\lambda)$, and $F_1[k_C(1/(1+\lambda)), 1/(1+\lambda)] = R < k_B = k_C(1/(1+\lambda))$, $\underline{h}_Y \in (1-\lambda, \underline{h}_X)$ is uniquely determined.

[14]For large λ, $\underline{h}_Y$ can be non-positive and there is no $\underline{h}$ that satisfies $\max\{0, 1-\lambda\} < \underline{h} < \underline{h}_Y$. In this case, $F_1(k_t, \underline{h})$ and the 45-degree line always intersect.

periods. Appendix B shows the existence of all dynamics depicted in Figures 4 (a)-(f).

Case 3: High level of income inequality

Lastly, we consider the case under high levels of income inequality: $0 \leq \underline{h} < \max\{0, 1-\lambda\}$. If $\lambda \geq 1$, Case 3 does not exist and an economy falls under either Case 1 or 2. If $\lambda < 1$, $\underline{h} < 1 - \lambda$ implies $S_2[k(0, \overline{h})] < 1/2$.

A higher level of income inequality reduces the density of individuals, $1/[2(1-\underline{h})]$, which suggests that the policy improving the credit markets benefits only a few individuals. The support rate function $S(k)$ is always smaller than $1/2$, and $\lambda_t = 0$ is implemented for any k. The dynamic equation of capital is represented as

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k(0, \overline{h}), \\ F_2(k_t, \underline{h}) & \text{if} \quad k(0, \overline{h}) \leq k_t \leq R. \end{cases} \tag{17}$$

As shown in Figure 5, the government policy is never implemented, and the economy is always caught in a poverty trap.

Analyzed throughout this section is the relationship between income inequality and financial and economic development. The results can be summarized in the following proposition.

Proposition 2 *High income inequality causes financial and economic underdevelopment. If* $\underline{h}_Y \leq \underline{h} \leq 1$, *then the range of capital level under which* $\lambda_t = \lambda$ *is broad and the economy has a positive steady state. In particular, if* $(\underline{h}_Y <)\underline{h}_X \leq \underline{h} \leq 1$, $\lambda_t = \lambda$ *for all time periods and the economy converges to* k^* *or* R *for any* $k_0 \geq k_A$. *If* $\max\{0, 1-\lambda\} \leq \underline{h} < \underline{h}_Y$, *then the economy has no positive steady state. If* $0 \leq \underline{h} < \max\{0, 1-\lambda\}$, *then* $\lambda_t = 0$ *for all time periods and the economy always falls into a poverty trap.*

In our model, a high level of income inequality lowers the percentage of individuals who benefit from the policy that improves the credit markets; as a result, government policy is less likely to be implemented, and economic development is retarded. This result is consistent with the evidence found by Easterly (2001, 2007). Although influential politico-economic studies by Alesina and Rodrik (1994) and Persson and Tabellini (1994) attributed the negative effect of income inequality on economic development to conflicts over redistribution policies, the mechanism in this paper is quite different from that in those studies. This paper therefore proposes a new explanation for the negative relationship between inequality and economic development.

As we have focused on R that satisfies (A.2), it is worth mentioning cases where (A.2) is dropped out. First, our claim that higher inequality retards financial and economic development would be unaffected since an economy is always classified into Case 1, 2, or 3 according to the degree of income inequality. When $R < 2k_A$, an economy is more likely to be trapped. In particular, even in Case 1, an economy may be trapped for any k_0 since, under lower R, capital is not accumulated enough to raise labor wages sufficiently. When $R > k_B$, in contrast, an economy is less likely to fall into a trap. Larger R leads to rapid capital accumulation once some individuals start the project. This greatly increases labor wages of the next generation and enables many individuals to invest. Even without (A.2), the negative effect of higher inequality on financial development remains intact.

6 Conclusion

It is widely recognized that the development of credit markets facilitates economic growth and development. This paper has investigated conditions under which a policy that improves credit markets is implemented under majority voting, and has analyzed interactions between government policy and economic development. High levels of income inequality and low levels of capital reduce the number of individuals who benefit from the policy and retard financial and economic development.

Although our interest is the analysis of policy determination under majority voting, some readers may be interested in the analysis under other political environments. It would be interesting to consider situations in which income inequality is associated with inequality in political power. Rich individuals could engage in political activities such as lobbying, and thereby try to keep credit markets underdeveloped in order to keep their rents, as Perotti and Volpin (2004) argue. The point of our paper here is that even in the absence of inequality in political power, improving credit markets is not always implemented.

As we have assumed a small open economy to simplify our analysis, studying in a closed economy setting would be interesting and important. In a closed economy, the interest rate would be endogenously determined but would not necessarily be adjusted to equate aggregate savings to aggregate investments because of information asymmetry between lenders and borrowers. There should be two regimes according to whether aggregate savings are underutilized or fully utilized. In Aghion, Banerjee, and Piketty (1999), whose specification of borrowing constraints we have used, an economy can keep moving between the two regimes and experience permanent fluctuations even under an unchanged credit multiplier. Changing the severity of borrowing constraints would affect the regime into which the economy is put, and individuals would have to vote with regime switching in mind. Analysis of policy making and capital accumulation in such environments is left for future research.

Appendix A. Feature of the Function $F_2(k, \underline{h})$

The gradient of the function $F_2(k, \underline{h})$ at $k = k(0, \overline{h})$ is given by

$$\frac{\partial}{\partial k} F_2[k(0, \overline{h}), \underline{h}] = \alpha \frac{R}{2} \frac{2 - \underline{h}}{1 - \underline{h}} k(0, \overline{h})^{-1} \equiv F_2'[k(0, \overline{h}), \underline{h}].$$

We denote by $\gamma(\underline{h})$ the gradient of the line segment that connects the points $(k(0,\overline{h}),0)$ and $(R/2,R/2)$, and denote by $\delta(\underline{h})$ the difference between the inverse of $F_2'[k(0,\overline{h}),\underline{h}]$ and that of $\gamma(\underline{h})$:

$$\delta(\underline{h}) = \frac{1}{F_2'[k(0,\overline{h}),\underline{h}]} - \frac{1}{\gamma(\underline{h})} = \frac{2}{R}\left[\frac{1-\underline{h}}{\alpha(2-\underline{h})}+1\right]\left(\frac{1}{1-\alpha}\frac{1}{2-\underline{h}}\right)^{\frac{1}{\alpha}} - 1.$$

Simple calculations show that $\delta(\underline{h})$ is increasing in $\underline{h}$, and thus, the value of $\delta(\underline{h})$ is minimized at $\underline{h}=0$. Since R is assumed to be smaller than k_B,

$$\delta(0) = 2\left(\frac{1}{2\alpha}+1\right)\left(\frac{1}{2}\right)^{\frac{1}{\alpha}}\frac{k_B}{R} - 1 > 2\left(\frac{1}{2\alpha}+1\right)\left(\frac{1}{2}\right)^{\frac{1}{\alpha}} - 1.$$

For any $\alpha \in (1/2,1)$, $2[1/(2\alpha)+1](1/2)^{1/\alpha} - 1 > 0$, which means that the value of $\delta(\underline{h})$ is always positive. Hence, $F_2'[k(0,\overline{h}),\underline{h}] < \gamma(\underline{h})$ for all $\underline{h} \in [0,1)$, and $F_2(k,\underline{h})$ and the 45-degree line never intersect (see Figure A).

Appendix B. Existence of the Dynamics of Capital in Case 2

In this section, we show the *existence* of all dynamics depicted in Figures 4 (a)-(f), focusing on the features of $k_C(\underline{h})$, $F_1[k_C(\underline{h}),\underline{h}]$, $F_2[k_C(\underline{h}),\underline{h}]$, and $F_2(R,\underline{h})$. First, note that whereas $k_C(\underline{h})$, $F_1[k_C(\underline{h}),\underline{h}]$, and $F_2[k_C(\underline{h}),\underline{h}]$ are increasing in $\underline{h}$, $F_2(R,\underline{h})$ is decreasing in $\underline{h}$ ((A.2) ensures this), and that $k_C(\underline{h})$ and $F_1[k_C(\underline{h}),\underline{h}]$ satisfy the following:

$$k_C(1-\lambda) = k_A, \quad k_C\left(\frac{1}{1+\lambda}\right) = k_B,$$

$$F_1[k_C(1-\lambda),1-\lambda] = \frac{R}{2}, \quad F_1\left[k_C\left(\frac{1}{1+\lambda}\right),\frac{1}{1+\lambda}\right] = R.$$

We then define $\underline{h}_Z$ by

$$F_2[k_C(\underline{h}_Z), \underline{h}_Z] = k_A.$$

It is clear that $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$ if and only if $\underline{h} \geq \underline{h}_Z$.

Figure B (a) depicts $k_C(\underline{h})$, $F_1[k_C(\underline{h}), \underline{h}]$, $F_2[k_C(\underline{h}), \underline{h}]$, and $F_2(R, \underline{h})$ in the case where R is slightly smaller than k_B. Since $F_2(R, \underline{h}) = k_B/2 > k_A$ when $R = k_B$, the continuity of $F_2(R, \underline{h})$ with respect to R ensures that $F_2(R, \underline{h}) > k_A$ for any $\underline{h} \in [1-\lambda, \underline{h}_X)$ as long as R is slightly smaller than k_B. Furthermore, $\underline{h}_Z < \underline{h}_Y = \underline{h}_X = 1/(1+\lambda)$ when $R = k_B$. By the continuity of $\underline{h}_X$, $\underline{h}_Y$, and $\underline{h}_Z$ with respect to R, $\underline{h}_Z < \underline{h}_Y < \underline{h}_X$ when R is slightly smaller than k_B. When $\underline{h}_Y \leq \underline{h} < \underline{h}_X$, $F_2[k_C(\underline{h}), \underline{h}] > k_A$, and $F_1(k, \underline{h})$ and the 45-degree line intersect. Thus, the dynamics of capital is depicted as in Figure 4 (a). When $\underline{h}_Z \leq \underline{h} < \underline{h}_Y$ ($1-\lambda \leq \underline{h} < \underline{h}_Z$), $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$ ($F_2[k_C(\underline{h}), \underline{h}] < k_A$), and the function $F_1(k, \underline{h})$ and the 45-degree line have no intersection, and thus, the dynamics of capital is depicted as in Figure 4 (d) (Figure 4 (e)).

Next, suppose that R is slightly larger than $2k_A$. Figure B (b) depicts $k_C(\underline{h})$, $F_1[k_C(\underline{h}), \underline{h}]$, $F_2[k_C(\underline{h}), \underline{h}]$, and $F_2(R, \underline{h})$ in such a case. Under (A.2) and $R = 2k_A$, $F_2(R, \underline{h}) < k_A$ for any $\underline{h} \in [1-\lambda, \underline{h}_X)$. By the continuity of the function $F_2(R, \underline{h})$ with respect to R, $F_2(R, \underline{h}) < k_A$ for any $\underline{h} \in [1-\lambda, \underline{h}_X)$ as long as R is slightly larger than $2k_A$. Furthermore, $\underline{h}_X < \underline{h}_Z = 1/(1+\lambda)$ for $R = 2k_A$. This implies that $\underline{h}_X < \underline{h}_Z$ when R is slightly larger than $2k_A$. When $\underline{h}_Y \leq \underline{h} < \underline{h}_X$, $F_1(k, \underline{h})$ and the 45-degree line intersect, and the dynamics is depicted as in Figure 4 (c). When $1-\lambda \leq \underline{h} < \underline{h}_Y$, in contrast, $F_1(k, \underline{h})$ and the 45-degree line do not intersect, and the dynamics of capital is depicted as in Figure 4 (f).

Last, we show that there exists dynamics depicted as in Figure 4 (b). Note that the functions $\underline{h}_X$ and $\underline{h}_Z$ are increasing and decreasing in R, respectively, and that $\underline{h}_X < \underline{h}_Z$ when $R = 2k_A$ and $\underline{h}_X > \underline{h}_Z$ when $R = k_B$. Thus, there exists a productivity parameter, $\bar{R}$, which makes $\underline{h}_X = \underline{h}_Z$ (see Figure B (c)). When $R = \bar{R}$ and $\underline{h}_Y \leq \underline{h} < \underline{h}_X = \underline{h}_Z$, $F_1[k_C(\underline{h}), \underline{h}] < k_A < F_2(\bar{R}, \underline{h})$, and

$F_1(k, \underline{h})$ and the 45-degree line intersect. Thus, the dynamics of capital is depicted as in Figure 4 (b).

Figure B illustrates the case where $1 - \lambda > 0$, which is not necessarily the case. However, it does not matter because we just aim to prove the existence of all the dynamics in Case 2.

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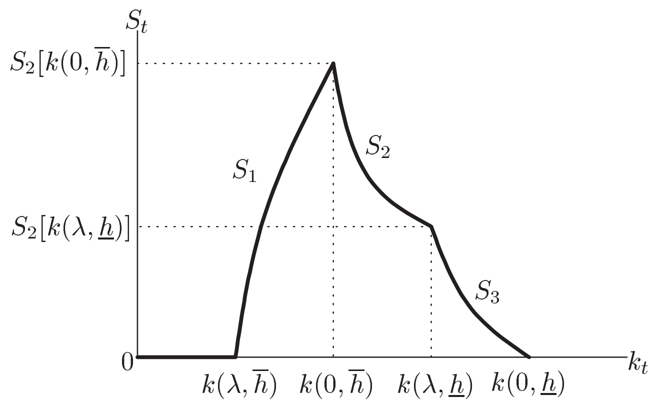

Figure 1: Support rate function

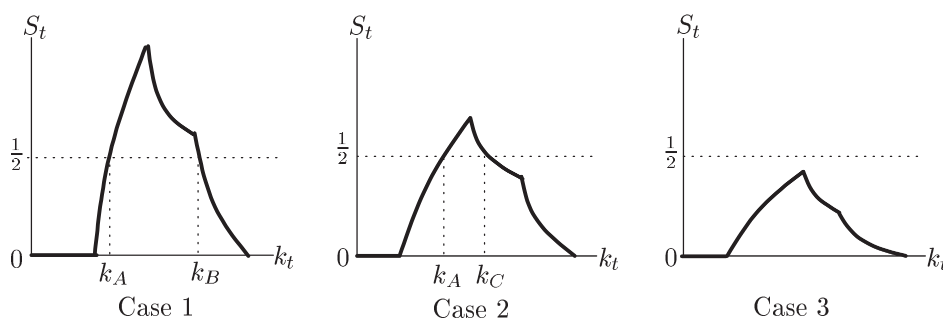

Figure 2: Support rate function in Cases 1, 2, and 3

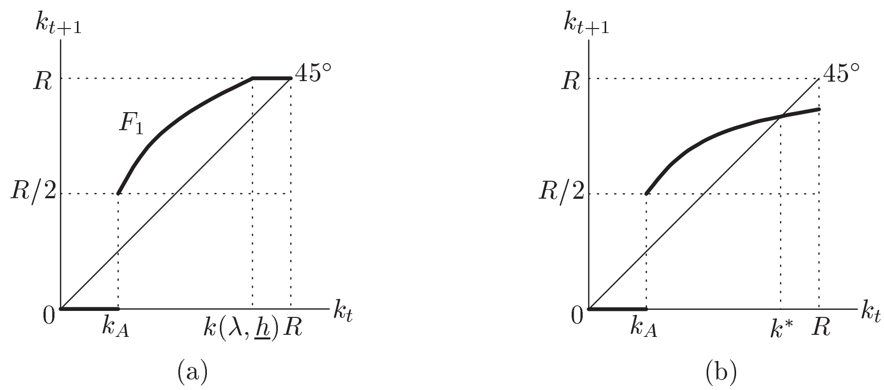

Figure 3: Dynamics for $\underline{h}_X \leq \underline{h} \leq 1$

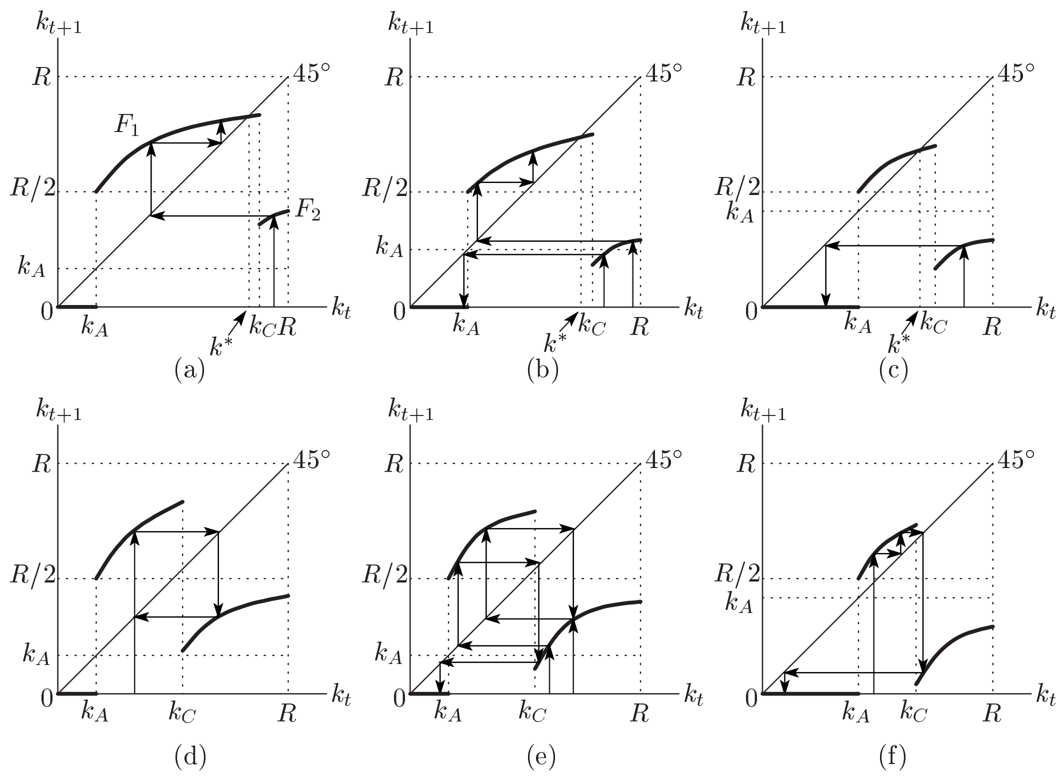

Figure 4: Dynamics for $\max\{0, 1-\lambda\} \leq \underline{h} < \underline{h}_X$

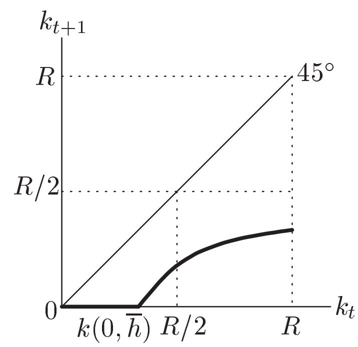

Figure 5: Dynamics for $0 \leq \underline{h} < \max\{0, 1 - \lambda\}$

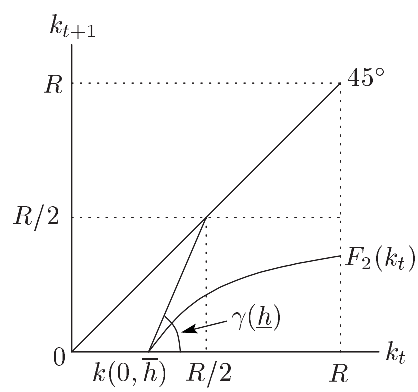

Figure A: Feature of $F_2(k, \underline{h})$

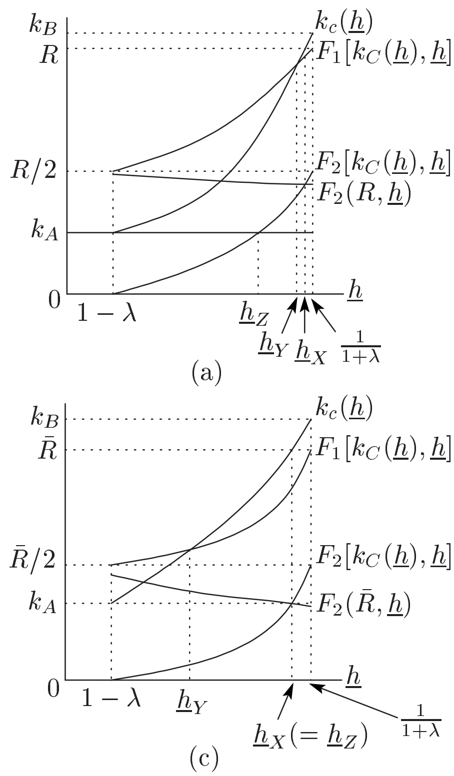

Figure B: Features of $k_C(\underline{h})$, $F_1[k_C(\underline{h}), \underline{h}]$, $F_2[k_C(\underline{h}), \underline{h}]$, and $F_2(R, \underline{h})$