*Macroeconomic Dynamics*, **23**, 2019, 358–383. Printed in the United States of America.
doi:10.1017/S136510051600136X

# THE POLITICS OF FINANCIAL DEVELOPMENT AND CAPITAL ACCUMULATION

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This paper considers the political economy of financial development in an overlapping generations model that incorporates credit market imperfections, and shows that income inequality is a determinant of financial and economic development. Individuals have an opportunity to start an investment project at a fixed cost, but their income to finance the cost is unequal. The government proposes a policy financed by taxation that mitigates credit market imperfections, the implementation of which is determined through majority voting. The policy benefits middle-income individuals who can start the investment only after the implementation of the policy. The policy is, however, against the interest of the rich who wish to block such new entry, and that of the poor who wish to avoid the tax burden. Whether the policy obtains majority support depends on income inequality. High income inequality makes the policy hard to implement, which causes financial and economic underdevelopment.

**Keywords:** Financial Development, Economic Development, Income Inequality, Majority Voting

## 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 more interestingly, it changes nonmonotonically over time within the same countries. Rajan and Zingales (2003) argue

We are grateful to Akihisa Shibata, Kazuhiro Yuki, Kazuo Mino, Kenn Ariga, and the seminar participants at Kyoto University for their helpful comments and suggestions. We are also grateful to an anonymous associate editor and two anonymous referees for their helpful suggestions. This work has received financial support from the Central Research Institute of Fukuoka University (No. 144002) and the Joint Research Program of KIER. Address correspondence to: Keigo Nishida, Faculty of Economics, Fukuoka University, 8-19-1, Nanakuma, Jonan-ku, Fukuoka, 814-0180, Japan; e-mail: knishida@fukuoka-u.ac.jp.

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https://doi.org/10.1017/S136510051600136X Published online by Cambridge University Press

that these changes are caused by political forces, observing that credit market imperfections work as an entry barrier because the imperfections prevent the poor from starting new businesses. The development of credit markets benefits potential entrants, but hurts incumbents because it promotes new entry, creates fierce competition, and reduces their returns. This breeds political conflict between entrants and incumbents.

The objective of this paper is to model the political conflict over financial development proposed by Rajan and Zingales (2003), and to analyze the interactions between the politically determined financial development and economic development. For this purpose, we consider 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 supply labor to the final good sector and earn wages, the amount of which differs across 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 individuals make their investment decisions, the government proposes a policy that improves the credit markets through taxation, and individuals vote for or against this. The next section reviews how the government improves credit markets.[1] 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 the 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, facilitates new entry, and reduces the return on the project. Because the poor are still not able to invest even if they bear a tax burden to develop the credit markets, they vote against the policy together with the rich who wish to block new entry.[2]

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 the income inequality, the less the capital accumulated. This result that high income inequality is harmful to financial and economic development agrees with the evidence by Easterly (2001, 2007).

This paper is related to several strands of literature. First, the literature on the political economy of financial development is closely related. As we have

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discussed, Rajan and Zingales (2003) point out the political conflict between incumbents and entrants. 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 the 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.[3] In their survey of the literature on finance and inequality, Claessens and Perotti (2007) provide the view that high income inequality can have adverse effects on financial development through political factors.[4] Although these studies identify determinants of financial development, they do not consider dynamic implications explicitly. Thus, a contribution of this paper is to investigate the interplay between politically determined financial development and economic development in a dynamic model.

Second, this paper is related to a number of studies that analyze the effects of income inequality in majority voting models. Alesina and Rodrik (1994) and Persson and Tabellini (1994) develop 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, we do not consider voting over redistribution from the rich to the poor, and 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.

Finally, this paper contributes to the literature on inequality, credit market imperfections, and development. Seminal works by Galor and Zeira (1993), Banerjee and Newman (1993), and Aghion and Bolton (1997) analyze how imperfect credit markets and fixed costs of investment affect the persistence of inequality and economic development. Building on the analysis of Galor and Zeira (1993), Bhattacharya (1998) considers the role of bequests for income distribution and capital accumulation when financial markets are imperfect and capitalists produce capital by utilizing risky but high-return technologies.[5] Bequests left by capitalists increase the internal funds of their offspring, mitigate financial market frictions, and thus allow them to obtain credit at lower costs. Although bequests improve the efficiency of financial markets and promote capital accumulation, they may perpetuate income inequality. Chakraborty and Ray (2006) examine the importance of financial systems in an endogenous growth model in which firm financing choices determine whether the financial system is market-based or bank-based. They prove that although neither system is necessarily better than the other in terms of their effects on the long-run growth rate, a bank-based system leads to lower inequality and larger per capita income because banks resolve agency problems, which enables more entrepreneurs to undertake high-productivity investment projects. Chakraborty and Ray (2007) show that the initial income inequality is a major

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determinant of financial depth. In their model, individuals who have their own wealth above some threshold obtain credit, become capitalists, and run an indivisible investment project that produces capital, while the others become workers. If the initial inequality is high and many individuals are too poor to obtain credit, the amount of capital produced is small. The labor wage is depressed as a result and workers will never accumulate sufficient wealth to borrow and become capitalists. The portion of individuals who obtain credit is therefore persistently small. In other words, financial markets remain underdeveloped. A big difference between our study and previous studies is that the lending technology itself changes, affected by the government policy implemented through majority voting. The voting result strongly depends on the extent of inequality, and our paper emphasizes a channel from inequality to financial development.[6]

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 the 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 et al. (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 et al. (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 et al. (2007) find that strong creditor protections have a positive impact on the private credit to GDP ratio. Haselmann et al. (2010) focus on 12 transition economies to investigate how banks respond to legal changes and find, consistent with the conclusions of Djankov et al. (2007), that improvements in creditor protections promote bank lending.[7]

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, which collects data on the standing of borrowers and makes it available to financiers.[8] 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

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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 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 et al. (2007), to which we have referred above, shows that information-sharing institutions are associated with higher private credit to gross domestic product (GDP) ratios. For microevidence, using firm-level data in transition countries, Brown et al. (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 et al. (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 et al. (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 replaces them.[9]

## 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 $\overline{h} = 2 - \underline{h}$. The inequality of endowments called "labor" is exogenously given and unaffected by market forces. Easterly (2007) calls such inequality "structural inequality," in contrast to "market inequality," and demonstrates that structural inequality is a determinant of bad institutions and underdevelopment. As will be described, our theory suggests that, consistent with Easterly (2001, 2007), structural inequality causes financial and economic underdevelopment through policymaking.

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### 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 the 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 $\rho_t$ 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, they are endowed with $e$ units of the final good and supply their labor inelastically.[10] The individual born in period $t$ with $h_i$ earns $w(k_t)h_i$, and his or her disposable income is $w(k_t)h_i + e - \tau_t$, where $\tau_t$ is a lump-sum tax. 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.[11] At the end of 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. We assume that the production factors, labor and the capital good, are nontradable. We also assume that individuals cannot carry out the investment project in foreign countries due to, for example, a lack of local information, differences in languages, habits, and cultures, and expropriation risks. In other words, foreign direct investments are not feasible.

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 $b_{it} = 1 - [w(k_t)h_i + e - \tau_t]$.

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, $\lambda_t$, times his or her disposable income, as shown by Aghion et al. (1999, 2005):

$$b_{it} \leq \lambda_t [w(k_t)h_i + e - \tau_t]. \tag{4}$$

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We call this inequality the *borrowing constraint*. The parameter $\lambda_t$ is commonly called the credit multiplier, and it represents the extent of financial development. The borrowing constraint disappears as $\lambda_t$ 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 et al. (1999, 2005) derive the constant credit multiplier and show that borrowing constraints take the form of (4).[12] 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, $\tilde{h}(\lambda_t, k_t)$, cannot invest in the project:

$$\tilde{h}(\lambda_t, k_t) \equiv \frac{1}{w(k_t)}\left(\frac{1}{1+\lambda_t} - e + \tau_t\right). \tag{5}$$

### 3.3. Government

The government can mitigate credit market imperfections, a type of market failure, caused by asymmetric information.[13] In concrete terms, the government can improve laws, establish public credit registries, and offer partial credit guarantee systems as described in Section 2. Making such a policy work in practice, however, incurs some costs. For example, making laws fully effective and judicial enforcement efficient enough incurs costs in the establishment of the regulatory authorities, the employment of civil servants and judges, and the provision of legal services. Many of the costs are flow costs, and therefore the government must levy a tax whenever it develops credit markets. The government budget is balanced in each period. We assume that the tax is collected in a lump-sum fashion. Appendix A discusses the implications of the lump-sum taxation.

Suppose that the technology the government uses to improve the markets is described by

$$\lambda_t = \begin{cases} \lambda_L & \text{if } 0 \le \tau_t < \tau, \\ \lambda_H & \text{if } \tau \le \tau_t, \end{cases} \tag{6}$$

where $\lambda_L < \lambda_H$. Improving the credit markets requires a fixed cost, and government spending less than $\tau$ has no effect on the markets. The parameter $\lambda_t$, which represents the degree of financial development, is $\lambda_L$ for $\tau_t \in [0, \tau)$. Government spending greater than or equal to $\tau$ does improve the credit markets, and the parameter increases to $\lambda_H$. We assume that government spending in excess of $\tau$ does not improve the credit markets any further, and consequently causes the parameter $\lambda_t$ to remain as $\lambda_H$. Under this governmental technology, the government chooses either (a) improving the credit markets with $\tau$ of lump-sum taxation, or (b) not improving the credit markets with no taxation. For simplicity, we set $\lambda_L = 0$, $\lambda_H = \lambda > 0$, and $\tau = e$.

Expressions (5) and (6) give the threshold labor endowment as a function of $\lambda_t$ and capital. The thresholds under the improved and unimproved credit markets are

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given respectively by $\tilde{h}(\lambda, k_t) \equiv 1/[(1+\lambda)w(k_t)]$ and $\tilde{h}(0, k_t) \equiv (1-e)/w(k_t)$. Both of the 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 the individuals are able to invest in the project since their wages are increasing in capital. It is true that government spending is likely to ease borrowing constraint (4) by raising $\lambda_t$, but the lump-sum tax lowers individuals' disposable income. Whether the threshold is lowered by the policy therefore depends on the amount of the endowment. We impose the following assumption on $e$:

$$e < \lambda/(1+\lambda). \tag{A.1}$$

Assumption (A.1) implies $\tilde{h}(0, k_t) > \tilde{h}(\lambda, k_t)$, which states that the government policy enables more individuals to invest in the project.

## 4. STATIC ANALYSIS

### 4.1. Evolution of Capital Under Given Imperfections

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 evolution equation for capital is represented as

$$k^0_{t+1} = R\{1 - G[\tilde{h}(0, k_t)]\}, \tag{7}$$

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.,

$$R\rho(k^0_{t+1}) \geq 1 \quad \Leftrightarrow \quad k^0_{t+1} \leq (\alpha R)^{1/(1-\alpha)} \equiv \bar{k}. \tag{8}$$

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 evolution equation for capital and the profitability condition are given respectively by

$$k^\lambda_{t+1} = R\{1 - G[\tilde{h}(\lambda, k_t)]\}, \tag{9}$$

$$R\rho(k^\lambda_{t+1}) \geq 1 \quad \Leftrightarrow \quad k^\lambda_{t+1} \leq \bar{k}, \tag{10}$$

where $k^\lambda_{t+1}$ 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

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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: $k^{\lambda}_{t+1} \geq k^{0}_{t+1}$ and $\rho(k^{\lambda}_{t+1}) \leq \rho(k^{0}_{t+1})$.

### 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 $h_i < \tilde{h}(\lambda, k_t)$. Although the policy requires the lump-sum tax, it does not enable them to invest in the project. These individuals thus prefer $\lambda_t = 0$ ($\tau_t = 0$). Next, let us investigate the political preferences of individuals with $\tilde{h}(\lambda, k_t) \leq h_i < \tilde{h}(0, k_t)$. These individuals can invest in the project only if the government improves the credit markets. As long as the profitability condition is satisfied, these individuals are willing to invest in the project under the improved credit markets. Thus, the consumption level of these individuals under $\lambda_t = \lambda$ ($\tau_t = \tau$) is given by $R\rho(k^{\lambda}_{t+1}) - [1 - w(k_t)h_i]$. In contrast, these individuals cannot invest in the project without the government policy, and the consumption level of these individuals under $\lambda_t = 0$ ($\tau_t = 0$) is given by $w(k_t)h_i + e$. Comparing these consumption levels, they prefer $\lambda_t = \lambda$ if and only if $R\rho(k^{\lambda}_{t+1}) \geq 1 + e$. We assume that the value of the productivity parameter $R$ is sufficiently high that the return of capital exceeds $1 + e$ even if all individuals invest in the project (i.e., $k_{t+1} = R$):

$$R\rho(R) > 1 + e \quad \Leftrightarrow \quad R > [(1 + e)/\alpha]^{1/\alpha}. \tag{A.2}$$

Under (A.2), individuals with $\tilde{h}(\lambda, k_t) \leq h_i < \tilde{h}(0, k_t)$ always prefer $\lambda_t = \lambda$.[14] Finally, individuals with $h_i \geq \tilde{h}(0, k_t)$ prefer $\lambda_t = 0$. They can invest without the government policy, and it creates a tax burden only to reduce the return on investment because $\rho(k^{\lambda}_{t+1}) \leq \rho(k^{0}_{t+1})$.

PROPOSITION 1. *Under (A.1) and (A.2), individuals with $\tilde{h}(\lambda, k_t) \leq h_i < \tilde{h}(0, k_t)$ prefer $\lambda_t = \lambda$, whereas individuals with $h_i < \tilde{h}(\lambda, k_t)$ and those with $h_i \geq \tilde{h}(0, k_t)$ 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).[15]

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 limits 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:

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

$$\tilde{h}(\lambda, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \{1/[(1 + \lambda)(1 - \alpha)\overline{h}]\}^{1/\alpha} \equiv k(\lambda, \overline{h}), \tag{12}$$

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$$\tilde{h}(0, k_t) < \underline{h} \quad \Leftrightarrow \quad k_t > \{(1-e)/[(1-\alpha)\underline{h}]\}^{1/\alpha} \equiv k(0, \underline{h}), \tag{13}$$

$$\tilde{h}(0, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \{(1-e)/[(1-\alpha)\overline{h}]\}^{1/\alpha} \equiv k(0, \overline{h}). \tag{14}$$

The inequality $\tilde{h}(\lambda, k_t) < \underline{h}$ in (11) states that even the poorest individuals can invest in the project as long as the government improves the credit markets. Expression (11) 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 (12) states that the richest individuals cannot invest in the project even under the improved credit markets. Expression (12) hence means that 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 (13) 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 (14) 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 (11)–(14) 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., $\underline{h} < 2/[(1+\lambda)(1-e)+1]$ implies $k(0, \overline{h}) < k(\lambda, \underline{h})$, and $\underline{h} \geq 2/[(1+\lambda)(1-e)+1]$ 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 $\underline{h} < 2/[(1+\lambda)(1-e)+1]$; 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.[16] 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 useful to recall expressions (11)–(14) in identifying 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.[17]

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 $\underline{h} \leq h_i < \tilde{h}(0, k_t)$. Last, when $k(0, \underline{h}) \leq k_t$, all individuals are able to invest in the project regardless of the government policy. On the basis of the above analysis, the support rate function $S(k)$ is represented as

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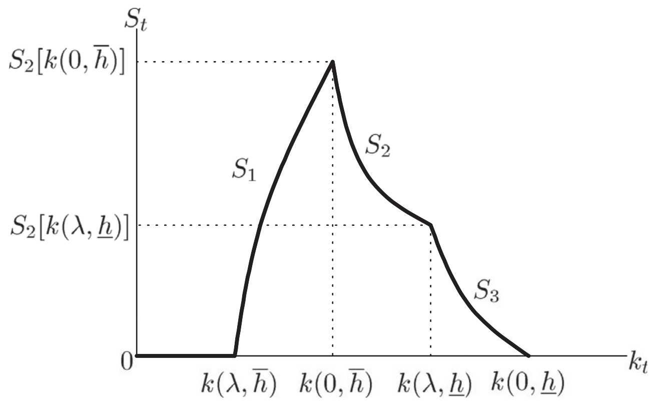


**FIGURE 1.** Support rate function.

$$S(k_t) = \begin{cases} 0 & \text{if } 0 \le k_t < k(\lambda,\overline{h}), \\ S_1(k_t) \equiv \int_{\tilde{h}(\lambda,k_t)}^{\overline{h}} dG(h_i) = \frac{1}{2(1-\underline{h})}\left(2 - \underline{h} - \frac{1}{1+\lambda}\frac{1}{1-\alpha}k_t^{-\alpha}\right) & \text{if } k(\lambda,\overline{h}) \le k_t < k(0,\overline{h}), \\ S_2(k_t) \equiv \int_{\tilde{h}(\lambda,k_t)}^{\tilde{h}(0,k_t)} dG(h_i) = \frac{1}{2(1-\underline{h})}\frac{\lambda-e-\lambda e}{1+\lambda}\frac{1}{1-\alpha}k_t^{-\alpha} & \text{if } k(0,\overline{h}) \le k_t < k(\lambda,\underline{h}), \\ S_3(k_t) \equiv \int_{\underline{h}}^{\tilde{h}(0,k_t)} dG(h_i) = \frac{1}{2(1-\underline{h})}\left(\frac{1-e}{1-\alpha}k_t^{-\alpha} - \underline{h}\right) & \text{if } k(\lambda,\underline{h}) \le k_t < k(0,\underline{h}), \\ 0 & \text{if } k(0,\underline{h}) \le k_t. \end{cases} \tag{15}$$

Figure 1 depicts the features of the support rate function $S(k)$. The support rate function can be obtained in the case of $2/[(1+\lambda)(1-e)+1] \le \underline{h} \le 1$ 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 the 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.[18] Note that the smaller the $\underline{h}$, the larger the income inequality. There are three cases based on income inequality: low (Case 1), moderate (Case 2), and high (Case 3) income inequality. Figure 2 illustrates these patterns. Because of our model structure with the fixed cost of the investment and credit market imperfections, the economy may fall into a poverty trap and converge to $k = 0$, depending on the initial conditions. Moreover, by the specification of (6) and the properties of the dynamics under $\lambda_t = 0$, proved in Appendix B, the economy may fall into a poverty trap even though it starts from a somewhat large capital stock. In

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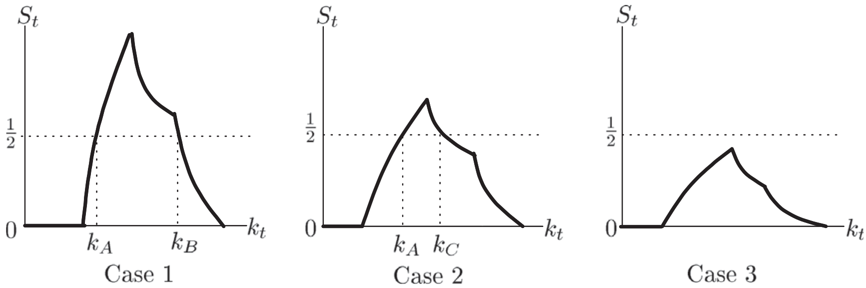


**FIGURE 2.** Support rate function and income inequality.

particular, in Case 3, $\lambda_t = 0$ is implemented all the time and the economy always falls into a poverty trap. We discuss how our model structure causes poverty traps in Appendix B, and do not deal with this issue again in the main text. In what follows, we focus on Cases 1 and 2.

## 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 $[(1+\lambda)(1-e)]^{-1} \leq \underline{h} < 2/[(1+\lambda)(1-e)+1]$. 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:

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

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 when credit markets are improved, and they therefore support the policy. 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:

$$2k_A < R < k_B. \qquad \textbf{(A.3)}$$

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,

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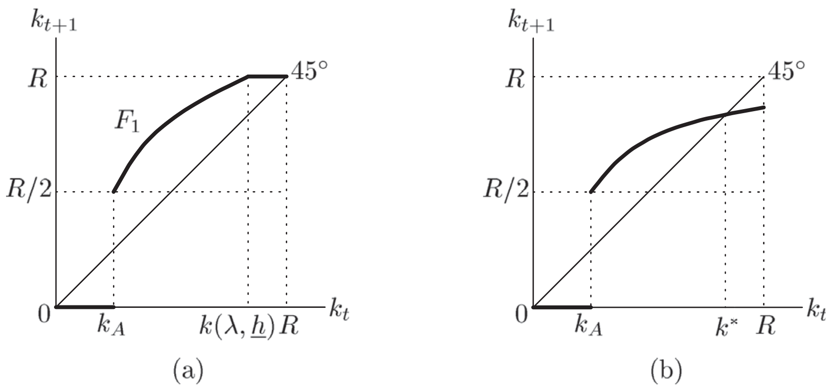


**FIGURE 3.** Dynamics for $\underline{h}_X \leq \underline{h} \leq 1$.

$R < k_B$, 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.3) implies $\lambda > 2^\alpha/(1-e) - 1$, and (A.2) and (A.3) imply $\alpha > (1+e)/2$.[19]

Under (A.3), $\lambda_t = 0$ 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 as

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

The third line in (16) 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. Note that $k(\lambda, \underline{h})$ is decreasing in $\underline{h}$ and moves from $k_B$ down to $\tilde{k} \equiv \{[(1+\lambda)(1-e)+1]/[2(1+\lambda)(1-\alpha)]\}^{1/\alpha} < k_B$ as $\underline{h}$ changes from $[(1+\lambda)(1-e)]^{-1}$ to $2/[(1+\lambda)(1-e)+1]$. When $\max\{\tilde{k}, 2k_A\} \leq R$, the dynamics correspond either 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 $k(\lambda, \underline{h}) \leq R$, and they correspond to Figure 3(b) if income inequality is relatively high, such that $k(\lambda, \underline{h}) > R$.[20]

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 (16) in the case of $2/[(1+\lambda)(1-e)+1] \leq \underline{h} \leq 1$.

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### Case 2: Moderate Level of Income Inequality

Next, we consider the case in which $\max\{0, 2-(1+\lambda)(1-e)\} \leq \underline{h} < [(1+\lambda)(1-e)]^{-1}$. 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

$$k_{t+1} = \begin{cases} 0 & \text{if } 0 \leq k_t < k_A, \\ F_1(k_t, \underline{h}) & \text{if } k_A \leq k_t \leq \min\{k_C(\underline{h}), R\}, \\ \frac{R}{2(1-\underline{h})}\left[2-\underline{h}-\frac{1-e}{1-\alpha}k_t^{-\alpha}\right] \equiv F_2(k_t, \underline{h}) & \text{if } \min\{k_C(\underline{h}), R\} < k_t \leq R. \end{cases} \tag{17}$$

The third line in (17) is valid if the interval $(\min\{k_C(\underline{h}), R\}, R]$ is nonempty. Appendix B 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 Case 2 and $k_C(\underline{h}) \geq R$, the dynamics described by (17) 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 implemented, which decreases the capital stock in the next period. Let us define another threshold, $\underline{h}_Y$, by $F_1[k_C(\underline{h}_Y), \underline{h}_Y] = k_C(\underline{h}_Y)$.[21] 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. In each case, the economy always converges to the stable steady state $k^*$, as long as $k_0 \in [k_A, k_C]$. If $k_0 \in (k_C, R]$, the dynamics are different, depending on the values of $F_2[k_C(\underline{h}), \underline{h}]$, $F_2(R, \underline{h})$, and $k_A$. Figure 4(a)–(c) illustrates the cases in which $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$, $F_2[k_C(\underline{h}), \underline{h}] < k_A \leq F_2(R, \underline{h})$, and $F_2(R, \underline{h}) < k_A$, respectively.

If income inequality is higher to such an extent that $\max\{0, 2-(1+\lambda)(1-e)\} < \underline{h} < \underline{h}_Y$, $F_1(k_t, \underline{h})$ and the 45-degree line do not intersect, and there are three possible dynamics as shown in Figure 4(d)–(f).[22] 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 or may not fluctuate permanently. Figure 4(f) depicts a case in which $F_2(R, \underline{h}) < k_A$. Appendix C shows the existence of all dynamics depicted in Figure 4(a)–(f).

If income inequality is even higher, such that $0 \leq \underline{h} < \max\{0, 2-(1+\lambda)(1-e)\}$, the economy is in Case 3, which is discussed in Appendix B.[23] Analyzed throughout this section is the relationship between income inequality and financial and economic development. The results are summarized in the following proposition.

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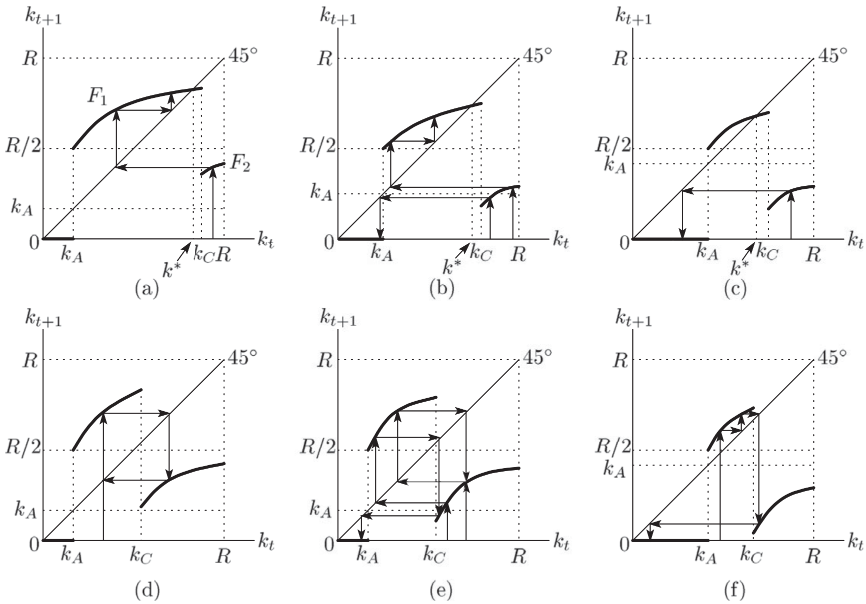


**FIGURE 4.** Dynamics for $\max\{0, 2-(1+\lambda)(1-e)\} \leq \underline{h} < \underline{h}_X$.

PROPOSITION 2. *High income inequality causes financial and economic underdevelopment. If* $\underline{h}_Y \leq \underline{h} \leq 1$*, then the range of the 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* $\max\{0, 2-(1+\lambda)(1-e)\} \leq \underline{h} < \underline{h}_Y$*, then the economy has no positive steady state. If* $0 \leq \underline{h} < \max\{0, 2-(1+\lambda)(1-e)\}$*, 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, the government policy is less likely to be implemented, and economic development is retarded.[24] This result is consistent with the evidence found by Easterly (2001, 2007).[25] Although influential politico-economic studies by Alesina and Rodrik (1994) and Persson and Tabellini (1994) attribute 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.[26]

As we have focused on $R$ that satisfies (A.3), it is worth mentioning cases where (A.3) is dropped. 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,

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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 the labor wages of the next generation and enables many individuals to invest. Even without (A.3), the negative effect of higher inequality on financial development remains intact.

## 6. DISCUSSION

This section illustrates how the results of our analysis may change if the economy is closed domestically and the interest rate changes endogenously. To close our model in a closed economy setting, we follow Aghion et al. (1999) and introduce an investment in a low-yield asset, or storage, that yields a return $\sigma$, and let $\sigma = 1$. The interest rate, $r_{t+1}$, is equal to $R\rho(k_{t+1})$ whenever the aggregate savings are fully utilized (i.e., whenever the aggregate investment in the project that produces capital is equal to the aggregate savings in equilibrium). We refer to this case as Regime I. The interest rate, $r_{t+1}$, drops to $\sigma = 1$ whenever the aggregate investment in the project to produce capital is less than the aggregate savings and the investment in the low-yield asset is undertaken. We refer to this case as Regime II.

In Regime I, no one has a strong incentive to invest in the project because $r_{t+1} = R\rho(k_{t+1})$. In other words, no one is credit constrained. For simplicity, suppose that the individuals who invest in the project are richer than those who do not. Accordingly, the individuals with $h_i \geq h^*$ borrow and invest, and the individuals with $h_i < h^*$ become lenders. Here, $h^*$ is characterized by the market-clearing condition of the loan market:

$$\int_{h^*}^{\overline{h}} b_{it} dG(h_i) = \int_{\underline{h}}^{h^*} [w(k_t)h_i + e - \tau_t] dG(h_i).$$

The left-hand side of this equation is the total demand for credit, and the right-hand side is the total supply of credit. Rearranging this equation, we obtain

$$h^* = \overline{h} - 2(\overline{h} - 1)[w(k_t) + e - \tau_t] \equiv h^*(\lambda_t, k_t),$$

where $h^*(\lambda_t, k_t)$ is decreasing in $k_t$. Because no one is credit constrained in Regime I, $h^*(\lambda_t, k_t) \geq \tilde{h}(\lambda_t, k_t)$. That is, although individuals with $\tilde{h}(\lambda_t, k_t) \leq h_i \leq h^*(\lambda_t, k_t)$ are able to borrow and invest, they become lenders.

Because $h^*(0, k_t) = \overline{h} - 2(\overline{h} - 1)[w(k_t) + e]$ and $\tilde{h}(0, k_t) = (1 - e)/w(k_t)$, $h^*(0, k_t) \geq \tilde{h}(0, k_t)$ is equivalent to

$$2(\overline{h} - 1)[w(k_t)]^2 - [\overline{h} - 2(\overline{h} - 1)e]w(k_t) + 1 - e \leq 0.$$

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Let $k_D^0$ denote the capital level such that $h^*(0, k_D^0) = \tilde{h}(0, k_D^0)$, where $k_D^0$ depends on the inequality parameter, $\overline{h} = 2 - \underline{h}$. If

$$1 - e - \frac{[\overline{h} - 2(\overline{h} - 1)e]^2}{8(\overline{h} - 1)} < 0 \qquad \textbf{(18)}$$

and

$$2(\overline{h} - 1)[w(R)]^2 - [\overline{h} - 2(\overline{h} - 1)e]w(R) + 1 - e < 0, \qquad \textbf{(19)}$$

then under $\lambda_t = 0$, the economy is in Regime I if $k_D^0 \leq k_t \leq R$, and in Regime II if $0 \leq k_t < k_D^0$.

Similarly, the economy is in Regime I under $\lambda_t = \lambda$ if $h^*(\lambda, k_t) \geq \tilde{h}(\lambda, k_t)$, where $h^*(\lambda, k_t) = \overline{h} - 2(\overline{h} - 1)w(k_t)$. Because $h^*(\lambda, k_t) > h^*(0, k_t)$ and $\tilde{h}(0, k_t) > \tilde{h}(\lambda, k_t)$, $h^*(0, k_t) \geq \tilde{h}(0, k_t)$ implies that $h^*(\lambda, k_t) \geq \tilde{h}(\lambda, k_t)$. This means that $k_D^\lambda < k_D^0$, where $k_D^\lambda$ is defined by $h^*(\lambda, k_D^\lambda) = \tilde{h}(\lambda, k_D^\lambda)$. Under $\lambda_t = \lambda$, the economy is in Regime I if $k_D^\lambda \leq k_t \leq R$, and in Regime II if $0 \leq k_t < k_D^\lambda$. Appendix D specifies the political conflicts in three cases: (i) $0 \leq k_t < k_D^\lambda$; (ii) $k_D^\lambda \leq k_t < k_D^0$; and (iii) $k_D^0 \leq k_t \leq R$.

Because it is practically impossible to fully characterize equilibrium dynamics in this closed economy case, we provide a numerical example. The following numerical example highlights the possibility that some poor individuals may support the policy because of the interest rate change. Let $e = 0.1$, $\alpha = 0.6$, $R = 3.38$, $\lambda = 1$, and $\underline{h} = 0.4$. Then, $k_D^\lambda = 1.4505$, and $k_D^\lambda = k_A$ because we choose $\lambda = 1$. The economy would be in Case 2 and the dynamics would be depicted by Figure 4(f) if the economy were the small open economy. Under these parameter values, (18) is violated, which means that this closed economy is always in Regime II whenever $\lambda_t = 0$.

If $0 \leq k_t < k_D^\lambda$, the economy is in Regime II regardless of the policy implementation. The economy is characterized exactly in the same way as in the small open economy case, and the dynamics are represented by $k_{t+1} = 0$. If $k_D^\lambda \leq k_t \leq R$, the economy is in Regime I as long as $\lambda_t = \lambda$. Because the interest rate is higher in Regime I, some poor individuals may support the policy if the benefit from the interest rate increase outweighs the tax burden. Such individuals are identified by the threshold, $\check{h}(k_t)$, defined in Appendix D, and individuals with $\check{h}(k_t) \leq h_i \leq \tilde{h}(0, k_t)$ support the policy. In this numerical example, even the poorest support the policy because the tax burden, $\tau = e = 0.1$, is very small and $\check{h}(k_t)$ is less than $\underline{h} = 0.4$ for any $k_t \in [k_D^\lambda, R]$. Furthermore, $\tilde{h}(0, R) = 1.0835 > 1$, which means that individuals with $\underline{h} \leq h_i \leq \tilde{h}(0, k_t)$, who support the policy, have a majority for all $k_t \in [k_D^\lambda, R]$, and therefore, $\lambda_t = \lambda$ is implemented regardless of the voting behavior of the others. The dynamics for $k_D^\lambda \leq k_t \leq R$ are represented by $k_{t+1} = Rw(k_t)$.

The dynamic equation of capital is summarized as follows:

$$k_{t+1} = \begin{cases} 0 & \text{if } 0 \leq k_t < k_D^\lambda, \\ Rw(k_t) & \text{if } k_D^\lambda \leq k_t \leq R. \end{cases}$$

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In this numerical example, financial openness negatively affects capital accumulation because the dynamics would be depicted by Figure 4(f) and the capital level would converge to zero if the economy were the small open economy.

## 7. CONCLUSION

It is widely recognized that the development of credit markets facilitates economic growth and development. This paper has investigated the conditions under which a policy that improves credit markets is implemented under majority voting, and has analyzed the 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, policies to improve credit markets are not always implemented.

Some limitations of this paper should be mentioned. First, because we have focused on a small open economy model, this paper does not offer a thorough analysis of a closed economy case. A complete study under both closed and small open economy settings would enable us to analyze the interaction between financial openness and financial development from politico-economic perspectives. Second, individuals in our model are heterogeneous only with respect to their income, and we do not consider all the possible sources of political conflict over financial development. For example, introducing the heterogeneity in productivities in addition to income inequality would change the structure of the political conflict. Addressing these issues is left for further research.

### *NOTES*

1. 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) and Aghion et al. (1999, 2005). Karlan and Zinman (2009) find evidence of moral hazard and adverse selection in credit markets. In these theories, the costs of gathering information and monitoring borrowers directly influence the amounts 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 mitigate asymmetric information can benefit credit markets.

2. 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.

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3. 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.

4. Rajan and Ramcharan (2011) present evidence that inequality of land holdings, which is often the earliest and most important form of wealth, reduces the number of banks per capita, which limits access to finance, and attempt a politico-economic explanation.

5. See also Bhattacharya et al. (2016) for a more recent study.

6. Some studies point out that financial frictions cause not only the misallocation of capital but also that of talent. For such studies, see Buera et al. (2011), Buera and Shin (2013), and Moll (2014).

7. 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.

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

9. All the policies reviewed in this section should reduce screening and monitoring costs of financial intermediaries. For a recent theoretical study that provides implications of the policies on financial development, see Laeven et al. (2015).

10. The endowment $e$ enables the poorest individuals to pay a tax when it is levied.

11. Matsuyama (2004) mentions that this assumption that individuals can invest in at most one project is reasonable when capital and the project are interpreted as human capital and education, respectively.

12. The constant credit multiplier is a standard way to introduce borrowing constraints in the literature. For example, see De Gregorio (1996), Aghion et al. (1999, 2005), Caballé et al. (2006), Bellettini and Berti Ceroni (2007), Antràs and Caballero (2009, 2010), and Kunieda et al. (2014).

13. In Aghion et al. (1999, 2005), the credit multiplier, $\lambda_t$, results from the optimal contract constrained by a given degree of asymmetric information, or from a given information structure. Because the extent of investor protection is a determinant of the constraints on the optimal contract, it has a crucial effect on $\lambda_t$. In this paper, the government mitigates the market failure caused by asymmetric information in credit markets by relaxing the constraints on financial contracts, and changes $\lambda_t$. The exercise of enforcement by public authority, including the judiciary and police, is indispensable to strengthening investor protection, and only the government can do this.

14. Under (A.2), the profitability condition is always satisfied.

15. If $\lambda_t$ were continuously increasing in $\tau_t$ over $\tau_t \in [0, e]$, the preferences would be neither single-peaked nor single-crossing, and there would be no guarantee that a political equilibrium exists.

16. 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.

17. Although we solely consider the voting for the policy that improves the credit markets, the way that the tax is implemented would also be a part of the outcome of majority voting. See Brett and Weymark (2017), and references therein.

18. 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.

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

20. $2k_A < R$ in (A.3) ensures that $F_1(k_t, \underline{h})$ has a fixed point when $k(\lambda, \underline{h}) > R$.

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

22. For large $\lambda$, $\underline{h}_Y$ can be nonpositive and there is no $\underline{h}$ that satisfies $\max\{0, 2-(1+\lambda)(1-e)\} < \underline{h} < \underline{h}_Y$. In this case, $F_1(k_t, \underline{h})$ and the 45-degree line always intersect.

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23. If $\lambda \geq (1+e)/(1-e)$, Case 3 does not exist and an economy falls under either Case 1 or 2. If $\lambda < (1+e)/(1-e)$, $\underline{h} < 2-(1+\lambda)(1-e)$ implies $S_2[k(0,\overline{h})] < 1/2$.

24. Although we have considered that the government maintains a balanced budget and proposes a policy that improves the credit markets, there might be a policy that could help the economy escape from poverty traps. For example, suppose that the government would abandon the balanced budget and be able to borrow sufficiently from abroad, and consider an economy trapped at $k = 0$. Then, the government would largely borrow from abroad, thereby increasing capital stock and continuing to improve the credit markets so that the economy would converge to a positive steady state. At the same time, the government would formulate a net tax schedule to repay its debt under the condition that the consumption of every individual in every generation would be greater than zero. In practice, however, it would be almost impossible for the government to propose such a policy and implement it through voting.

25. Rajan and Ramcharan (2011) and Claessens and Perotti (2007) also argue that high income inequality can cause financial underdevelopment through political factors.

26. In our model, economic development does not always increase financial development. Rajan and Zingales (2003) find such a nonmonotonic relationship between economic and financial development in both cross-sectional and time-series data.

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# APPENDIX A: ON THE TAXATION SYSTEM

The method of taxation used in this paper is lump-sum taxation. Under this taxation, the ratio of the two thresholds, $\tilde{h}(0, k_t)/\tilde{h}(\lambda, k_t)$, is constant at $(1-e)(1+\lambda)$, which is independent of $k_t$. The condition imposed on $\lambda$ to ensure that $\tilde{h}(0, k_t) > \tilde{h}(\lambda, k_t)$ is independent of $k_t$, as specified in assumption (A.1). If the government collects a given amount of tax revenue not through lump-sum taxation, but through proportional taxation, then $\tilde{h}(0, k_t)/\tilde{h}(\lambda, k_t)$ depends on $k_t$. This implies that the condition to ensure that $\tilde{h}(0, k_t) > \tilde{h}(\lambda, k_t)$ changes as $k_t$ moves.

An alternative to lump-sum taxation to avoid this problem is to redefine $\tau_t$ in (6) as the proportional tax rate and assume that the credit markets improve if the proportional tax rate, $\tau_t$, reaches a positive rate, $\tau$. Under this specification, the amount of cost to improve the credit markets is small when $k_t$ is small. Suppose that individuals are not endowed with the final good, and let $e = 0$. Then, the income of individual $i$ is $w(k_t)h_i$, on which the government imposes a proportional tax at the rate of $\tau_t$. The disposable income of individual $i$ is $(1-\tau_t)w(k_t)h_i$, and the amount of borrowing necessary to run the project is $b_{it} = 1 - (1-\tau_t)w(k_t)h_i$. Individual $i$ can invest if the labor endowment, $h_i$, is greater than or equal to the threshold level, $\tilde{h}(\lambda_t, k_t) = 1/[(1+\lambda_t)(1-\tau_t)w(k_t)]$. Because $\tilde{h}(\lambda, k_t) = 1/[(1+\lambda)(1-\tau)w(k_t)]$ and $\tilde{h}(0, k_t) = 1/w(k_t)$, $\tilde{h}(0, k_t)/\tilde{h}(\lambda, k_t)$ is constant at $(1+\lambda)(1-\tau)$. The condition that ensures $\tilde{h}(0, k_t) > \tilde{h}(\lambda, k_t)$ is given by $\lambda > \tau/(1-\tau)$, which does not depend on $k_t$. By following exactly the same steps as in the case of lump-sum taxation, we obtain the same results, and the message of our model analysis remains unchanged.

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# APPENDIX B: POVERTY TRAPS AND THE DYNAMICS IN CASE 3

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 $\gamma(\underline{h})$:

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

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 $k_B$,

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

For any $\alpha \in (1/2, 1)$, $2[1/(2\alpha) + 1](1/2)^{1/\alpha} - 1 > 0$. Because (A.2) and (A.3) imply that $\alpha \in ((1 + e)/2, 1)$, 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.

This property and the conditions on $F_2(k_t, \underline{h})$ discussed in Case 2 cause the possibility of poverty traps in Figure 4(b), (c), (e), and (f). If $0 \leq \underline{h} < \max\{0, 2 - (1 + \lambda)(1 - e)\}$, the economy is in Case 3. 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

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

As shown in Figure B.1, the economy is always caught in a poverty trap.

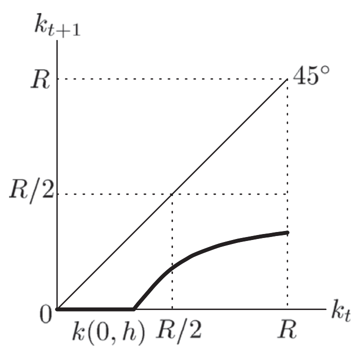


**FIGURE B.1.** Dynamics for $0 \leq \underline{h} < \max\{0, 2 - (1 + \lambda)(1 - e)\}$.

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# APPENDIX C: EXISTENCE OF THE DYNAMICS OF CAPITAL IN CASE 2

In this section, we show the *existence* of all dynamics depicted in Figure 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.3) ensures this), and that $k_C(\underline{h})$ and $F_1[k_C(\underline{h}), \underline{h}]$ satisfy the following:

$$k_C(2-(1+\lambda)(1-e)) = k_A, \quad k_C\left(\frac{1}{1+\lambda}\frac{1}{1-e}\right) = k_B,$$

$$F_1[k_C(2-(1+\lambda)(1-e)), 2-(1+\lambda)(1-e)] = \frac{R}{2},$$

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

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 C.1(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 $\underline{h} \in [2-(1+\lambda)(1-e), \underline{h}_X)$ as long as $R$ is slightly smaller than $k_B$. Furthermore, $\underline{h}_Z < \underline{h}_Y = \underline{h}_X = 1/[(1+\lambda)(1-e)]$ 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 are depicted as in Figure 4(a). When $\underline{h}_Z \leq \underline{h} < \underline{h}_Y$ $(2-(1+\lambda)(1-e) \leq \underline{h} < \underline{h}_Z)$, $F_2[k_C(\underline{h}), \underline{h}] \geq k_A$ $(F_2[k_C(\underline{h}), \underline{h}] < k_A)$, and the function $F_1(k, \underline{h})$ and the 45-degree line have no intersection, and thus the dynamics of capital are depicted as in Figure 4(d) (Figure 4(e)).

Next, suppose that $R$ is slightly greater than $2k_A$. Figure C.1(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.3) and $R = 2k_A$, $F_2(R, \underline{h}) < k_A$ for any $\underline{h} \in [2-(1+\lambda)(1-e), \underline{h}_X)$. By the continuity of the function $F_2(R, \underline{h})$ with respect to $R$, $F_2(R, \underline{h}) < k_A$ for any $\underline{h} \in [2-(1+\lambda)(1-e), \underline{h}_X)$ as long as $R$ is slightly larger than $2k_A$. Furthermore, $\underline{h}_X < \underline{h}_Z = 1/[(1+\lambda)(1-e)]$ 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 are depicted as in Figure 4(c). When $2-(1+\lambda)(1-e) \leq \underline{h} < \underline{h}_Y$, in contrast, $F_1(k, \underline{h})$ and the 45-degree line do not intersect, and the dynamics of capital are depicted as in Figure 4(f).

Last, we show that there exist 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 C.1(c)). When $R = \bar{R}$ and $\underline{h}_Y \leq \underline{h} < \underline{h}_X = \underline{h}_Z$, $F_2[k_C(\underline{h}), \underline{h}] < k_A < F_2(\bar{R}, \underline{h})$, and $F_1(k, \underline{h})$ and the 45-degree line intersect. Thus, the dynamics of capital are depicted as in Figure 4(b).

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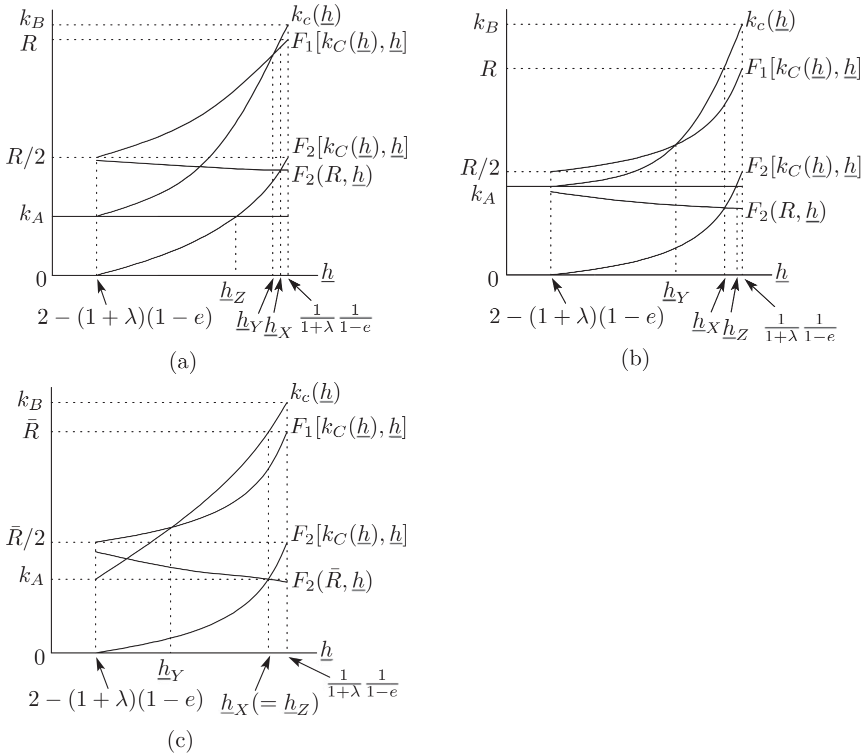


**FIGURE C.1.** On the existence of all dynamics in Figure 4.

Figure C.1 illustrates the case where $2-(1+\lambda)(1-e)>0$, 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.

# APPENDIX D: VOTING BEHAVIOR IN A CLOSED ECONOMY

For the purpose of exposition, suppose that (18) and (19) hold. If $0 \leq k_t < k_D^\lambda$, the economy is in Regime II, regardless of the government policy. The interest rate, $r_{t+1}$, is always equal to $\sigma = 1$, and the economy is characterized in the same way as in the small open economy case where the gross world interest rate is one ($r = 1$).

If $k_D^\lambda \leq k_t < k_D^0$, the regime of the economy is dependent on the government policy. If $\lambda_t = \lambda$, the economy is in Regime I, and $r_{t+1} = R\rho(k_{t+1})$. In Regime I, the aggregate savings, $w(k_t)$, are equal to the aggregate investment in the project, and therefore $k_{t+1} = Rw(k_t)$. Because $r_{t+1} = R\rho(k_{t+1})$, the second-period consumption of individual $i$ is independent of the investment decision, and given by $c_{it+1} = R\rho(Rw(k_t))w(k_t)h_i$. If $\lambda_t = 0$, the economy is in Regime II and $r_{t+1} = 1$. As in the small open economy

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case, individuals with $h_i < \tilde{h}(0, k_t)$ cannot invest and their second-period consumption is given by $c_{it+1} = w(k_t)h_i + e$, whereas individuals with $h_i \geq \tilde{h}(0, k_t)$ can invest and their second-period consumption is given by $c_{it+1} = R\rho(k^0_{t+1}) - \{1 - [w(k_t)h_i + e]\}$.

First, consider the political preferences of relatively poor individuals with $h_i < \tilde{h}(0, k_t)$, who cannot invest under $\lambda_t = 0$. Such individuals may benefit from the policy to increase $\lambda_t$ because it increases the interest rate from $r_{t+1} = 1$ to $r_{t+1} = R\rho(Rw(k_t))$. They support the policy if $R\rho(Rw(k_t))w(k_t)h_i \geq w(k_t)h_i + e$, which is equivalent to

$$h_i \geq \frac{e}{[R\rho(Rw(k_t)) - 1]w(k_t)} \equiv \check{h}(k_t).$$

Thus, individuals with $\underline{h} \leq h_i < \check{h}(k_t)$ are against the policy, whereas individuals with $\check{h}(k_t) \leq h_i < \tilde{h}(0, k_t)$ support the policy. Although the policy increases the interest rate, its benefit is smaller than the tax burden for the poor individuals with $h_i < \check{h}(k_t)$. Second, consider individuals with $h_i \geq \tilde{h}(0, k_t)$. The second-period consumption is $R\rho(Rw(k_t))w(k_t)h_i$ if $\lambda_t = \lambda$, whereas it is $R\rho(k^0_{t+1}) - \{1 - [w(k_t)h_i + e]\}$ if $\lambda_t = 0$. Such individuals support the policy if

$$h_i \geq \frac{R\rho(k^0_{t+1}) - 1 + e}{[R\rho(Rw(k_t)) - 1]w(k_t)} \equiv \ddot{h}(k_t, \underline{h}) > \check{h}(k_t).$$

Thus, individuals with $\tilde{h}(0, k_t) \leq h_i < \ddot{h}(k_t, \underline{h})$ suffer a loss from higher costs of borrowing due to the interest rate increase as well as the tax burden, $\tau_t = e$, caused by the policy implementation, whereas individuals with $\ddot{h}(k_t, \underline{h}) \leq h_i \leq \overline{h}$ benefit from the policy because their wealth that remains after running the project earns the higher interest rate.

If $k^0_D \leq k_t \leq R$, the economy is in Regime I, regardless of the policy. Because the aggregate savings are equal to the aggregate investment in the project, $k_{t+1} = R[w(k_t) + e - \tau_t]$. The interest rate, $r_{t+1} = R\rho(k_{t+1})$, is higher under $\lambda_t = \lambda$ than under $\lambda_t = 0$ because the policy reduces $k_{t+1}$ by the amount of $Re$. The consumption in the second period does not depend on the investment decision because $r_{t+1} = R\rho(k_{t+1})$, and it is given by $c_{it+1} = R\rho(R[w(k_t) + e - \tau_t])[w(k_t)h_i + e - \tau_t]$. The policy implementation affects consumption through two effects. In the first effect, the policy reduces the disposable income by the amount of $e$. In the second effect, the interest rate increases because of the reduction of the capital stock in the next period. The preference for the policy depends on which effect is larger. Individual $i$ is against the policy if $R\rho(R[w(k_t)+e])[w(k_t)h_i+e] \geq R\rho(Rw(k_t))w(k_t)h_i$. This inequality is equivalent to

$$h_i \leq \frac{\rho(R[w(k_t) + e])e}{[\rho(Rw(k_t)) - \rho(R[w(k_t) + e])]w(k_t)} \equiv \hat{h}(k_t).$$

Political conflict arises when $k_t$ satisfies $\underline{h} < \hat{h}(k_t) < \overline{h}$. Poor individuals with $h_i \leq \hat{h}(k_t)$ are against the policy, whereas rich individuals with $h_i > \hat{h}(k_t)$ support the policy.

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