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The Politics of Financial Development and Capital Accumulation

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Abstract

This paper proposes a 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. The policy increases the welfare of middle-income individuals who can start new investments at the expense of poor and rich individuals. The preferences for the policy are thus non-monotonic over income levels. The realization of the policy strongly depends on the level of capital and the extent of income inequality. The low level of capital and high income inequality make the policy hard to implement, which is likely to cause the economy to fall into a poverty trap.

JEL classification: D72; G18; O11; O15; O16
Keywords: financial development; economic development; income inequality; majority voting

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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 process that formulates policies toward financial development is 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 et al. (1999, 2005), and others. 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. In empirical research, Karlan and Zinman (2009) find evidence of moral hazard and adverse selection in credit markets; these create difficulty in financial contracts. This observation also implies the validity of policies that alleviate agency problems. For example, improving investor protection and establishing public credit registries to ease asymmetric information can benefit credit markets. The next section reviews theory and evidence on the effectiveness of such policies.

We take the view that the size of policies to improve credit markets is determined in political processes. Because financial development has different impacts across agents, various conflicts arise concerning the policies. 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. The conflicts between incumbents and entrants are not the only factor that matters for financial development. Considering voting games, Pagano and Volpin (2005) analyze conflicts between controlling shareholders, who prefer weak investor protection to exploit private benefits, and non-controlling shareholders, who prefer strong investor protection to constrain exploitation by the controlling shareholders. Bebchuk and Neeman (2010) also analyze conflicts between corporate insiders and outside investors in a lobbying model. 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.

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).[1] 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. This is because most countries adopt generally democratic political systems, and the investigation of politico-economic outcomes under majority voting as a benchmark case is beneficial for the political analysis of financial development.

The model is outlined as follows. It 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 of their lives, individuals inelastically supply 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. The individuals then decide whether to invest in a project that produces capital. In the second period, the returns from the project are realized and the individuals consume their

[1]Levine (2005) and Matsuyama (2007) provide literature surveys on finance and economic development.

entire resulting wealth. The project requires a fixed size of investment, and it is thus necessary for poor individuals to borrow in order to invest in the project. All individuals, however, face borrowing constraints because credit markets are imperfect. Before the individuals make their investment decisions, the government proposes a policy that improves the credit markets through taxation; the individuals vote for or against this.

Financial development has different effects on different individuals, while it has positive effects on the economy as a whole, including higher economic growth and poverty alleviation. The imperfect credit markets work as an entry barrier, and the improvement of the markets enables more individuals to invest in the project. On one hand, the improvement increases the welfare of individuals who can newly start the project; on the other, it decreases the welfare of the rich who do not need to borrow much because the improvement of the credit markets facilitates new entry and reduces the return on the project. This is how political conflicts come about. One noticeable feature of our model is that preferences for the policy are not monotonic over income levels, and the preference of an individual with the median income does not necessarily determine whether the policy is realized. Because the very poor are still not able to invest in the project even if they bear a tax burden to develop the credit markets, they vote against the policy to improve the credit markets together with the rich who wish to block new entry. Individuals with middle income who support the policy may hence conflict with the rich and the poor.[2]

Whether the policy to improve the credit markets is practiced strongly depends on the extent of income inequality and the level of capital accumulation at the time voting takes place. It is difficult to obtain majority support for a policy to develop credit markets when income inequality is high. This is because when 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. In contrast, when income inequality is low, it is easy to obtain majority support for such a policy, as it benefits a large proportion of individuals. This result agrees with the evidence by Easterly (2001): high inequality leads to less developed credit markets. The level of capital accumulation also affects the realization of the policy. At the very

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

early stages of economic development, even the relatively rich are not able to invest unless the credit markets are well developed. It is thus only the rich that vote in favor of the policy, and the others vote against it in order to avoid taxation because they are unable to invest even though the credit markets are improved. As the economy develops, middle-income individuals who can newly invest support it, while the rich who can invest without the policy and the poor who are still unable to invest with the policy are against it. As the economy further develops, only the relatively poor who can begin the project only with the policy support it.

Dynamic analysis of the model suggests that the economy may fall into a poverty trap in a way in line with some recent evidence. The policy to improve the credit markets is not realized under a low level of initial capital, which in turn keeps the capital level low in the next period as well. This bilateral causality between financial development and economic development was empirically confirmed by Calderon and Liu (2003). In addition, our model prediction that high inequality causes financial and economic underdevelopment is consistent with the evidence found 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. For example, Perotti (1996) concluded that neither the positive relationship between income inequality and redistribution nor the negative relationship between redistribution and economic growth are supported by the data. 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 paper is organized as follows. Section 2 reviews how governments can improve credit markets. Section 3 describes the model, identifies supporters and opponents of financial development, and analyzes the dynamics. Section 4 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 twelve 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.[3]

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.[4] 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

[3]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.

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

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 GDP ratios. For micro evidence, 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 replacing them.

3 The Model

3.1 The basic environment

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 (Matsuyama 2004). The distribution of the labor endowments does not vary over time, and follows a uniform distribution on the support $[\underline{h}, \overline{h}]$. The density function is given by

$$g(h_i) = \begin{cases} 0 & \text{if} \quad h_i < \underline{h}, \\ \frac{1}{\Delta} & \text{if} \quad \underline{h} \leq h_i \leq \overline{h}, \\ 0 & \text{if} \quad \overline{h} < h_i, \end{cases} \tag{1}$$

where

$$\Delta \equiv \overline{h} - \underline{h},$$

and let $G(h_i)$ denote the cumulative distribution function of h_i. We normalize the average labor endowment to one, which implies

$$\int_{\underline{h}}^{\overline{h}} h_i \frac{1}{\Delta} dh_i = 1 \quad \Longleftrightarrow \quad \overline{h} = 2 - \underline{h}.$$

3.1.1 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:

$$y_t = k_t^{\alpha} l_t^{1-\alpha}, \quad 0 < \alpha < 1, \tag{2}$$

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

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

$$w_t = (1-\alpha) k_t^{\alpha} \equiv w(k_t), \tag{4}$$

where ρ_t and w_t are the price of capital and the wage, respectively. Whereas the wage function $w(k)$ is increasing in k, the capital price function $\rho(k)$ is decreasing in k.

3.1.2 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.[5] The individual i born in period t with h_i earns $w(k_t)h_i$, and his or her disposable income is

$$w(k_t)h_i + e - \tau_t,$$

[5]The endowment e enables the poorest individuals to pay a tax when it is levied.

where τ_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. 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 $r \geq 1$ determined in international financial markets. 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 disposable 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

$$b_{it} = 1 - [w(k_t)h_i + e - \tau_t]. \tag{5}$$

Although individuals can lend and borrow at the world interest rate r, 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 et al. (1999, 2005);

$$b_{it} \leq \lambda_t[w(k_t)h_i + e - \tau_t]. \tag{6}$$

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 et al. (1999, 2005) derive the constant credit multiplier and show that borrowing constraints take the form of (6).[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 (6) implies that individuals whose labor endowments are less than the threshold, $\hat{h}(\lambda_t, \tau_t, k_t)$, cannot invest in the project:

$$\hat{h}(\lambda_t, \tau_t, k_t) \equiv \frac{1}{w(k_t)} \left(\frac{1}{1+\lambda_t} - e + \tau_t \right). \tag{7}$$

[6]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), and Antràs and Caballero (2009, 2010).

3.1.3 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. To make such a policy work in practice, however, incurs some costs. For example, to make laws fully effective and judicial enforcement efficient enough incurs costs in the establishment of regulatory authority, the employment of civil servant and judges, and the provision of legal services. Many of the costs are flow costs, and the government therefore must levy a tax whenever it develops credit markets.[7] The government budget is balanced in each period. We assume that the tax is collected in a lump-sum fashion in order to abstract the income redistribution effects of taxation and analyzes only the policy effects to improve credit markets.

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

$$\lambda_t = \begin{cases} \lambda_L & \text{if} \quad 0 \leq \tau_t < \tau, \\ \lambda_H & \text{if} \quad \tau \leq \tau_t, \end{cases} \tag{8}$$

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

Expressions (7) and (8) give the threshold labor endowment as a function of λ_t, the lump sum tax, and capital. The thresholds under the improved and unimproved credit markets are respectively given by

$$\tilde{h}(\tau, k_t) \equiv \frac{A}{w(k_t)}, \quad \tilde{h}(0, k_t) \equiv \frac{B}{w(k_t)},$$

[7]The policies such as the improvement of laws, the establishment of credit registries, and partial credit guarantee systems should all reduce screening and monitoring costs of financial intermediaries. For a recent theoretical research that provides implications of the policies on financial development, see Michalopoulos et al. (2009).

where $A \equiv 1/(1+\lambda_H) - e + \tau$ and $B \equiv 1/(1+\lambda_L) - e$. Both of the thresholds, $\tilde{h}(\tau, k_t)$ 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. It is true that the government spending is likely to ease borrowing constraint (6) by raising λ_t, but the lump-sum tax lowers individuals' disposable income. Whether the threshold is lowered by the policy therefore depends on the level of the required lump-sum tax. We impose the following assumption on the lump-sum tax τ:

$$B > A \quad \Leftrightarrow \quad \tau < \frac{\lambda_H - \lambda_L}{(1+\lambda_L)(1+\lambda_H)}. \tag{A.1}$$

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

3.1.4 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

$$k^0_{t+1} = R\{1 - G[\tilde{h}(0, k_t)]\}, \tag{9}$$

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, i.e.,

$$R\rho(k^0_{t+1}) \geq r \quad \Leftrightarrow \quad k^0_{t+1} \leq \left(\frac{\alpha R}{r}\right)^{\frac{1}{1-\alpha}} \equiv \bar{k}. \tag{10}$$

We call this inequality the *profitability condition*. Individuals whose labor endowments are greater than or equal to $\tilde{h}(\tau, k_t)$ 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

$$k^\tau_{t+1} = R\{1 - G[\tilde{h}(\tau, k_t)]\}, \tag{11}$$

$$R\rho(k^\tau_{t+1}) \geq r \quad \Leftrightarrow \quad k^\tau_{t+1} \leq \bar{k}, \tag{12}$$

where k^{τ}_{t+1} is the level of capital at period $t+1$ under the condition that the government improves the credit markets at period t. Notice 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:

$$k^{\tau}_{t+1} > k^{0}_{t+1}, \quad \rho(k^{\tau}_{t+1}) < \rho(k^{0}_{t+1}).$$

Timing of events

Before analyzing the voting behavior of individuals, we summarize the sequence of events individuals born in period t go through.

- period t
  1. Individuals supply their labor to the final good sector and earn wages.
  2. Individuals vote in favor of or against the policy that improves the credit markets.
  3. Credit markets are improved if and only if the policy is practiced.
  4. Individuals decide whether to invest in the project.
- period $t+1$
  1. The return on the project is realized.
  2. Individuals consume their entire wealth.

3.2 Voting behavior

3.2.1 The political preferences of individuals

Individuals who support financial development are identified by two thresholds, $\tilde{h}(\tau, k_t)$ and $\tilde{h}(0, k_t)$. First, let us consider the preferences of individuals with $h_i < \tilde{h}(\tau, k_t)$. Whereas the policy requires the lump-sum tax, it does not enable them to invest in the project. These individuals thus prefer $\tau_t = 0$ ($\lambda_t = \lambda_L$). Next, let us investigate the political preferences of individuals with $\tilde{h}(\tau, k_t) \leq h_i < \tilde{h}(0, k_t)$. These individuals can invest in the project

only if the government improves the credit markets. The consumption levels of these individuals under $\tau_t = \tau$ and $\tau_t = 0$ are represented by, respectively,

$$R\rho(k^{\tau}_{t+1}) - r[1 - w(k_t)h_i - e + \tau],$$

and

$$r[w(k_t)h_i + e].$$

They prefer $\tau_t = \tau$ if $R\rho(k^{\tau}_{t+1}) \geq r(1+\tau)$, and prefer $\tau_t = 0$ if $R\rho(k^{\tau}_{t+1}) < r(1+\tau)$. We assume the value of the productivity parameter R is sufficiently high that the return of capital exceeds $r(1+\tau)$ even if all individuals invest in the project (i.e., $k_{t+1} = R$):

$$R\rho(R) > r(1+\tau) \quad \Leftrightarrow \quad R > \left[\frac{r(1+\tau)}{\alpha}\right]^{\frac{1}{\alpha}}. \tag{A.2}$$

Under (A.2), individuals with $\tilde{h}(\tau, k_t) \leq h_i < \tilde{h}(0, k_t)$ always prefer $\tau_t = \tau$ ($\lambda_t = \lambda_H$). Finally, individuals with $h_i \geq \tilde{h}(0, k_t)$ prefer $\tau_t = 0$ because they can invest without the government policy. The policy not only requires the lump-sum tax, but also reduces return on investment because $\rho(k^{\tau}_{t+1}) < \rho(k^{0}_{t+1})$.

Proposition 1 *Under (A.2),*

- *individuals with* $h_i < \tilde{h}(\tau, k_t)$ *prefer* $\tau_t = 0$,
- *individuals with* $\tilde{h}(\tau, k_t) \leq h_i < \tilde{h}(0, k_t)$ *prefer* $\tau_t = \tau$, *and*
- *individuals with* $h_i \geq \tilde{h}(0, k_t)$ *prefer* $\tau_t = 0$.

Proposition 1 states that preferences for the policy that improves the credit markets are not monotonic over income levels. The policy raises the welfare of individuals with middle income at the cost of the welfare of rich and poor individuals.[8]

The attitude of individuals toward the policy is dependent on capital levels since the thresholds, $\tilde{h}(\tau, k_t)$ and $\tilde{h}(0, k_t)$, are functions of k_t. It is particularly useful to define the following four levels of capital, whcih summarize the magnitude relation among the two thresholds and the upper and lower

[8]Such non-monotonic preferences also arise in a model by Bellettini and Berti Ceroni (2007).

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:

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

$$\tilde{h}(\tau, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \left[\frac{A}{(1-\alpha)\overline{h}}\right]^{\frac{1}{\alpha}} \equiv k(\tau, \overline{h}), \tag{14}$$

$$\tilde{h}(0, k_t) < \underline{h} \quad \Leftrightarrow \quad k_t > \left[\frac{B}{(1-\alpha)\underline{h}}\right]^{\frac{1}{\alpha}} \equiv k(0, \underline{h}), \tag{15}$$

$$\tilde{h}(0, k_t) > \overline{h} \quad \Leftrightarrow \quad k_t < \left[\frac{B}{(1-\alpha)\overline{h}}\right]^{\frac{1}{\alpha}} \equiv k(0, \overline{h}). \tag{16}$$

The inequality $\tilde{h}(\tau, k_t) < \underline{h}$ in (13) states that even the poorest individuals can invest in the project as long as the government improves the credit markets. Expression (13) hence means that implementation of the policy that improves the credit markets allows all individuals to invest in the project if the level of capital is higher than $k(\tau, \underline{h})$. The inequality $\tilde{h}(\tau, k_t) > \overline{h}$ in (14) states that the richest individuals cannot invest in the project even under the improved credit markets. Expression (14) hence means the policy cannot enable any individuals to invest in the project if the level of capital is lower than $k(\tau, \overline{h})$. Similarly, expression (15) 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 (16) 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 (13)-(16) imply $k(\tau, \overline{h}) < k(0, \overline{h})$ and $k(\tau, \underline{h}) < k(0, \underline{h})$, but the magnitude relation between $k(0, \overline{h})$ and $k(\tau, \underline{h})$ depends on the value of $\underline{h}$:

- $\underline{h} < (2A)/(A+B)$ implies $k(0, \overline{h}) < k(\tau, \underline{h})$, and
- $\underline{h} \geq (2A)/(A+B)$ implies $k(0, \overline{h}) \geq k(\tau, \underline{h})$.

3.2.2 The support rate

Let us discuss the support rate for the policy to improve the credit markets in the case of $\underline{h} < (2A)/(A+B)$; that is, $k(0, \overline{h}) < k(\tau, \underline{h})$. The support

rate is a function of capital k_t since $\tilde{h}(\tau, k_t)$ and $\tilde{h}(0, k_t)$ depend on k_t. It is useful to remember expressions (13)–(16) in order to identify the attitudes of individuals toward the policy. 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]

When the level of capital is less than $k(\tau, \overline{h})$, no individual can invest in the project even if the government improves the credit markets. All individuals thus prefer $\tau_t = 0$, and the support rate for the policy, S_t, is zero:

$$S_t = 0.$$

When $k(\tau, \overline{h}) \leq k_t < k(0, \overline{h})$, individuals with $\underline{h} \leq h_i < \tilde{h}(\tau, k_t)$ prefer $\tau_t = 0$ because they cannot invest in the project regardless of the government policy. In contrast, individuals with $\tilde{h}(\tau, k_t) \leq h_i \leq \overline{h}$ prefer $\tau_t = \tau$ because the policy enables them to invest in the project. The support rate is given by

$$\begin{aligned} S_t &= \int_{\tilde{h}(\tau,k_t)}^{\overline{h}} dG(h_i) = 1 - G[\tilde{h}(\tau, k_t)] \\ &= \frac{1}{\Delta}\left[\overline{h} - \frac{A}{1-\alpha}k_t^{-\alpha}\right] \equiv S_1(k_t). \end{aligned}$$

The support rate function $S_1(k)$ is increasing in the level of capital k; a higher level of capital lowers $\tilde{h}(\tau, k)$ and enables more individuals to invest in the project since the wage $w(k)$ is increasing in k.

When $k(0, \overline{h}) \leq k_t < k(\tau, \underline{h})$, individuals with $\underline{h} \leq h_i < \tilde{h}(\tau, k_t)$ prefer $\tau_t = 0$, but individuals with $\tilde{h}(\tau, k_t) \leq h_i < \tilde{h}(0, k_t)$ prefer $\tau_t = \tau$ because they can invest only with the assistance of the government policy. Individuals with $\tilde{h}(0, k_t) \leq h_i \leq \overline{h}$ prefer $\tau_t = 0$ since they can invest without the policy. The support rate is given by

$$\begin{aligned} S_t &= \int_{\tilde{h}(\tau,k_t)}^{\tilde{h}(0,k_t)} dG(h_i) = G[\tilde{h}(0, k_t)] - G[\tilde{h}(\tau, k_t)] \\ &= \frac{1}{\Delta}\frac{B-A}{1-\alpha}k_t^{-\alpha} \equiv S_2(k_t). \end{aligned}$$

[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.

The support rate function $S_2(k)$ is decreasing in the level of capital k; a higher level of capital contracts the support $[\tilde{h}(\tau, k_t), \tilde{h}(0, k_t)]$.

When $k(\tau, \underline{h}) \leq k_t < k(0, \underline{h})$, individuals with $\underline{h} \leq h_i < \tilde{h}(0, k_t)$ prefer $\tau_t = \tau$, while those with $\tilde{h}(0, k_t) \leq h_i \leq \overline{h}$ prefer $\tau_t = 0$ since they dislike the taxation. The support rate is thus given by

$$\begin{aligned} S_t &= \int_{\underline{h}}^{\tilde{h}(0,k_t)} dG(h_i) = G[\tilde{h}(0, k_t)] \\ &= \frac{1}{\Delta}\left[\frac{B}{1-\alpha}k_t^{-\alpha} - \underline{h}\right] \equiv S_3(k_t). \end{aligned}$$

The support rate function $S_3(k)$ is decreasing in k; a higher level of capital increases the fraction of individuals who can invest in the project without the government policy; that is, the threshold $\tilde{h}(0, k_t)$ is lowered.

When $k(0, \underline{h}) \leq k_t$, all individuals prefer $\tau_t = 0$ because they are able to invest in the project regardless of the government policy, which leads to

$$S_t = 0.$$

In summary, the support rate function $S(k)$ is represented as

$$S(k_t) = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k(\tau, \overline{h}), \\ S_1(k_t) & \text{if} \quad k(\tau, \overline{h}) \leq k_t < k(0, \overline{h}), \\ S_2(k_t) & \text{if} \quad k(0, \overline{h}) \leq k_t < k(\tau, \underline{h}), \\ S_3(k_t) & \text{if} \quad k(\tau, \underline{h}) \leq k_t < k(0, \underline{h}), \\ 0 & \text{if} \quad k(0, \underline{h}) \leq k_t. \end{cases} \tag{17}$$

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

3.3 Dynamic analysis

This subsection 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. 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.

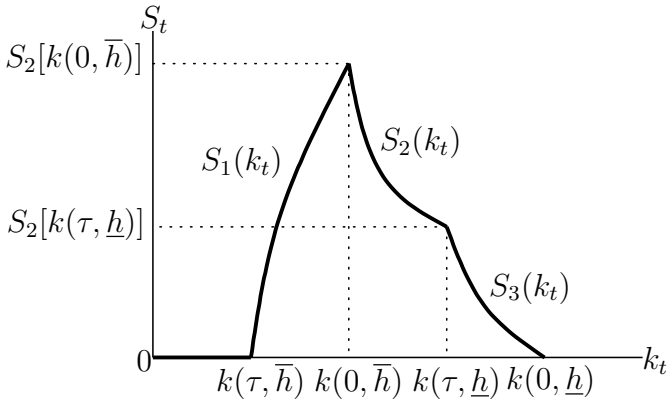

Figure 1: Support rate function

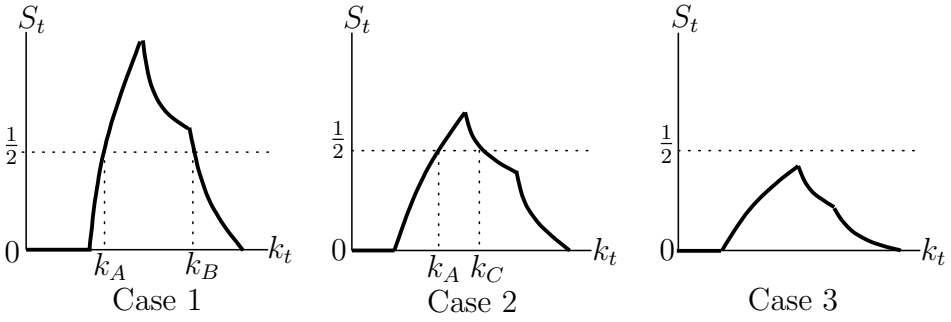

Figure 2: Support rate function in Cases 1, 2, and 3

3.3.1 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 $A/B < \underline{h} \leq (2A)/(A+B)$. This inequality implies

$$S_2[k(\tau, \underline{h})] \geq \frac{1}{2}.$$

Let k_A and k_B denote the capital levels satisfying the following equalities:

$$S_1(k_A) = \frac{1}{2} \quad \Leftrightarrow \quad k_A = \left(\frac{A}{1-\alpha}\right)^{\frac{1}{\alpha}},$$

$$S_3(k_B) = \frac{1}{2} \quad \Leftrightarrow \quad k_B = \left(\frac{B}{1-\alpha}\right)^{\frac{1}{\alpha}}.$$

If $0 \leq k_t < k_A$, the support rate is less than $1/2$, and $\tau_t = 0$ is chosen as a result. 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 $\tau_t = \tau$ 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. If $k_t > k_B$, the support rate is again less than half, and $\tau_t = 0$ 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:

$$k_A < R < k_B \quad \Leftrightarrow \quad \left(\frac{A}{1-\alpha}\right)^{\frac{1}{\alpha}} < R < \left(\frac{B}{1-\alpha}\right)^{\frac{1}{\alpha}}. \tag{A.3}$$

Assumption (A.3) implies that the support rate for the government policy becomes more than $1/2$, and $\tau_t = \tau$ is implemented if the economy develops sufficiently that all individuals in the previous period invest in the project.

Under (A.3), the politically determined policy is represented as

$$\tau_t = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ \tau & \text{if} \quad k_A \leq k_t \leq R, \end{cases} \tag{18}$$

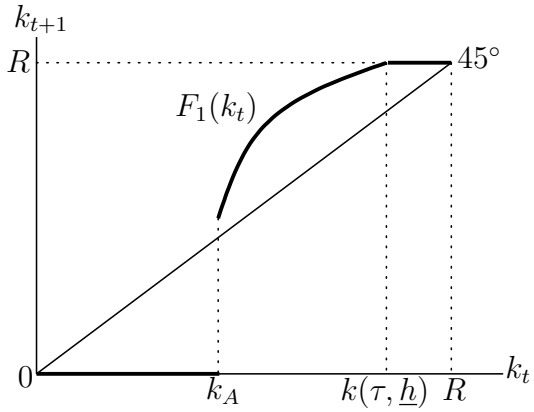

Figure 3: A pattern of economic development in Case 1

and the dynamic equation of capital is given by

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ \frac{R}{2(1-\underline{h})}\left(2 - \underline{h} - \frac{A}{1-\alpha}k_t^{-\alpha}\right) \equiv F_1(k_t) & \text{if} \quad k_A \leq k_t < k(\tau, \underline{h}), \\ R & \text{if} \quad k(\tau, \underline{h}) \leq k_t \leq R. \end{cases} \tag{19}$$

Figure 3 depicts a typical pattern of economic development.[10] There are two locally stable steady states. If the economy starts with $k_0 < k_A$, the government policy is not implemented and the economy falls into a poverty trap in which the level of capital is 0. In the poverty trap, no one can invest in the project, and all individuals consume only their endowment e. If $k_A \leq k_0 \leq R$, in contrast, this policy is always implemented, and the level of capital converges to R.

It is easy to show that the politically determined policy and the dynamic equation of capital are also respectively given by (18) and (19) in the case of $(2A)/(A+B) \leq \underline{h} \leq 1$.

[10]Setting $\lambda_H = 1$, $\lambda_L = 0$, $e = 0.3$, $\tau = 0.2$, $R = 3.8$, $r = 1.1$, $\alpha = 0.75$ and $\underline{h} = 0.7$ generates the dynamics shown in Figure 3. In order to focus on the effects of income inequality on economic development, we provide parameter examples corresponding to Figures 4-6 using the same values for these parameters except for $\underline{h}$.

Case 2: Moderate level of income inequality

Next, we consider the politically determined policy under a moderate level of income inequality: $(2A - B)/A \leq \underline{h} < A/B$. This inequality implies

$$S_2[k(\tau, \underline{h})] < \frac{1}{2} \leq S_2[k(0, \overline{h})].$$

Let us define k_C by

$$S_2(k_C) = \frac{1}{2} \quad \Leftrightarrow \quad k_C = \left(\frac{1}{1-\underline{h}} \frac{B-A}{1-\alpha} \right)^{\frac{1}{\alpha}},$$

where k_C is increasing in $\underline{h}$. An increase in $\underline{h}$ increases the density of individuals in the interval $[\tilde{h}(\tau, k_t), \tilde{h}(0, k_t)]$, who benefit from the policy improving 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 is increasing in $\underline{h}$. By the same logic discussed in Case 1, the policy is implemented if $k_A \leq k_t \leq k_C$, and not implemented otherwise.[11]

$$\tau_t = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ \tau & \text{if} \quad k_A \leq k_t \leq \min\{k_C, R\}, \\ 0 & \text{if} \quad \min\{k_C, R\} < k_t \leq R. \end{cases} \tag{20}$$

The dynamic equation of capital is represented as

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k_A, \\ F_1(k_t) & \text{if} \quad k_A \leq k_t \leq \min\{k_C, R\}, \\ \frac{R}{2(1-\underline{h})} \left[2 - \underline{h} - \frac{B}{1-\alpha} k_t^{-\alpha} \right] \equiv F_2(k_t) & \text{if} \quad \min\{k_C, R\} < k_t \leq R. \end{cases} \tag{21}$$

The third lines in (20) and (21) are valid if the interval $(\min\{k_C, R\}, R]$ is non-empty. Because k_C is increasing in $\underline{h}$, k_C is larger than R for sufficiently large $\underline{h}$, and k_C is smaller than R for sufficiently small $\underline{h}$. Figure 4 depicts a pattern of economic development for $\underline{h}$ close to A/B.[12] In this case, the

[11] Note that the value of k_C with $\underline{h} = A/B$ coincides with that of k_B. Thus, $k_C > R$ for $\underline{h}$ sufficiently close to A/B. Furthermore,

$$k(0, \underline{h}) = k_B \left(\frac{1}{\underline{h}} \right)^{\frac{1}{\alpha}} > k_B > R.$$

[12] Setting $\underline{h} = 0.5$ generates the dynamics shown in Figure 4.

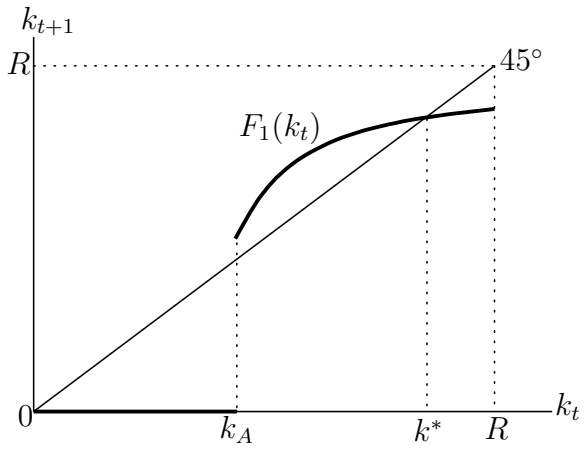

Figure 4: A pattern of economic development when $\underline{h}$ is slightly smaller than A/B

range in which the government policy is implemented, $[k_A, k_C]$, is broad, and the curve $F_1(k)$ and the 45-degree line intersect at k^*. Similarly to Case 1, the level of capital converges to k^* if $k_A \leq k_0 \leq R$, although the economy is caught in a poverty trap if $0 \leq k_0 < k_A$.

Figure 5 depicts a pattern of economic development for $\underline{h}$ close to $(2A - B)/A$.[13] In this case, the range $[k_A, k_C]$ is narrow, and the curve $F_1(k)$ does not intersect the 45-degree line. The economy is caught in a poverty trap for any k_0. If $k_A \leq k_0 \leq k_C$, the government policy is implemented at first. The policy is, however, unlikely to be implemented thereafter, and the economy eventually falls into the poverty trap.

Case 3: High level of income inequality

Lastly, we consider the politically determined policy in the case under high levels of income inequality: $0 \leq \underline{h} < (2A-B)/A$. This inequality is equivalent to

$$S_2[k(0, \overline{h})] < \frac{1}{2}.$$

A higher level of income inequality reduces the density of individuals $1/\Delta$, which suggests that the policy improving the credit markets benefits only a

[13]Setting $\underline{h} = 0.3$ generates the dynamics shown in Figure 5. It is easy to show that $F_2(R) < R/2$.

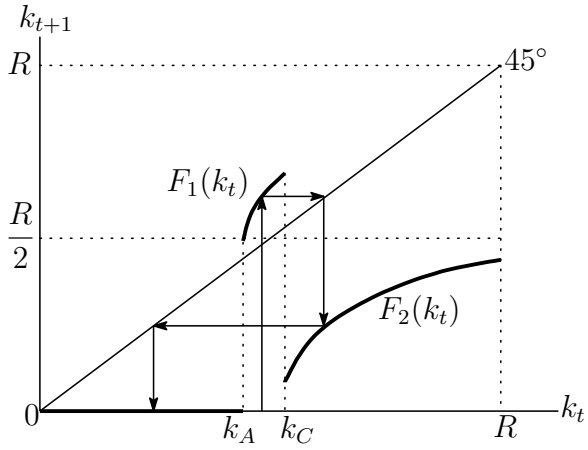

Figure 5: A pattern of economic development when $\underline{h}$ is slightly larger than $(2A - B)/A$

few individuals. The support rate function $S(k)$ is smaller than $1/2$, and $\tau_t = 0$ is implemented for any k. The dynamic equation of capital is represented as

$$k_{t+1} = \begin{cases} 0 & \text{if} \quad 0 \leq k_t < k(0, \overline{h}), \\ F_2(k_t) & \text{if} \quad k(0, \overline{h}) \leq k_t \leq R. \end{cases} \tag{22}$$

Figure 6 depicts a typical pattern of economic development.[14] The government policy is never implemented, and the economy is always caught in a poverty trap. Proposition 2 summarizes the results in this subsection.

Proposition 2 *Under (A.1), (A.2) and (A.3),*

- *the pattern of capital accumulation when* $A/B \leq \underline{h} \leq 1$ *is given by (19),*
- *the pattern of capital accumulation when* $(2A - B)/A \leq \underline{h} < A/B$ *is given by (21), and*
- *the pattern of capital accumulation when* $0 \leq \underline{h} < (2A - B)/A$ *is given by (22).*

[14]Setting $\underline{h} = 0$ generates the dynamics shown in Figure 6.

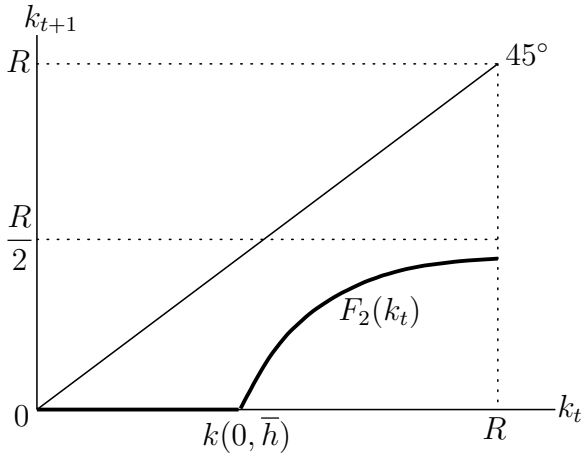

Figure 6: The pattern of economic development in Case 3

The obtained results agree with some recent evidence as described in Introduction. 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 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.

Furthermore, this paper theoretically explains the bilateral causality between financial and economic development found by Calderon and Liu (2003). In our model, a necessary condition for the policy to be supported is that capital must be above k_A. This result suggests causality from economic development to financial development. Obviously, financial development stimulates investments, which cause economic development.

4 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 by 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 could 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 here is that even in the absence of inequality in political power, improving credit markets does not always obtain majority support.

The logic of our model could be applied to the analysis of other public policies. For example, government policies that improve public schools could be the subjects of political conflicts similar to those in this paper. The very poor who cannot afford any higher education and the very rich who are interested in expensive private schools may be against the policies and oppose the middle-income individuals who obtain the most benefit from public schooling. The analysis of conflicts over such policies in the framework of this paper could be a fruitful direction for further research.

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