Trust and Law in Credit Markets*

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February 14, 2017

Abstract

This paper studies the coevolution of civicness and formal institutions in determining financial and economic development. In credit markets with asymmetric information, uncivic borrowers engage in cheating and enjoy larger gains with weaker enforcement of claims on collateral they pledge. As a consequence, a low-trust society demands for weak enforcement and in turn, if the society believes that weak enforcement will appear, it discourages parents to instill civic values in their children. This complementarity leads to multiple steady states: a high-trust one with strong enforcement and high aggregate output; a low-trust one with weak enforcement and low aggregate output. History and self-fulfilling expectations are determinants of steady state which the economy will end up in. We also argue that technological innovation and contractual innovation may be detrimental to the underdeveloped economy.

JEL Classification: O10, O16, Z13.

Keywords: credit markets, collateral, culture, trust, institutions, enforcement, cultural transmission, history versus expectations, technical change.

*This paper is part of my Ph.D. dissertation at Osaka University. I am especially grateful to Katsuya Takii, Junichiro Ishida and Shingo Ishiguro for the valuable discussions and suggestions. I am also grateful to Koichi Futagami, Hirokazu Ishise, Ryosuke Okazawa, Akihisa Shibata, Takashi Shimizu, and the participants at the 2016 Asian Meeting of the Econometric Society, the 2016 Autumn Meeting of the Japanese Economic Association, the Osaka Workshop on Economics of Institutions and Organizations, and the Workshop on Economics of Human Resource Allocation. All remaining errors are my own.

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1 Introduction

The working of credit markets is central to understanding the development process. Well-functioning credit markets reduce the cost of credit, encourage entrepreneurial activities, and lead to economic prosperity. Taking these benefits seriously, countries suffering from underdevelopment have struggled to find ways to overcome imperfections in credit markets.

A large body of literature following La Porta et al. (1997a, 1998) demonstrate that formal legal institutions are important determinants of financial development. The legal systems, such as creditor protection and its enforcement, enhance creditors' ability to seize assets that borrowers pledge as collateral in the event of default. The better access to collateral makes creditors more willing to provide their fund to borrowers at lower costs and results in developed credit markets. [1]

More recently, empirical studies pay attentions to alternative mechanism which can serve a good substitute for legal systems: trust. Guiso et al. (2004, 2008) and Cole et al. (2013) argue that without the faith that borrowers have norms of good conduct and behave in lenders' interests, they hesitate to trust their money and are out of the financial markets. Moreover, Guiso et al. (2004) show that the importance of trust is particularly evident in areas with weak legal institutions. Because lenders must crucially depend on borrowers' moral values when lenders are poorly protected by legal rules, the effect of trust on the availability of financial contracts is bigger in areas where legal institutions are weaker.

Despite the potential benefit of either strengthening legal protection of creditors or cultivating trust, developing countries fail to do both. For example, many Latin American countries have been plagued by weak institutions (e.g., unprotected creditor rights and weak legal enforcement) and lack of generalized trust, which are conducive to underdeveloped financial markets. The connection between ineffective financial systems and distrust is made more plausible by other piece of evidence. The quality of legal institutions, which enforce contracts, is positively associated with measures of trust among countries, European regions (Tabellini, 2008a

[1] For discussions of this mechanism, see De Soto (2000) and Besley et al. (2012).

and Algan and Cahuc, 2014, Tables 2.6a and 2.6b), or Italian provinces (Guiso et al., 2004) and the correlation remains significant even in cases of using different measures and controlling for other factors.

To explain the diversity, we develop a model of interplay between civicness and the institutions of financial markets. A low level of civic-mindedness creates the demand for weak enforcement, whereas weak enforcement reduces benefits of trustworthy behavior. The interaction leads to multiple steady states with different levels of cultural, institutional, financial, and economic outcomes. Our analysis highlights the roll of history in shaping the long-run development. We also show that technological innovation and contractual innovation could erode trust in the underdeveloped economy and widen the disparities in aggregate output with the developed economy.

We provide a model of credit markets where entrepreneurs borrow funds by pledging their wealth as collateral and then decide whether to invest the funds in projects or divert them to personal use secretly. The incentive of cheating is influenced by two factors. The first factor is legal enforcement of claims on collateral. Stronger enforcement increases the possibility that entrepreneurs lose their collateral as a result of cheating and induces them to make investments. The second factor is civic values. Civic entrepreneurs have a feeling of satisfaction from entrepreneurial activity and a feeling of guilt for cheating, whereas uncivic entrepreneurs do not and their private benefit of cheating is too high to deter it even with perfect enforcement. Despite the anticipated cheating by uncivic entrepreneurs, they are not excluded from credit markets because their type is private information and they mimic civic entrepreneurs. The resulting equilibrium features cross-subsidization of the uncivic entrepreneur by the civic one who is expected of trustworthy behavior and emphasizes the roll of trust—beliefs in entrepreneurs' trustworthiness—in financial contracts.

An important feature of our model is that institutions and civic values are endogenously determined. At first, we analyze a static model where while strength of enforcement is selected through a majority voting before financing, share of civic entrepreneurs is exogenously

given. Uncivic entrepreneurs prefer weaker enforcement to enjoy larger benefit from cheating but do not demand for too weak enforcement which causes the breakdown of credit markets. As a result, a low-trust society where uncivic entrepreneurs are widely dominant sets the weakest enforcement conditional on being funded. In contrast, civic entrepreneurs prefer stronger enforcement because it reduces the loss on uncivic entrepreneurs and lowers the degree of cross-subsidization. Thus, a high-trust society where the share of civic entrepreneurs is large sets the strongest enforcement.

Then, we extend the static model to an overlapping generation economy that is populated by two-period lived entrepreneurs whose civic values are inherited from their parents through family civic education. When young, they receive parental education and form their values. When old, they experience the same events as in the static model and then choose what values to transmit to their children. Following Bisin and Verdier (2001) and Tabellini (2008b), we assume "imperfect empathy": parents care about utilities of their children but evaluate their children's behavior based on their own values. As a result of the paternalistic altruism, civic parents educate their children to have strong civic virtues, whereas uncivic parents do not.

In the dynamic setting, if parents expect that their children live in an environment with weak enforcement, they expect that civic children have to engage in entrepreneurial activity in the disadvantageous situation and therefore are reluctant to make their children civic. The resulting low level of educational effort creates a low-trust economy which supports weak enforcement and the initial expectations are justified. If, instead, parents expect that their children live in an environment with strong enforcement, they expect that civic children receive great returns from the investment and therefore are willing to make their children civic. The resulting high level of educational effort leads to a high-trust economy which supports strong enforcement and the initial beliefs are again justified. The complementarity between civicness and institutions lead to multiple steady states: a low-trust one that leads to weak enforcement and low aggregate outputs; a high-trust one that achieves strong enforcement and high aggregate outputs.

Which steady state the economy will end up in depends on history and expectations. When

either civic values are widely dominant initially, history matters; that is, the economy with the initial low (high) level of trust, along with weak (strong) enforcement, reaches a low-trust (high-trust) steady state. When there is no widely dominant civic value initially, such precondition alone does not determine the long-run outcome and expectations play a roll in selecting it. If a society expects weak (strong) enforcement, it achieves a low (high) level of education and converges to the low-trust (high-trust) steady state.

It is well known that history and expectations determine the long-run economic development, as in Krugman (1991) and Matsuyama (1991). The implication of our model is that history and expectations have the long-lasting effect on not only economic prosperity but also trust and institutions. This argument resonates with empirical works that find the long-term persistence of trust. Once a positive historic shock, such as the free city-states experience in the Italian Middle Ages (Putnam, 1993 and Guiso et al., 2016), or a negative historic shock, such as Africa's slave trade (Nunn and Wantchekon, 2011), influence beliefs in trustworthiness of current and future generations in the society, the resulting trust persists over the long-run and generates the persistence of development. In our model, these historic shocks have long-lasting effects because of the feedback from institutions.

As stressed by Tabellini (2008a,b), the culture-based approach can also explain the persistence of institutions. Beck et al. (2003) and Acemoglu and Johnson (2005) state that bad institutions set up by European colonialists have persisted for a long time and deterred financial and economic development. By considering the colonial experience as a trust-destroying shock in our model, we show that such historic shock generates a low-trust society in which financial institutions remain weak. La Porta et al. (1998, 2008) also argue that legal origins transplanted by the origin countries through conquest and colonization have the persistent effect on the legal protections of investors and financial development. French civil law countries are more likely to adopt weak legal protections and have less developed financial markets than English common law countries. Our model may explain this legal origin theory based on La Porta et al.'s (2008) argument that French civil law system embeds the beliefs that a country needs to be concerned

with private disorder, whereas the common law system embeds the beliefs that private citizens are so peaceful that the country needs to be less concerned with disorder. According to such a view, while the transplantation of civic law changes peoples' mindset and brings about distrust in other people, the transplantation of common law encourages the formation of trust in others. Therefore, we can consider that the historic shock about the transplantation of civil (common) law corresponds to the initial low (high) level of trust whereby the economy converges to the steady state with weak (strong) financial institutions.

In addition to these empirical relevance, our model delivers three testable implications. First, the relationship between trust and institutions changes depending on time spans. In the long run, trust and institutions are complements. In the short-run, however, they may be substitutes. During the transitional path towards a low-trust steady state, uncivic entrepreneurs have political power and weaken enforcement further as trust becomes higher. That the relationship in the transition is opposite to the long-run relationship is a new insight to the literature.

Second, technical change drives cultivation of trust and economic development in a high-trust steady state and retards them in a low-trust steady state. In the high-trust steady state, the higher productivity of projects increases the return of being civic entrepreneurs and encourages family civic education. In the low-trust steady state, however, the effect is opposite. Because higher productivity leads an entrepreneur to have higher ability to attract funds, the uncivic entrepreneurs can weaken enforcement further. The political response discourages parental education and aggravates lack of trust. If the adverse effect exceeds the direct and positive effect from increased productivity, the economy deteriorates. Thus, technical change can exacerbate the levels of inequality in trust, institutional quality, and aggregate output between the steady states.

Third, contractual innovation that facilitates more sophisticated contracts may be detrimental to the long-run outcome. The sophisticated contract enables the civic entrepreneur to separate from the uncivic one and extract higher compensation. In the economy where the uncivic type is the majority, the higher profitability allows them to weaken enforcement further, dis-

couraging family education. As a consequence, contractual innovation could end up causing trust collapse.

Literature review: This paper is related to several strands of literature.

A vast body of research has studied what is a primary determinant of formal institutions that affect financial markets and suggested two distinct hypotheses. The first view is that the cross-country variation in formal institutions is shaped by historic accident, such as the conquest and colonization by European countries (La Porta et al., 1998, Beck et al., 2003 and Acemoglu and Johnson, 2005). The second view is that legal rules protecting investors are the result of the political economy process. The preferences of groups with political power are reflected in decisions on legal protections. Recent contributions include Rajan and Zingales (2003), Pagano and Volpin (2005, 2006), Perotti and von Thadden (2006), and Biais and Mariotti (2009). Our paper attempts to bridge the gap between the two views by pointing out that culture is the missing link. When peoples' cultural values are shocked by a historic event, they believe that the society will adopt the legal institutions that are favorable for those with affected values, thus transmitting their values to their children and making the belief justified. The mechanism of cultural transmission, combined with political economy, generates the path dependency.

Our paper also contributes to an extensive literature that has recognized the importance of civic values and trust in determining economic performances (see e.g, Putnam, 1993, Fukuyama, 1995, Knack and Keefer, 1997, La Porta et al., 1997b, Algan and Cahuc, 2010, and Tabellini, 2010). Following the seminal work of Bisin and Verdier (2001), the theoretical works on this field focuses on cultural transmission of values, such as those regarding trustworthiness (Francois and Zabojnik, 2005) and corruption (Hauk and Saez-Marti, 2002).[2] In contrast with these papers, we incorporate policies that are determined by collective decisions to study joint dynamics of trust and the institutions of financial markets.

There is a recent burgeoning literature on the coevolution of culture and formal institutions.

[2] Kumar and Matsusaka (2009) develops alternative model to study cultural evolution and development process, where they distinguish social capital that relies on personal network from social capital that is useful for enforcing contracts with strangers.

[3] Tabellini (2008b) provides a theoretical model of interaction between values about cooperation and legal institutions that enhance cooperation. Alesina and Angeletos (2005) and Bénabou and Tirole (2006) focus on the interaction between culture of work and redistribution policies. Bidner and Francois (2011) analyze the dynamic systems of honesty norms and institutions that encourage trading and show that larger scale of a country has higher level of trust. Aghion et al. (2011), Michau (2013) and Alesina et al. (2015) pay attention to the interplay between labor market institutions and cultural trait. In contrast with all of these papers, our paper focus on trust and institutions that enforce financial contracts.

The closer works to our interests are Aghion et al. (2010) and Carlin et al. (2009), which focus on the co-evolution between trust and government regulation. In Aghion et al. (2010), trust and entry regulation are substitutes because low-trust countries demand for entry regulation to prevent uncivic entrepreneurs from misbehaving, whereas under strong regulation people become uncivic to pay bribes and entry the market. Carlin et al. (2009) place financial markets at the center and show that whether trust and regulation are substitutes or complements depends on values of social capital. Our paper has two different points from their papers. First, we show that trust and institutions are complements in the long run and can be substitutes in the short run. Second, while their papers assume an one-shot model in which agents make a one-time choice of civic values, our paper assume an infinite-horizon model in which civic values are transmitted from one generation to the next. Our approach of cultural transmission enables us to clarify the roll of history and expectations in yielding the persistence of trust, institutions, and economic development.

The rest of the paper is organized as follows. Section 2 provides the framework of the static model in which civic values are exogenous. Section 3 analyzes the equilibrium of the static model and shows the one-way effect of trust on quality of enforcement. Section 4 extends the model to the dynamic setting in which trust is endogenously determined through family civic education. The dynamic economy describes the divergence in development through the two

[3] See Bisin and Verdier (2015) for the general model and Alesina and Giuliano (2015) for excellent surveys of the literature.

way effects between trust and institutions. Section 5 discusses the implication of contractual innovations. Section 6 concludes.

2 The Static Model

In this section, we describe the basic framework of the static model in which civic values are given whereas a level of enforcement is an endogenous variable.

There are a continuum 1 of entrepreneurs and lenders. Both agents are risk-neutral and consume at the end of the period. Both are protected by limited liabilities. There is a storage technology that produces zero profit. The entrepreneur runs a project requiring an fixed investment $I > 0$. The project produces cash flows $R > 0$ with probability $p \in (0, 1]$ and nothing with probability $1 - p$. Lenders receive sufficiently large amount of cash, but cannot have access to the project. Entrepreneurs without any funds have to rely on external financing to utilize the project.

Entrepreneurs have illiquid wealth $C > 0$. The wealth cannot be transformed into cash and consumed until the investment return is realized. The entrepreneur can pledge the wealth as collateral in the case of default. The pledge is enforced and lenders seize collateral C with probability $\tau \in [0, 1]$, implying that an effective value of collateral is τC. The probability τ measures the strength of financial institutions, such as strength of creditor rights and the quality of their enforcement, with a higher score corresponding to stronger financial institutions. The idea behind this interpretation is that law that improves the creditor rights and its strong enforcement enhances the power of creditors against defaulting borrowers. [4] Before financing occurs, the strength of legal enforcement is determined in the political process in which each agent votes on τ with majority rule. Although in reality some costs are present when the government reforms bankruptcy laws and formal legal procedure, we assume that the government can change τ without any cost to focus on the main mechanism.

[4] We can also interpret τ as the strength of property rights as in Besley et al. (2012), where improving property rights enhances the entrepreneurs' ability to pledge assets as collateral.

Projects are subject to entrepreneurs' moral hazard.[5] Entrepreneurs can divert funds I and use them for the private purpose instead of investing them in the project. The misbehavior results in default but leads to private benefits b for the entrepreneurs. Thus, they choose whether to cheat or not comparing the payoffs their behavior induces. An entrepreneur's payoff is determined by her cultural trait or civic value $i \in \{G, B\}$, indicating good (civic) type and bad (uncivic) type, respectively. In the case of cheating, entrepreneurs with better civic attitudes have stronger guilt feelings toward cheating, as in Algan and Cahuc (2009) and Michau (2013). An entrepreneur with trait $i = G$, who can be thought of as person with higher level of morality, obtains small private benefit $b = b^G > 0$ because she has a feeling of guilt on such uncivic behavior, while an entrepreneur with trait $i = B$ feels less guilty on the cheating and obtains large private benefit $b = b^B > b^G$. In the case of not cheating (i.e., investing in the project), entrepreneurs with higher civic values have a stronger feeling of satisfaction from an entrepreneurial activity and the cooperative behavior during such activity, as in Tabellini (2008b) and Aghion et al. (2010). In this setting, a civic entrepreneur obtains psychological gains $\alpha > 0$ from investing, whereas an uncivic entrepreneur does not. Thus, a good entrepreneur is more likely to behave in line with lenders' interests than a bad one. [6]

Each entrepreneur becomes the good type with probability $\phi \in (0, 1]$ and becomes the bad type with probability $1 - \phi$ independently. The law of large number implies that ϕ is also the share of good entrepreneurs. The entrepreneur's type is her private information. Because in the equilibrium, as we will see later, only bad types cheat and lenders cannot distinguish both types, ϕ is not only the share of civic entrepreneurs but also the lenders' beliefs concerning the probability of not being cheated. Thus, ϕ measures how much lenders can trust an entrepreneur to behave in line with their interests, based on Gambetta's (2000) definition of trust. [7] Here-

[5] This formalization is similar to the model developed by Holmström and Tirole (1997).

[6] Our results would not change qualitatively if we alternatively assume that both types receive the same private benefits b from cheating, whereas a civic entrepreneur obtains psychological benefits α^G and an uncivc entrepreneur incurs psychological costs α^B from investing.

[7] Gambetta (2000) defines trust as "the subjective probability with which an agent assesses that another agent or group of agents will perform a particular action" and states that "when we say we trust someone or that someone is trustworthy, we implicitly mean that the probability that he will perform an action that is beneficial or at least not detrimental to us is high enough for us to consider engaging in some form of cooperation with him."

after, following this interpretation, we refer to ϕ as a measure of trust. While we take ϕ to be exogenously given in the static model, we allow ϕ to be determined endogenously as a result of family civic education in Section 4.

We focus on the contract that specifies (i) that lenders contribute I, (ii) that the lenders receive r and the entrepreneur receives $R - r$ when the investment succeeds, and (iii) that lenders try to seize collateral C in the case of default. [8] Because lenders observe only whether the entrepreneur defaults on payments or not, the enforcement occurs when she engages in cheating or her project fails. [9]

The timing of events is as follows:

1. Nature determines each entrepreneur's type.
2. All agents vote on quality of creditor protections τ with majority rule.
3. Entrepreneurs make a take-it-or-leave-it offer that specifies a repayment r to lenders and they decide whether to accept. If lenders accept the offer, they lend money. If lenders reject the offer, they use storage technology and entrepreneurs consume only collateral.
4. If an entrepreneur borrows funds, she faces moral hazard problem.
5. Investment returns are realized, the realized outcome is shared as contracted, and consumption takes place.

Then, we define an equilibrium. In addition to the requirements of the perfect Bayesian equilibrium, we need to incorporate how to determine quality of enforcement in the political process into the equilibrium definition. The assumption of simple majoritarian voting implies

[8] We focus on the financial contract in which entrepreneurs pledge an amount C of collateral in the case of default. Even when entrepreneurs can offer the contract in which they pay parts of their collateral, pledging all wealth C as collateral is derived as one of the optimal contracts.

[9] When the default after cheating and the one after project failure are distinguishable and verifiable, entrepreneurs can offer the contracts with the different amount of wealth pledged as collateral in both states. However, the optimal contract does not change; entrepreneurs choose to pledge all their wealth as collateral in both cases. This is because the contract provides the maximum incentive not to cheat and maximizes the good entrepreneurs' payoff.

that the government's preference coincides with the median voter's one. Our (economic and political) equilibrium is defined in the following way.

Definition 1 *An equilibrium is given by the strength of enforcement τ, the entrepreneurs' decisions on cheating, their payment r to lenders when the project is successful, lenders' decision for financing, and the market's beliefs about the type of entrepreneurs such that the following conditions are satisfied:*

- *The choice on cheating, and the contract that specifies r maximizes the utility of entrepreneurs where beliefs and the lenders' financing strategies are taken as given;*
- *The financing decision of the lenders maximize their utility, where beliefs, the entrepreneurs' choice on cheating and the contracts they offer are taken as given;*
- *The market's beliefs are consistent with Bayes's rule given equilibrium strategies, whenever possible.*
- *The strength of enforcement τ maximizes the utility of the median agent.*

Finally, we makes three parametric assumptions. The first assumption guarantees that a project produces a positive net present value (NPV), but cheating conducted even by a bad entrepreneur produces a negative NPV:

Assumption 1 $pR > I > b^B$.

The second assumption insures that there is no loan agreement where bad entrepreneurs do not cheat and lenders do not lose money:

Assumption 2 $b^B - C > pR - I$.

This assumption means that for a bad entrepreneur, cheating produces larger payoffs than investing in the project even if pledging wealth as collateral is enforced perfectly. This assures that when the entrepreneur is identified as a bad type, she cannot obtain financing. This assumption creates the strong incentive for the bad entrepreneur to mimic the good one, ruling

out a separating equilibrium. Combining Assumption 1 with Assumption 2, we have $b^B > C$, which means that the benefit of cheating for a bad entrepreneur is larger than the cost of losing collateral.

The third assumption imposes some restrictions on the psychological gains just for simplicity.

Assumption 3 $\alpha < (1-p)b^G$.

This assumption guarantees that civic entrepreneurs participate in financial contracts when they obtain not only psychological gain but also the positive compensation. This implies that under Assumption 3, the limited liability constraint is not binding in the equilibrium. [10]

3 Analysis of the Static Model

This section analyzes the equilibrium of the static model. Section 3.1 characterizes the optimal contract and shows that higher trust or stronger contract enforcement allows entrepreneurs to borrow funds with lower repayments. Section 3.2 investigates how trust has an effect on quality of enforcement.

3.1 Optimal Contracts

Given a level of trust ϕ and quality of contract enforcement τ, we solve financial contracts problem. We characterize a equilibrium in which entrepreneurs offer a pooling contract r that cross-subsidizes the bad type at the expense of the good one. In particular, we focus on the pooling contract that solves the following problem:[11]

$$U^G = \max_r p(R-r) - (1-p)\tau C + \alpha \tag{1}$$

[10] If $\alpha > (1-p)b^G$, there is a equilibrium in which entrepreneurs obtain financing by offering $r = R$. The additional case entails more complicated analysis but does not affect our conclusion.

[11] Although there are many pooling equilibria depending on off-the-equilibrium-path beliefs, we focus on this pooling allocation because it is the unique equilibrium that satisfies the definition of perfect sequential equilibrium.

subject to

$$\phi p r + (1-\phi p)\tau C \geq I, \tag{2}$$

$$p(R-r) - (1-p)\tau C + \alpha \geq -\tau C + b^G, \tag{3}$$

$$0 \leq r \leq R. \tag{4}$$

The objective function (1) is the good entrepreneur's net expected payoff. The constraint (2) is the participation constraint for lenders. The left-hand side represents the expected payoff to lenders, whereas the right-hand side represents the lending amount given that the storage technology that produces zero profit is the outside option. The constraint (3) is the incentive compatibility condition. The left-hand side is the good entrepreneurs' expected payoffs in the case of not cheating and the right-hand side is those in the case of cheating. The constraint (4) is limited liability constraints.

The problem (1)–(4) shows that a lower r gives a good entrepreneur higher payoff and stronger incentive not to cheat. Because of these benefits, the good entrepreneur is willing to decrease r as long as lenders have incentive to participate in the financial contracts. Thus, the optimal level of r is determined from the participation constraint (2) holding as equality. This implies that (3) boils down to

$$\phi\left(pR + \alpha - b^G\right) + \tau C \geq I. \tag{5}$$

This condition means that the amount that at most are expected to be paid to lenders without inducing the good entrepreneur to cheat is larger than the cost of financing I. If the condition (5) holds, lenders are willing to provide funds to all entrepreneurs. The pooling equilibrium features cross-subsidization: lenders make money on the good entrepreneur and lose money on the bad one. If (5) is violated, no financing occurs.

The value function of a good entrepreneur is given by

$$U^G = \frac{1}{\phi}(\phi pR - I) + \frac{1-\phi}{\phi}\tau C + \alpha. \tag{6}$$

U^G is increasing in trust ϕ because a higher level of trust mitigates the problem of adverse selection and lowers its cost incurred by the good entrepreneur. Moreover, U^G is increasing in strength of enforcement τ under the equilibrium where a bad entrepreneur is cross-subsidized at the expense of a good one. By reducing the loss lenders suffer owning to a bad entrepreneur, stronger enforcement can decrease the degree of cross-subsidization. Indeed, when lenders believe that an entrepreneur is a good type and cross-subsidization does not occur (i.e., $\phi = 1$), strength of enforcement affects only the contractual term r but does not affect the entrepreneur's payoff U^G. [12]

On the other hand, a bad entrepreneur offers the same contract as a good one and obtains the payoff

$$U^B = b^B - \tau C. \tag{7}$$

The bad entrepreneur chooses cheating to enjoy private benefits at the expense of losing collateral because the cheating is more attractive than investing in the project from Assumption 2. [13] U^B is independent of trust ϕ because it affects only a repayment r, which is irrelevant to bad entrepreneurs who will default on the repayments. More important, U^B is decreasing in τ in contrast with the payoff of a good entrepreneur (6). A bad entrepreneur faces the fear that

[12] In other words, the feature that U^G is increasing in τ is due to the different perception about collateral values between good entrepreneurs and lenders. The cost of pledging effective collateral τC for an good entrepreneur is measured as her default probability $1-p$. In contrast, the benefit of collateral for lenders is measured as their subjective probability that entrepreneurs default, $1-\phi p$, which is higher than $1-p$ because lenders cannot distinguish entrepreneurs' types. This implies that lenders place higher value on collateral that mitigates the risk of being cheated than good entrepreneurs. The overvaluation about collateral leads them to be willing to pledge their wealth as collateral. Consequently, good entrepreneurs benefit from stronger enforcement. When $\phi = 1$, there is no such overvaluation.

[13] Assumption 2 assures that the following incentive compatibility condition holds:

$$b^B - \tau C > p(R-r) - (1-p)\tau C.$$

where r is determined by (2) holding as equality. The payoffs in the case of cheating (left-hand side) is higher than those in the case of no cheating (right-hand side).

lenders will attempt to foreclose on her wealth as a result of cheating. To reduce the fear and have the wealth in hand, the bad entrepreneur prefer to weaken contract enforcement.

In addition to the financing constraint (5), in the equilibrium where entrepreneurs secure financing by offering the pooling contract, it has to lead to greater payoffs for both types of entrepreneur than their outside option. The bad type finds it profitable to participate in financial contracts under Assumption 2, whereas the good type does if the following participation constraint holds:

$$U^G \geq 0. \tag{8}$$

Therefore, financing occurs under the following condition,

$$\tau C \geq \max\left\{I - \phi\left(pR + \alpha - b^G\right), \frac{I - \phi(pR+\alpha)}{1-\phi}\right\}. \tag{9}$$

The following lemma characterize an lower bound on τ for each ϕ above which (4) and (9) hold, denoted by $\underline{\tau}(\phi)$.

Lemma 1 *Suppose that Assumptions 1–3. When $\tau \geq \underline{\tau}(\phi)$ where*

$$\underline{\tau}(\phi) = \begin{cases} \dfrac{I - \phi(pR+\alpha)}{C(1-\phi)} & \text{if } \phi(pR+\alpha-b^G) \leq I - b^G, \\ \dfrac{I - \phi(pR+\alpha-b^G)}{C} & \text{if } I - b^G < \phi(pR+\alpha-b^G) \leq I, \\ 0 & \text{if } I < \phi(pR+\alpha-b^G), \end{cases} \tag{10}$$

(4) and (9) hold. Then, $\underline{\tau}(\phi)$ is nonincreasing in ϕ.

Proof. See Appendix A. ■

Figure 1 explains Lemma 1 graphically. The horizontal axis represents a level of trust ϕ and the vertical axis represents strength of enforcement τ. The solid lines are constraints (5) and (8) that hold with equality. Figure 1 has two features. First, as ϕ increases, both constraints are more likely to hold. A higher level of trust allows good entrepreneurs to offer contracts that

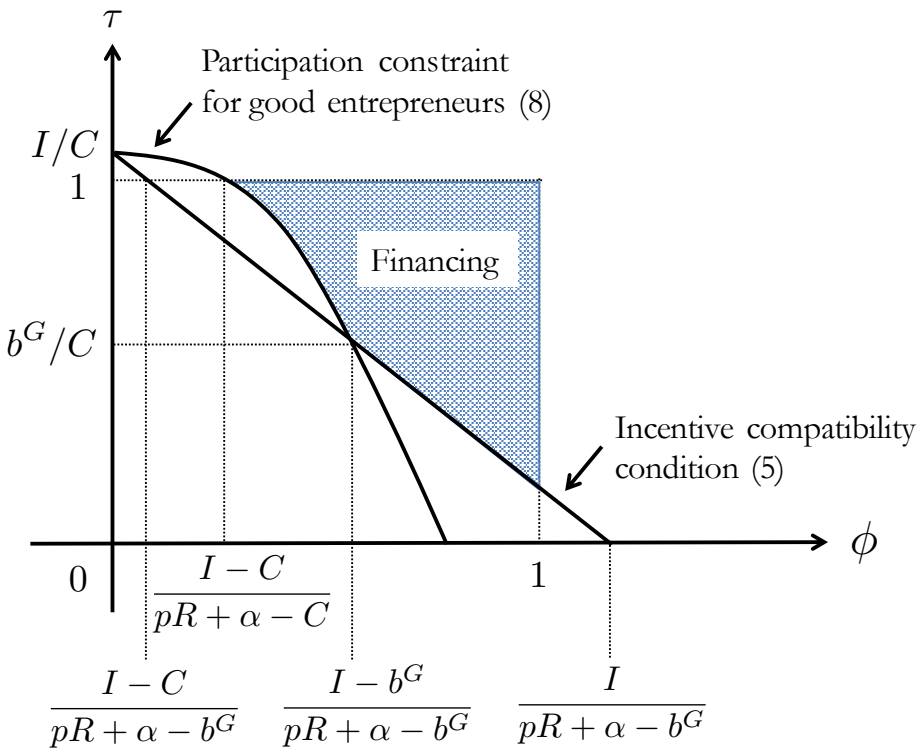


Figure 1: Financing conditions

specify lower repayments by mitigating adverse selection and to have stronger incentive not to cheat. Accordingly, both constraints (5) and (8) are satisfied when the quality of enforcement is lower. When ϕ is very high, (5) and (8) hold even under the condition where the quality of enforcement reaches out to the lowest level, 0. Thus, the lower bound $\underline{\tau}(\phi)$ is nonincreasing in ϕ.

Second, the severer constraint changes depending on ϕ. If ϕ is low, the participation constraint (8) demands higher level of τ than the incentive compatibility constraint (5). The more severe effect of adverse selection puts a large burden on good entrepreneurs. When ϕ is high, the incentive compatibility constraint (5) is tighter than the participation constraint (8). In that case, a good type finds it more difficult to have an incentive to invest in the project than to have a profitable financial contract. Thus, the lower bound $\underline{\tau}(\phi)$ is determined by (5) when ϕ is low and by (8) when ϕ is high. Note that limited liability constraints (4) always hold when $\tau \geq \underline{\tau}(\phi)$ for any ϕ under Assumption 3.

To characterize the optimal contract completely, we need to consider the highest value of τ, which takes up to 1. The presence of the upper bound implies that when ϕ is sufficiently low,

even perfect enforcement cannot compensate for it. The lower bound on ϕ below which no financing occurs for any $\tau \in [0,1]$ is given by

$$\underline{\phi} = \max\left\{\frac{I-C}{pR+\alpha-C}, \frac{I-C}{pR+\alpha-b^G}\right\}. \tag{11}$$

Proposition 1 *Suppose that Assumptions 1–3 hold. If τ is high such that $\tau \geq \underline{\tau}(\phi)$ for any $\phi \geq \underline{\phi}$, both types of entrepreneur obtain financing by offering the contracts*

$$r = \frac{I-(1-\phi p)\tau C}{\phi p}.$$

Otherwise, no financing occurs.

Proposition 1 implies not only that trust and institutions matter in financial contract but also that the effect of trust on external cost of financing is larger in the economy which suffers from weaker enforcement ($\partial^2 r/(\partial\phi\partial\tau) < 0$). This is the mechanism emphasized in Guiso et al. (2004).

Moreover, Proposition 1 implies that although entrepreneurs can offer a menu of contracts, there is no separating equilibrium in which different types of entrepreneurs choose different contractual terms. Under Assumption 1 and Assumption 2, if lenders know an entrepreneur's type as bad, she cannot obtain financing. The fear of not being financed induces the bad entrepreneur to mimic the good one and obtain the net payoff U^B given by (7). Thus, any separating equilibrium unravels.

3.2 The Equilibrium Quality of Enforcement

Given a level of trust ϕ, strength of enforcement τ is determined by the preference of the median voter. [14] Because lenders earn zero profit regardless of τ, we assume that they do not participate

[14] We obtain the similar conclusion when considering an alternative political process. Suppose that the government chooses τ to maximize a weighted social welfare function given by $\phi\chi^G U^G(\tau)+(1-\phi)\chi^B U^B(\tau)$ where χ^G and χ^B are the weights on good type and bad type respectively. The optimal level of τ is equivalent to the solution of the problem choosing τ to maximizes $(\chi^G-\chi^B)(1-\phi)\tau C$. Then, suppose that individuals with different cul-

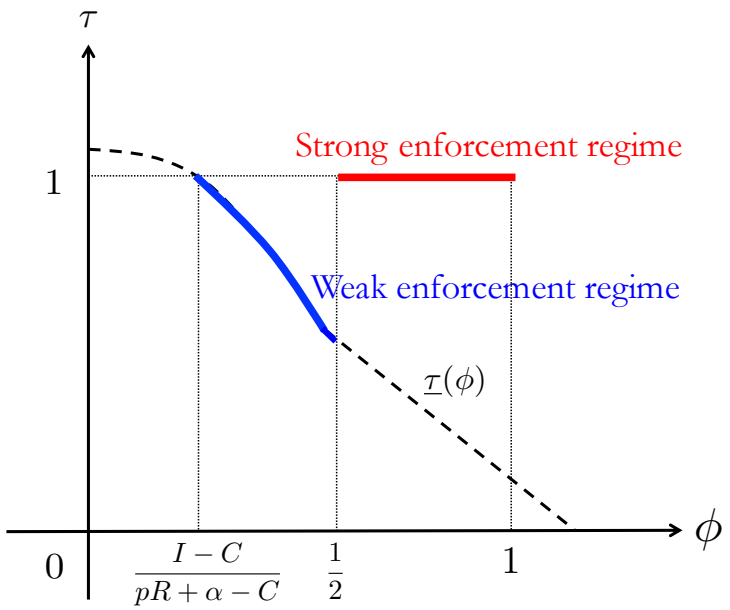


Figure 2: Equilibrium level of enforcement

in the voting. This means that the median voter can be a good entrepreneur or a bad one. [15]

To guarantee that financing can occur even when a bad entrepreneur is the majority, we make the assumption that assures $\underline{\phi} < 1/2$:

Assumption 4 $2I - pR - C + \max\{0, b^G - C\} < \alpha$.

Because Assumption 1 and Assumption 2 implies that $0 < 2I - pR - C$, Assumption 4 requires that the psychological gain α takes some positive value.

Figure 2 illustrates the result of voting. While the dashed line represents the cutoff point of financing $\underline{\tau}(\phi)$, the bold line represents the equilibrium level of enforcement. The level is dependent upon a fraction of good entrepreneurs. When a good entrepreneur is the majority (i.e., $\phi \geq 1/2$), she becomes the median voter. The good entrepreneur's payoff (6) implies that, given that she obtains financing, she prefers perfect enforcement (i.e., $\tau = 1$) because

tural trait belong to different groups and the larger groups are more likely to be organized in a lobby. In this setting, χ^G and χ^B are endogenous variables. When ϕ is low the group that comprise bad types have stronger political power (i.e., $\chi^G < \chi^B$) and demands for weak enforcement regime. When ϕ is high the group that comprises good types have stronger political influence (i.e., $\chi^G > \chi^B$) and sets strong enforcement regime.

[15] In general, lenders have some bargaining power at financial contracts and earn positive profits. In that case, lenders prefer stronger enforcement because rents for entrepreneurs can be reduced. If the lenders' bargaining power is strong, the good entrepreneur prefers weaker enforcement as with the bad one to obtain more rents. Therefore, if lenders have weak political power so that they find it difficult to influence policy choices (e.g., they cannot engage in lobbying activities effectively or they are foreign investors) and their bargaining power is sufficiently weak, our conclusion remains unchanged.

stronger enforcement reduces the degree of cross-subsidization. The exceptional case is that when lenders expect that the economy consists of only good types ($\phi = 1$), they are indifferent to τ. It seems natural, however, that the continuity of preferences holds; that is, the preferences of good entrepreneurs over quality of enforcement in the case that $\phi = 1$ are the same as those in the case that ϕ is sufficiently high. Thus, we assume that in the economy with $\phi = 1$, a good entrepreneur prefers $\tau = 1$. We refer to the situation in which collateral pledging is enforced perfectly as the *strong enforcement regime*, represented as the (red) bold line in Figure 2.

When a bad entrepreneur is the majority (i.e., $\phi < 1/2$), her preference is reflected in the policy decision as the median voter. The bad entrepreneur prefers obtaining financing to not being funded, and conditional on securing financing, prefers weaker contract enforcement from her payoff (7) because it reduces the effectiveness of the punishment against cheating. This, coupled with Proposition 1, implies that the bad entrepreneur sets $\tau = \underline{\tau}(\phi)$ for any $\phi \in [\underline{\phi}, 1/2)$. We call the situation the *weak enforcement regime*, depicted as as the (blue) bold line in Figure 2. When the number of bad entrepreneur is sufficiently large such that $\phi < \underline{\phi}$, all entrepreneur cannot obtain financing for any τ. In that case, the bad entrepreneurs are indifferent to τ.

The discussion is summarized as follows.

Proposition 2 *Suppose that Assumptions 1–4 hold. If $\phi \geq 1/2$, the equilibrium involves $\tau = 1$ (strong enforcement regime). If $\underline{\phi} \leq \phi < 1/2$, then $\tau = \underline{\tau}(\phi)$ as given in (10) (weak enforcement regime). Otherwise, the equilibrium level of enforcement takes any value in $[0, 1]$.*

Proposition 2 exhibits the non-linear relationship between trust and enforcement. The economy with distrust rampant demands for strong enforcement to secure financing. Then, as trust is cultivated, the need for enforcement decreases and uncivic entrepreneurs shape weaker enforcement to their own advantage. Once the economy achieves sufficient level of trust, the regime change occurs and civic agents are placed to have political power, followed by strong enforcement.

Our analysis so far assumes that civic values are exogenously given. It is possible, however, that the cultural attitudes are transmitted through generations and interact with institutions. In

the next section, we endogenize the choice of civic values and present the result consistent with the empirical regularity.

4 Dynamics

In this section, we extend the one-shot model developed in Section 3 into a dynamic setting, which allows us to analyze the intergenerational cultural transmission and the evolution of trust.

Section 4.1 describes the dynamic setting. Section 4.2 characterizes the transitional dynamics and the steady state under the hypothetical situation in which regime change does not occur. Section 4.3 shows that the presence of regime change causes multiple steady states and multiple equilibria. [16] This section presents the main results consistent with empirical evidence. Then, Section 4.4 and Section 4.5 analyze the effects of technological progress and public education, respectively.

4.1 Dynamic Setting

The important departure from the model of Section 3 is the presence of family civic education. Parents choose what values to transmit to their children and through the parental education influence the civic values that their children have. Following Bisin and Verdier (2001) and Tabellini (2008b), we have the "imperfect empathy" approach: parents are altruistic and take into account the utility of their children, but evaluate their children's actions based on their own preferences but not on the children's preferences. [17] In the sense, this approach reflects the idea that parents are paternalistic. Through the cultural transmission, trust evolves and interact with institutions.

We consider an overlapping generations model with a continuum of mass one of risk-neutral

[16] In this dynamic analysis, a steady state refers to the situation in which the economy stays stationary (i.e., $\phi_t = \phi_{t+1}$ for all t) and an equilibrium refers to an entire path of the economy.

[17] Doepke and Zilibotti (2008) provides alternative mechanism of preference formation. In their paper, altruistic parents instill values in their children to maximize their children's utilities.

lenders and entrepreneurs. [18] Time is discrete, indexed by $t = 0, 1, 2, \ldots$, and goes on forever. Lenders live one period and provide their cash for active entrepreneurs in each period. We assume that lenders cannot observe the performance of entrepreneurs of past generations. This assumption allows us to ignore the difference between an individual level of trust and an aggregate level of trust.

There are ex-ante identical entrepreneurs who lived two periods. A new generation of entrepreneurs has the timeline as in Figure 3. When young, they merely receive family civic education and know their own type. When old, they become active and experience the same events as those in the static model of Section 3; receiving illiquid wealth, voting, offering financial contracts, facing moral hazard, and consuming.[19] Additionally, after working (in the retirement phase) each old entrepreneur has one child and instills civic virtues in youth individually, regardless of the project outcome. Following Tabellini (2008b), we assume that an old entrepreneur with a type $i \in \{G, B\}$ of generation t exerts costly effort to educate the child and increases the probability that the child becomes good by $f_t^i \geq 0$. To exert educational effort, the old entrepreneur must incur psychological cost $(f_t^i)^2/2\gamma$ with $\gamma > 0$.

Let U_{t-1}^i and V_t^{ij} denote the expected net payoff to a type i entrepreneur of generation $t-1$ deriving from her own activity in the working phase and the one deriving from the activity in the working phase of her type j child, $i, j \in \{G, B\}$, respectively. The expected lifetime utility of a type i entrepreneur of generation $t-1$ is given by

$$U_{t-1}^i + (\delta + f_{t-1}^i) V_t^{iG} + (1 - \delta - f_{t-1}^i) V_t^{iB} - \frac{(f_{t-1}^i)^2}{2\gamma}, \tag{12}$$

where $\delta \in (\underline{\phi}, 1/2)$ is the probability that a good child is born naturally and assures that financing occurs in every period.

[18] We assume away occupational choice from the model. The assumption of intergenerational transfer of entrepreneurship can be supported by the empirical evidence that entrepreneurial parents are more likely to have entrepreneurial children by about 60% through prebirth and postbirth factors. See Lindquist et al. (2015).

[19] For simplicity, we assume that each old entrepreneur is exogenously endowed with illiquid wealth C at the beginning of the period by abstracting from any intergenerational wealth transfer. Even if the amount of collateral increases with aggregate output of earlier generations, our conclusion does not change.

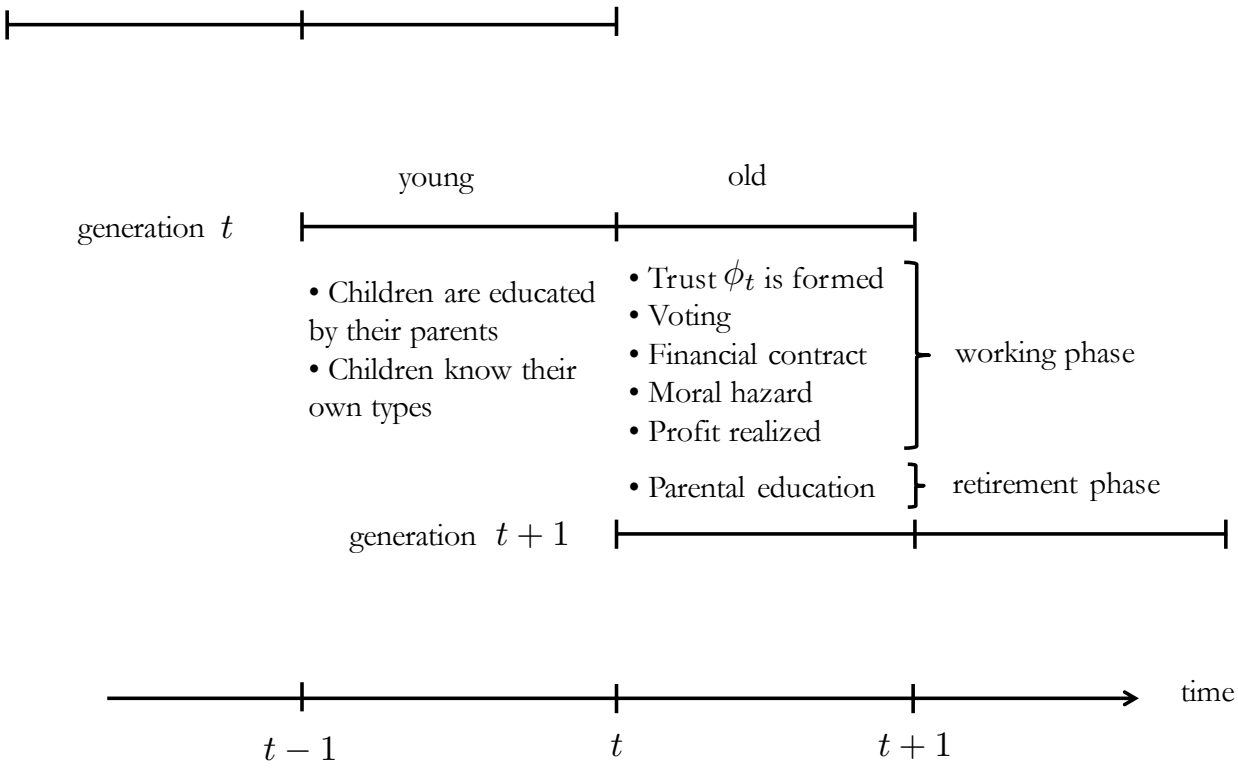


Figure 3: Time structure of overlapping generations model

We focus on the Markovian strategies, such that strategies selected by agents only depend on the current state variable, that is a level of trust. Correspondingly, we have changed the notation of trust into ϕ_t to highlight the dependence on time. Based on ϕ_t, the old entrepreneur of generation t votes for the quality of enforcement, offers financial contracts, and chooses whether to cheat. These decisions in the working phase does not influence the future level of trust ϕ_{t+1} (which determines their children's decisions) and their the educational choice. Thus, we can separate the entrepreneur's optimization problem in the working phase from the one in the retirement phase.

This separability simplifies the equilibrium analysis in the working phase and allows us to apply the result of Section 3. Proposition 1 and Proposition 2 imply that with a given level of trust ϕ_t, the equilibrium contract and the equilibrium level of enforcement in period t are given by

$$r(\phi_t) = \frac{I - (1-\phi_t p)\tau(\phi_t)C}{\phi_t p}, \tag{13}$$

and

$$\tau(\phi_t)\begin{cases} =1 & \text{if } 1/2 \leq \phi_t, \\ =\underline{\tau}(\phi_t) & \text{if } \underline{\phi} \leq \phi_t < 1/2, \\ \in[0,1] & \text{otherwise,} \end{cases} \tag{14}$$

where $\underline{\tau}(\phi_t)$ is given by (10), respectively. When a good (bad) entrepreneur is the majority in period t, the strong (weak) enforcement regime emerges during the period. Correspondingly, the value functions of entrepreneurs with type $i \in \{G,B\}$ are given by:

$$U_t^G = U^G(\phi_t) = pR - \frac{I}{\phi_t} + \frac{1-\phi_t}{\phi_t}\tau(\phi_t)C + \alpha, \tag{15}$$

$$U_t^B = U^B(\phi_t) = b^B - \tau(\phi_t)C, \tag{16}$$

where (15) and (16) are derived from (6) and (7), respectively.

Next, consider the education choice of old entrepreneurs. Let $V^{ij}(\phi_t)$ denote the equilibrium payoff that a type i parent (an entrepreneur of generation $t-1$) derives from a type j child (an entrepreneur of generation t) when a level of trust is ϕ_t. [20] When a parent's type and a child' one is the same (i.e., $i=j$), there is a perfect congruency between the parent and the child: $V^{GG}(\phi_t) = U^G(\phi_t)$ and $V^{BB}(\phi_t) = U^B(\phi_t)$. When parens have different civic values from their children (i.e., $i \neq j$), the idea of imperfect empathy comes in. Parents evaluate their children's actions with their own values:

$$V^{GB}(\phi_t) = b^G - \tau(\phi_t)C, \tag{17}$$

$$V^{BG}(\phi_t) = pR - \frac{I}{\phi_t} + \frac{1-\phi_t}{\phi_t}\tau(\phi_t)C. \tag{18}$$

Good parents consider cheating as a shameful conduct and derive small payoff (17) from their bad children, who obtain large private benefits b^B. Alternatively, bad parents does not feel any

[20] Although V^{ij} depends on the parent's expectation of trust in the child's generation, in the equilibrium the expected level of trust has to be consistent with the realized level of trust. Thus, there is the dependence of V^{ij} on ϕ_t in the equilibrium.

satisfaction from an entrepreneurial activity and derives from small payoffs (18) from their good children, who acquire psychological gains α.

The optimization problem that a type i parent of generation $t-1$ solves is to maximize the overall payoff (12) by choosing education effort f^i_{t-1}, given the expectation on future level of trust ϕ_t. The problem boils down to

$$\max_{0\le f^i_{t-1}\le 1-\delta}(\delta+f^i_{t-1})V^{iG}(\phi_t)+(1-\delta-f^i_{t-1})V^{iB}(\phi_t)-\frac{(f^i_{t-1})^2}{2\gamma}. \tag{19}$$

As a result of imperfect empathy, parents incentive to instill their own civic values in their children. Bad parents prefer cheating to investing from Assumption 2 and put greater values on the cheating of their children: $V^{BB}(\phi_t)>V^{BG}(\phi_t)$. Therefore, the parents choose $f^B_{t-1}=0$ for any period. [21] Meanwhile good parents choose entrepreneurial activity when the incentive compatibility constraint (5) holds and would like their children to do the entrepreneurial activity: $V^{GG}(\phi_t)\ge V^{GB}(\phi_t)$. The paternalistic view makes the parents exert educational effort. The first-order condition about educational choice (and the complementarity slackness condition) is given by:

$$\frac{1}{\phi_t}\left[\phi_t\left(pR+\alpha-b^G\right)+\tau(\phi_t)C-I\right]\ge\frac{f^G_{t-1}}{\gamma},\qquad\text{with equality if } f^G_{t-1}<1-\delta. \tag{20}$$

The left-hand side represents the marginal benefit of parental education, whereas the right-hand side represents the marginal cost of education. (20) implies that the optimal level of education depends on the share of good entrepreneurs of next generation ϕ_t.

Then, trust evolves according to

$$\phi_t=\phi_{t-1}(\delta+f^G_{t-1})+(1-\phi_{t-1})\delta=\delta+\phi_{t-1}f^G_{t-1}. \tag{21}$$

[21] We assume that $f^i_{t-1}\ge 0$. When bad parents are allowed to instill their uncivic values in their own children, i.e., f^B_t can take negative values (the minimum value is $-\delta$), the number of good entrepreneur is less likely to increase and level of trust is lower. However, the qualitative result is the same.

The total number of good children in period t is the sum of a measure $\delta + f_{t-1}^{G}$ of good children raised by good parents and a measure δ of good children raised by bad parents.

To characterize completely the optimal level of education (20), accompanied by the dynamics of trust (21), we need to plug in a result of voting (14) for these equations. The important mechanism is that stronger enforcement in the next period increases the benefit of children being good type and encourages family civic education, implying that trust is greater in the strong enforcement regime than in the weak enforcement regime. The effect of enforcement on trust generates the mechanism through which multiple steady states emerge.

Before we move on to the analysis of the case in which regime change occurs depending on level of trust, it would be useful to analyze the case without the regime change in order to comprehend the underlying mechanism. It follows that after characterizing the equilibrium path and the steady state in the case without regime change in Section 4.2, then we do the analysis in the case with regime change in Section 4.3.

4.2 Dynamic Analysis without Regime Change

First, suppose that in any period t the government chooses the strong enforcement regime. Substituting $\tau(\phi_t) = 1$ in (20), we have the optimal education effort

$$f_s(\phi_t) = \begin{cases} \gamma\left[pR + \alpha - b^G - (I-C)/\phi_t\right] & \text{if } \phi_t < (I-C)/(pR + \alpha - b^G - (1-\delta)/\gamma) \\ 1-\delta & \text{otherwise,} \end{cases} \tag{22}$$

which is depicted in Figure 4. When the optimal level of education is determined by the first-order condition (20) with equality, there is *cultural complementarity*; that is, good parents have more incentive to instill their civic values in their children as good types will be more dominant in the population, or f_s is increasing in ϕ_t. An increase in ϕ_t decreases the extent of cross-subsidization by good entrepreneurs, followed by an increase in their payoff $U^G(\phi_t)$. The beneficial effect makes their good parents' payoff $V^{GG}(\phi_t)$ higher and encourages parental edu-

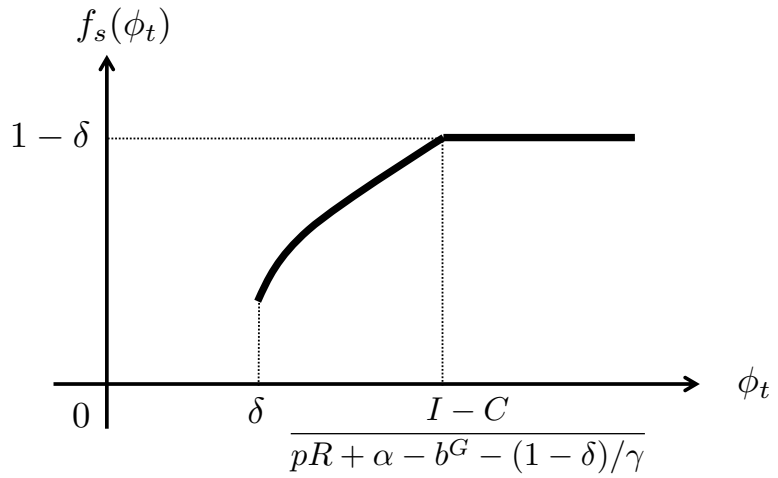


Figure 4: The optimal level of education in strong enforcement regime

cation. Once ϕ_t increases sufficiently, f_s reaches an upper bound and keeps constant.

The following lemma characterizes the steady state and transitional dynamics if the strong enforcement regime is selected any time.

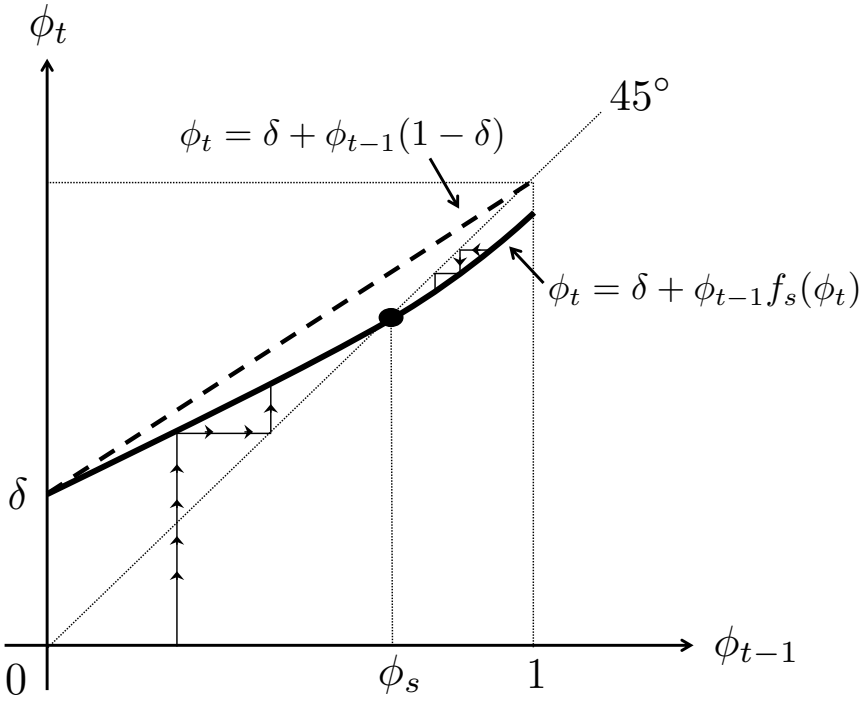
Lemma 2 *Suppose that Assumptions 1–4 hold and $\tau(\phi_t) = 1$ for any t. There exists the unique steady state where the level of trust is given by*

$$\phi_s = \begin{cases} \dfrac{\delta - \gamma(I-C)}{1-\gamma(pR+\alpha-b^G)} \in (\delta, 1) & \text{if } \dfrac{I-C}{pR+\alpha-b^G-(1-\delta)/\gamma} > 1, \\ 1 & \text{otherwise.} \end{cases} \tag{23}$$

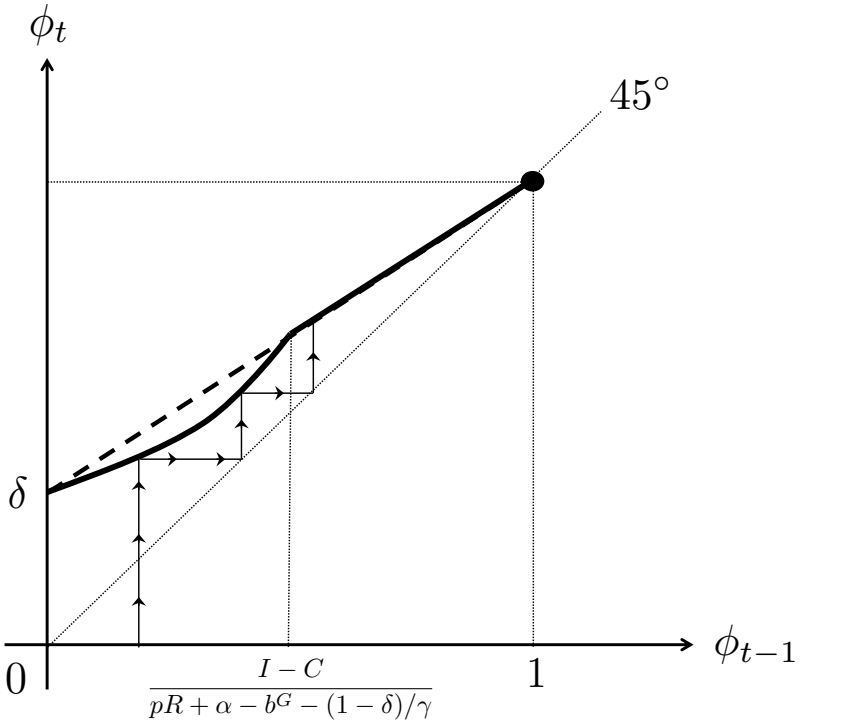
Moreover, starting from any $\phi_0 \in (0,1]$, ϕ_t evolves as (21) with $f^G_{t-1} = f_s(\phi_t)$ and monotonically converges to ϕ_s.

Proof. See Appendix B. ■

Figure 5 shows the steady state ϕ_s and the stability result diagrammatically. While the bold line represents the dynamic equation (21) with $f^G_{t-1} = f_s(\phi_t)$, the dashed line represents the hypothetical dynamics with $f^G_{t-1} = 1-\delta$. When the cost of family civic education is high (γ is low) in Figure 5a, the economy that starts from any initial level of trust ϕ_0 reaches the steady state with heterogeneous population ($\phi_s < 1$). When the cost of family civic education is low (γ is high) in Figure 5b, the economy that starts with any ϕ_0 reaches the upper bound of edu-



(a) When γ is low such that $\phi_s < 1$



(b) When γ is high such that $\phi_s = 1$

Figure 5: Transitional dynamics under the strong enforcement regime

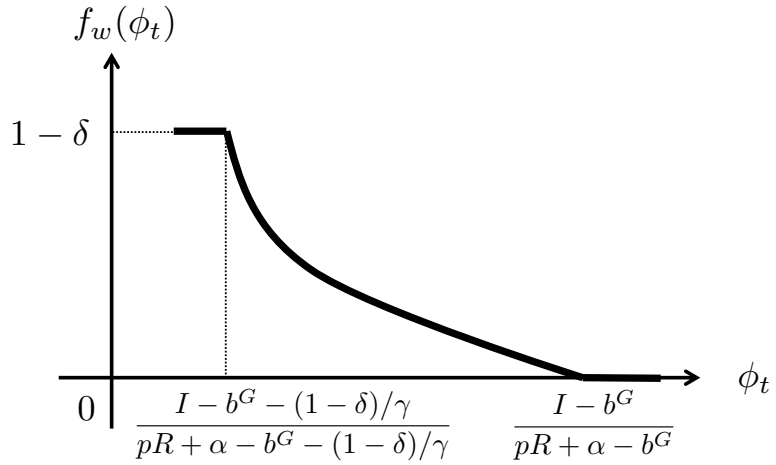


Figure 6: The optimal level of education in weak enforcement regime

cational effort at a certain point and grows toward the steady state with a perfect homogenous population ($\phi_s = 1$). The cultural homogeneity is due to cultural complementarity. As good types are more dominant in the population, they are more willing to exert educational effort, resulting in greater trust.

Next, suppose that in any period t the government chooses the weak enforcement regime. Substituting $\tau(\phi_t) = \underline{\tau}(\phi_t)$ given by (10) in (20), we have the optimal level of education in the weak enforcement regime

$$f_w(\phi_t) = \begin{cases} 1-\delta & \text{if } \phi_t < \dfrac{I-b^G-(1-\delta)/\gamma}{pR+\alpha-b^G-(1-\delta)/\gamma}, \\ \gamma\left[\dfrac{I-\phi_t(pR+\alpha)}{1-\phi_t} - b^G\right] & \text{if } \dfrac{I-b^G-(1-\delta)/\gamma}{pR+\alpha-b^G-(1-\delta)/\gamma} \le \phi_t < \dfrac{I-b^G}{pR+\alpha-b^G}, \\ 0 & \text{otherwise,} \end{cases} \tag{24}$$

where we assume that $\underline{\tau}(\phi_t) > 0$ for any $\phi_t \ge \delta$. [22] The optimal education is illustrated in Figure 6. When the participation constraint (8) is binding and the incentive constraint (5) is not, we have $V^{GG}(\phi_t) = 0 > V^{GB}(\phi_t)$. The negative payoff when having a bad kid provides good parents with incentives to educate their children. The important difference from the strong enforcement regime is that there is *cultural substitution*; that is, the more popular good types are,

[22] If ϕ_t is sufficiently large such that $I/(pR+\alpha-b^G) < \phi_t$, good parents make positive efforts because the quality of enforcement reaches the lowest level 0. To exclude the case and simplify the analysis, we assume that $pR+\alpha-b^G \le I$. Without the assumption, multiple steady states might emerge under weak enforcement regime.

good parents have less incentive to educate their children, or f_w is decreasing in ϕ_t. Under the weak enforcement regime, higher degrees of trust increases entrepreneurs' ability to attract funds and thus yields more room to weaken enforcement, as Figure 2 suggests. The resulting weaker enforcement increases the payoff of a bad kid and discourages parental education. When ϕ_t increases up to $(I-b^G)/(pR+\alpha-b^G)$, $\tau(\phi_t)$ is determined at the point in which the incentive compatibility constraint (5) is binding from (10) and leads to $V^{GG}(\phi_t)=V^{GB}(\phi_t)$. Thus, f_w reaches an lower bound 0.

To make the analysis interesting, we put the following assumption:

Assumption 5

$$\delta < \frac{I-b^G}{pR+\alpha-b^G}$$

Assumption 5 guarantees that there exists a transitional path to the steady state in which parents exert some educational efforts.

The following lemma characterizes the steady state and transitional dynamics under the weak enforcement regime.

Lemma 3 *Suppose that Assumptions 1–5 hold and $\tau(\phi_t)=\underline{\tau}(\phi_t)$ for any t. Suppose that $pR+\alpha-b^G \leq I$. There exists the unique steady state ϕ_w such that*

$$\phi_w = \frac{(\phi_w-\delta)(1-\phi_w)}{\gamma[I-b^G-\phi_w(pR+\alpha-b^G)]} \in \left(\delta, \frac{I-b^G}{pR+\alpha-b^G}\right). \tag{25}$$

Moreover, the steady state equilibrium described by (21) with $f^G_{t-1}=f_w(\phi_t)$ is globally stable and, starting from any $\phi_0 \in (0,1]$, ϕ_t monotonically converges to ϕ_w.

Proof. See Appendix C. ■

Figure 7 depicts the result of Lemma 3. The figure plots the evolution of trust (21) with $f^G_{t-1}=f_w(\phi_t)$ and makes sure that starting with any initial trust, the economy converges to ϕ_w. The important point is that the map is concave, as opposed to the one under the strong enforcement regime in Figure 5. The mechanism behind it is cultural substitution property.

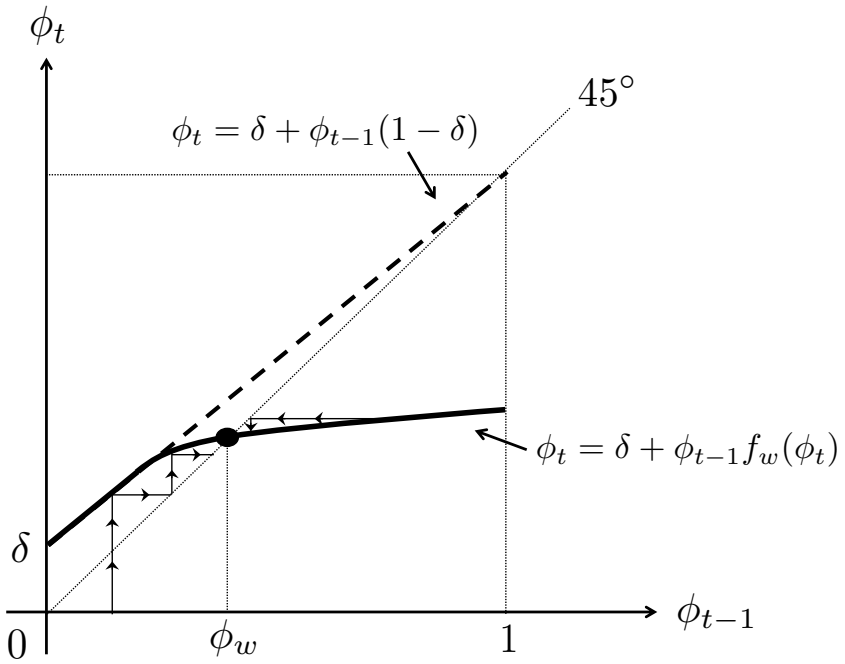


Figure 7: Transitional dynamics under the weak enforcement regime

When ϕ_t is low, parents exert maximum educational effort and ϕ_t evolves according to (21) with $f^G_{t-1} = 1-\delta$. As ϕ_t increases, however, greater trust discourages family education and impede cultivating trust. As a result, the economy does not achieve cultural homogeneity.

4.3 Dynamics with Regime Change

Taking into account Lemma 2 and Lemma 3, we analyze the dynamics with regime change which occurs based on (14). When $\phi_t \geq 1/2$, strong enforcement regime appears and the evolution of (21) depends on the optimal level of education given by (22). When $\phi_t < 1/2$, weak enforcement regime emerges and the dynamics evolve according to (21) depending on (24). Note that in the model with regime change, without the additional assumption, we have $\underline{\tau}(\phi_t) > 0$ under weak enforcement regime. [23]

[23] In Lemma 3, we assume that $pR + \alpha - b^G \leq I$ to assure that $\underline{\tau}(\phi_t) > 0$ for any $\phi_t \in [\delta, 1]$. Without such assumption, however, we obtain the condition that $\underline{\tau}(\phi_t) > 0$ for any $\phi_t \in [\delta, 1/2)$ because

$$\frac{I}{pR+\alpha-b^G} > \frac{I}{p(R-b^G)} > \frac{I}{pR+C} > \frac{1}{2}$$

where the first inequality holds from Assumption 3 and the third inequality holds from Assumption 1 and Assumption 2.

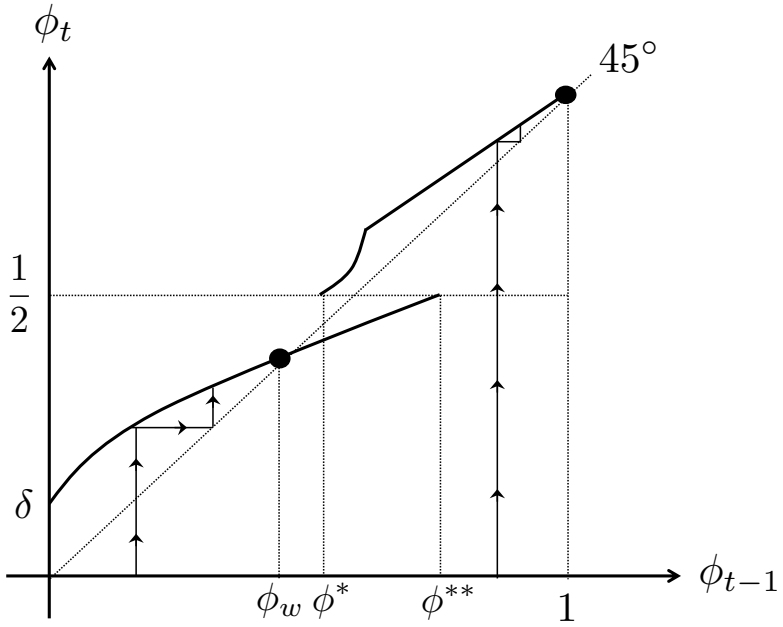


Figure 8: Multiple stable steady states

Lemma 2 and Lemma 3 imply that there exists the unique steady state in each regime. In contract the results without regime change, the setting with regime change does not necessarily support the existence of steady states. To ensure their existence, we make the following assumption:

Assumption 6

$$2I - pR - \alpha < \frac{1-2\delta}{\gamma} + b^G \leq pR + \alpha - 2I + 2C.$$

The first inequality assures that $\phi_w < 1/2$ and thus, there exists the steady state ϕ_w under the weak enforcement regime. The second inequality also assures that $\phi_s \geq 1/2$, implying that there exists the steady state ϕ_s under the strong enforcement regime.

Figure 8 plots the evolution of trust with regime change, which yields multiple steady states. If $\phi_w < \phi^*$ where

$$\phi^* \equiv \frac{1-2\delta}{2f_s(1/2)} = \max\left\{\frac{1/2-\delta}{\gamma[pR+\alpha-b^G-2I+2C)]}, \frac{1/2-\delta}{1-\delta}\right\}, \tag{26}$$

in the economy where the initial level of trust ϕ_0 is also lower than ϕ^*, there exists a unique equilibrium path, along which entrepreneurs make education $f_w(\phi_t)$ and weak enforcement regime persists, and the economy will end up in the steady state represented by ϕ_w. If $\phi_s > \phi^{**}$ where

$$\phi^{**} \equiv \frac{1-2\delta}{2f_w(1/2)} = \frac{1-2\delta}{2\gamma(2I - pR - \alpha - b^G)}, \tag{27}$$

in the economy where the initial level of trust ϕ_0 is also higher than ϕ^{**}, a unique equilibrium path is that entrepreneurs choose education $f_s(\phi_t)$, strong enforcement regime persists, and the economy converges monotonically to the steady state represented by ϕ_s. In these situations, preconditions determine the equilibrium path and the resulting steady state.

If $\phi_w < \phi^*$ and $\phi^{**} < \phi_s$ hold and the economy with a given ϕ_0 starts from the region, $[\phi^*, \phi^{**}]$, multiple equilibria are possible. Expectations determine which equilibrium emerges. If a good parent expects that other parents exert high (low) level of educational effort and future level of trust is high (low), followed by strong (weak) enforcement regime, she also provides high (low) education. As a result of the self-fulfilling features, if the initial level of trust is inside the region, $[\phi^*, \phi^{**}]$, there exists at least one dynamic path toward either steady state.

We summarize the characterization of multiple steady states and their local stability.

Proposition 3 *Suppose that Assumptions 1–6 hold. There exist two steady states, ϕ_s given by (23) and ϕ_w given by (25). If $\phi_w < \phi^*$, starting from any $\phi_0 < \phi^*$, ϕ_t monotonically converges to ϕ_w. If $\phi^{**} < \phi_s$, starting from any $\phi_0 > \phi^{**}$, ϕ_t monotonically converges to ϕ_s. If $\phi_w < \phi^*$ and $\phi^{**} < \phi_s$, for any $\phi_0 \in [\phi^*, \phi^{**}]$ both steady states can be reached.*

The multiplicity in Proposition 3 comes from complementarity between trust and enforcement through regime change. In a high-trust economy, good entrepreneurs have political power and demand for strong enforcement regime. The strong enforcement in turn provides good entrepreneurs with sufficient incentive to instill their civic values, leading to a high-trust economy. On the other hand, in the economy with a low-level of trust bad entrepreneurs exert their political power and creates weak enforcement regime. The weak enforcement, in turn, dampens

educational incentives and shapes weak trust.

Proposition 3 has three implications about trust, legal enforcement, and financial and economic development. First of all, multiple steady states with different characteristics are consistent with the evidence, if we consider that different countries rest on different steady states. The one steady state is characterized by a high level of trust, strong enforcement, well-developed financial markets (in the sense that the cost of external financing r is low), and high aggregate output. The other steady state has a low level of trust, weak enforcement, less developed financial markets (high r), and low aggregate output. Comparing the steady states, we have the positive relationship between the level of trust, quality of enforcement, and degree of economic development.

Second, history could be the long-term determinant of the divergence in levels of trust, institutions and economic development. If the initial level of trust is very high (very low), such preconditions drive a society to a high-trust (low-trust) steady state. That history is decisive seems consistent with empirical evidence on the long-term persistence of trust. Once trust is destroyed by the slave trade in Africa (Nunn and Wantchekon, 2011) or cultivated by the emergence of the free cities of the Italian Middle Ages (Putnam, 1993 and Guiso et al., 2016), affected trust has not been restored to a previous level for the long time and leads to the persistence in development.

Moreover, history dependence of our model can also explain the reason why legal origins transplanted by the origin countries through conquest and colonization have the long-lasting effect on the legal protections of investors. La Porta et al. (2008) argue that French civil law system embeds the beliefs that a country needs to be more concerned with private disorder than the dictatorship, whereas the common law system embeds the beliefs that a country does not need to be concerned with disorder compared to the dictatorship. Based on the argument, we can consider that when French civic law is transplanted, distrust in other people incorporated in the law is also transmitted, whereas the transplantation of common law brought about trust in other people. Therefore, the transplantation of French civil law sets the initial low level of trust

and generates the persistence of weak financial institutions. In contrast, the transplantation of common law sets the initial high level of trust and leads to the persistence of strong financial institutions.

Third, whether trust and legal enforcement are complements or substitutes for each other depends on the time span. In the long-run, the economy reaches one of the steady states, showing that trust and enforcement are complements. In contrast, in the short-run trust and enforcement may be substitutes. Along the adjustment path leading to a steady state under weak enforcement regime, greater trust increases entrepreneurs ability to receive financing and thus allows a society to weaken enforcement further. This is a testable implication left for future work.

4.4 The Effect of Technical Change

Proposition 3 shows the presence of multiple steady state. In this section, we investigate how each steady state is affected by one of the important factors pertaining to economic development, technological change. We view it as the increase in project return R. [24]

Figure 9 depicts the effect of technological change on levels of trust. Given the strong enforcement regime, the increase in R makes the good entrepreneur's payoff larger and encourages their family education, followed by the shift of dynamic equation upward. The steady state level of trust ϕ_s and the corresponding aggregate output are also higher. Given the weak enforcement regime, higher R enhances entrepreneurs' ability to attract funds and thus creates more room to weaken enforcement. The resulting weaker enforcement discourages family education, making the dynamic equation shift downward. The steady state level of trust ϕ_w decreases and, if the decrease is sufficiently large, the corresponding aggregate output also drops. Moreover, the shifts of both dynamic equations imply that the region where enforcement regime in the next period depends on expectations, $[\phi^*, \min\{\phi^{**}, 1\}]$, becomes wider.

[24] The increase in p and the decrease in I are also interpreted as technological progress. These changes have the same effect as the increase in R.

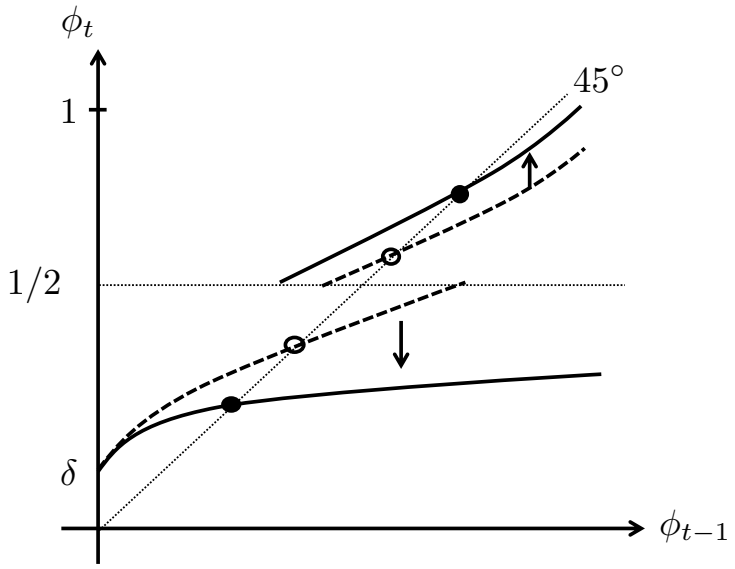


Figure 9: The effect of technological change (increase in R)

Proposition 4 *Suppose that Assumptions 1–6 hold. ϕ_s and the width of the region, $[\phi^*, \min\{\phi^{**}, 1\}]$, are nondecreasing and ϕ_w and $\tau(\phi_w)$ are decreasing in R. When $\delta < (1+\gamma(b^G-\alpha))\phi_w^2$, an increase in R decreases an aggregate output at the steady state ϕ_w.*

Proof. See Appendix D. ■

This exercise has two implications. First, technological progress exacerbate the level of inequality in trust, institutions, and aggregate income between steady states. If the technical change drives a high-trust economy to the new high-trust steady state, then the economy will cultivate trust further and becomes more prosperous. In contrast, if the technological progress drives a low-trust economy to the new low-trust steady state, then the economy would suffer from lower institutional quality and more severe trust deficit. The adverse effect may lower the level of aggregate output by offsetting the benefit of technical change.

This result may explain why Latin American economies stagnated in the 90s despite technological advances. Although the poor countries can have access to new technology developed in advanced economies and enhance the productivity, the change favors uncivic citizens, worsens mistrust in other people and stifles economic development. Indeed, the low levels of trust in Latin America further decline during the late 90s. [25]

[25]The Latinobarómetro measures interpersonal trust as the share of respondents who say "You can trust most

Second, technical change may increase the relative importance of expectations over history. In the wider range of initial level of trust, beliefs in trustworthiness of other people of future generations determine the long-run outcome. This implies that managing expectations is more important to achieve great trust.

4.5 The Effect of Public Education

Next, consider the effect of the provision of public school. Although we focus on family civic education, public education offers alternative mechanism through which civic virtues and trust are formed. In our model, we can capture this effect as an increase in δ. [26]

Higher δ increases the number of good children directly and allows them to receive financing at the better contractual term. In turn, good parents become more willing to educate their children. Because the beneficial effect is significant, the dynamic equations in both strong and weak enforcement regimes shift upwards in Figure 10. Accordingly, the steady-state levels of trust and aggregate output in both regimes increase.

The magnitude of the effect of the increase in δ, however, varies depending on regime. The steady-state level of trust under strong enforcement regime increases greater than the one under weak enforcement regime. Under weak enforcement regime, the higher trust leads to lower quality of enforcement and discourages family education. The crowd-out effect makes provision of public school less effective. This implies that as with technical change, public education increases inequality in levels of trust, institutions and aggregate output between steady states.

Proposition 5 *Suppose that Assumptions 1–6 hold and* $\phi_s < 1$. *We have*

$$\frac{\partial \phi_s}{\partial \delta} > \frac{\partial \phi_w}{\partial \delta} > 0 > \frac{\partial \tau(\phi_w)}{\partial \delta}.$$

people" to the following question: "Generally speaking, would you say that you can trust most people, or that you can never be too careful when dealing with others?." The overall level of trust in Latin America declines from 20 percent in 1996 to 15 percent in 2000. Each country also shows the decline in level of trust; e.g., from 23 to 11 percent in Argentina, from 11 to 4 percent in Brazil and from 33 to 23 percent in Uruguay.

[26] Because the public education encourages people to have stronger civic values and feel more guilty from cheating, the effect can be captured by an decrease in b^G. This comparative statics derive the similar implication as the increase in δ.

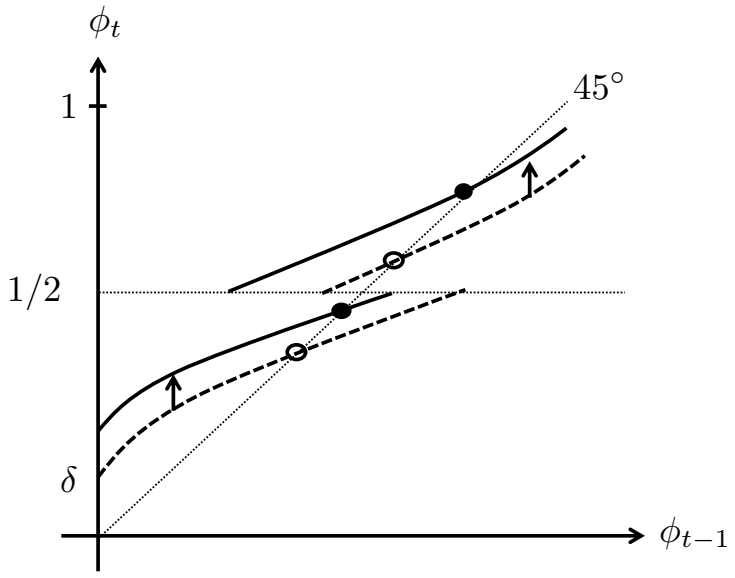


Figure 10: The effect of public education (increase in δ)

Proof. See Appendix E. ■

Proposition 5 emphasizes the roll of public school in cultivating trust and developing the economy. In particular, Figure 10 suggests that if the effect of public education is sufficiently large (i.e., δ increases sufficiently), the low-trust steady state vanishes and an economy which has been trapped in the state jumps on the path toward a high-trust steady state. Public education might play a key roll in helping the economy escape from the underdevelopment trap.

5 Contractual Innovations

So far we have focused on the simple financial contract that demands compensations only in the case of success. The restriction on the contracting leads to the pooling contract. In this section, we consider more sophisticated contracts that allows a good entrepreneur to separate from a bad one. We show that the separating contract gives the good entrepreneur higher compensation at the stage of contracting than the pooling contract because the over-investment problem the pooling contract entails is resolved. In the long-run, however, the contractual innovation does not help the economy caught in the low-trust trap cultivate trust. If anything, the advent of sophisticated contracts may cause trust collapse.

We modify contract design by an entrepreneur in two ways as in Tirole (2006, Chapter 6). First, contactual terms contain not only the lenders' stake r but also the probability that they provide funds I to the entrepreneur, $x \in [0,1]$, and her compensations in the absence of funds, $T \geq 0$. Second, these contractual terms depend on entrepreneurs' type.

In period t, an entrepreneur offers an "option contract," $\{(r_t, x_t, T_t), (\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)\}$. If lenders accept the contract, the entrepreneur chooses between the contractual terms for the good type, (r_t, x_t, T_t), and the one for the bad type, $(\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)$.

Given a level of trust ϕ_t and strength of enforcement τ_t, the optimal contract that is incentive compatible solves

$$\max_{r_t, x_t, T_t, \tilde{r}_t, \tilde{x}_t, \tilde{T}_t} x_t[p(R - r_t + C) + (1-p)(1-\tau_t)C + \alpha] + (1-x_t)(T_t + C) \tag{28}$$

subject to

$$\phi_t[x_t\{p r_t + (1-p)\tau_t C - I\} - (1-x_t)T_t] + (1-\phi_t)\left[\tilde{x}_t(\tau_t C - I) - (1-\tilde{x}_t)\tilde{T}_t\right] \geq 0, \tag{29}$$

$$p(R - r_t) - (1-p)\tau_t C + \alpha \geq b^G - \tau_t C, \tag{30}$$

$$\begin{aligned} x_t[p(R - r_t + C) + (1-p)(1-\tau_t)C + \alpha] + (1-x_t)(T_t + C) \\ \geq \tilde{x}_t[p(R - \tilde{r}_t + C) + (1-p)(1-\tau_t)C + \alpha] + (1-\tilde{x}_t)(\tilde{T}_t + C), \end{aligned} \tag{31}$$

$$\tilde{x}_t\left[b^B + (1-\tau_t)C\right] + (1-\tilde{x}_t)(\tilde{T}_t + C) \geq x_t\left[b^B + (1-\tau_t)C\right] + (1-x_t)(T_t + C), \tag{32}$$

$$0 \leq r_t \leq R, \tag{33}$$

$$0 \leq \tilde{r}_t \leq R. \tag{34}$$

The objective function (28) is the good entrepreneur's gross utility. (29) is the participation constraint for lenders. (30) means that the good entrepreneur prefers investing to cheating. (31) and (32) requires that the good and bad entrepreneur choose the contractual term for their own type. (33) and (34) are limited liability constraints.

Given that a bad entrepreneur cheats after receiving funds I, the optimal contract must be

designed to give the opportunity to invest to a good entrepreneur. The requirement, coupled with the linearity of our model structure, leads to $x_t = 1$ and $T_t = 0$. However, because the bad entrepreneur yields negative social surplus, $b^B - I < 0$, by cheating from Assumption 1, it can be more efficient to prevent her from receiving funds I through the lump-sum transfer. Therefore, the optimal separating contract specifies $\tilde{x}_t = 0$ and $\tilde{T}_t = b^B - \tau_t C$ from (32). In that case, $\tilde{r}_t$ does not affect the optimal allocation and thus takes any value in $[0, R]$. Also, the good entrepreneur obtains the highest payoff by setting the repayment r_t as (29) is binding. This contract allows the good type to separate from the bad type and to extract higher compensation compared to the one in the case of pooling contract (6). We focus on the equilibrium in which entrepreneurs offer the separating contract, if feasible, rather than the pooling contract. [27]

Consequently, the separating contract is optimal if the following constraint is satisfied:

$$\tau_t C \geq b^B - \phi_t(pR + \alpha - I), \tag{35}$$

where the condition is derived by plunging (29) into the incentive compatibility constraint (31) that leads the good type to reveal own type. [28] In contrast with simple financial contracts analyzed in Section 3, the separating contract creates the incentive for the good type to mimic the bad type because the lump-sum payment for the bad type, $\tilde{T}_t$, is attractive. If (35) is violated, the separating equilibrium unravels and the equilibrium results in the pooling allocation or no financing described in Proposition 1.

The conditions under which entrepreneurs borrow funds with the use of sophisticated contracts are depicted in Figure 11. While in the (red) dark shaded area, entrepreneurs offer the separating contract, in the (blue) light shaded area, they offer the pooling contract. The advent of separating contracts enhances the ability to attract funds, when ϕ_t is low so that the good type suffers from severe adverse selection problem. When ϕ_t is higher, however, the incentive

[27] When both the pooling and separating contracts are feasible, the unique equilibrium features the separating contract based on the definition of perfect sequential equilibrium as discussed in footnote 11 because the deviation from offering the pooling contract to doing the separating one benefits both types.

[28] When (35) holds, the optimal contract also satisfies the incentive compatibility constraint (30) that makes the good type behave and the limited liability constraint (33) under Assumption 3.

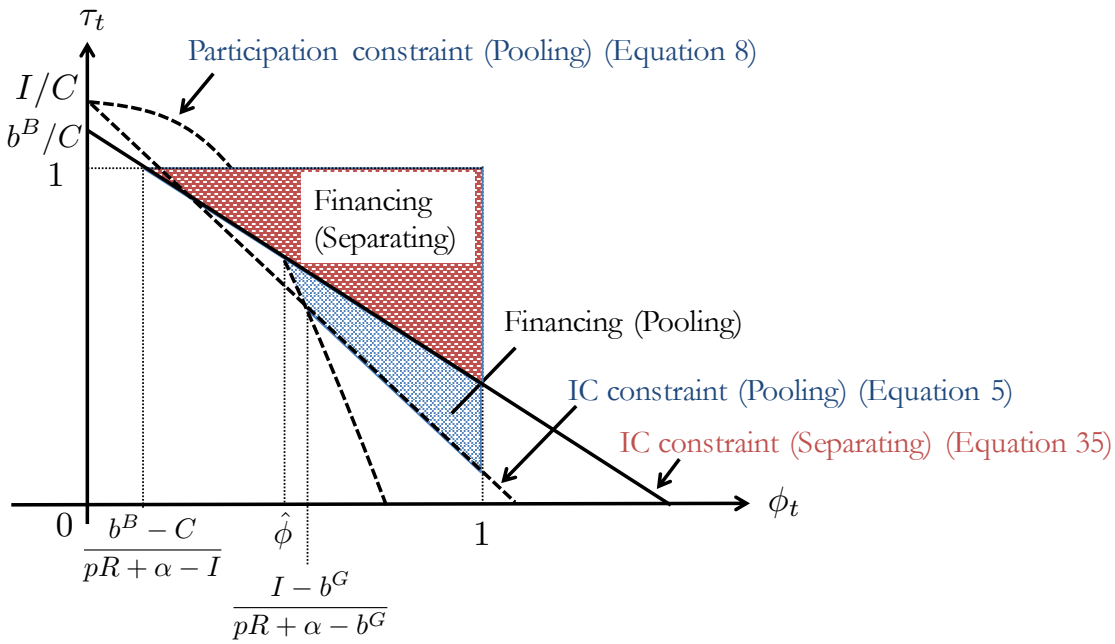


Figure 11: The financing condition with sophisticated contracts

problem that the separating contract entails is more serious than the one in the pooling contract. This creates the region in which only pooling contracts are feasible.

Despite the beneficial effect, the contractual innovation can have a negative effect on the society once we consider the political economy. Let $\hat{\phi}$ be defined as the upper bound of ϕ_t below which the pooling contract is not offered in the equilibrium regardless of τ_t. Figure 11 implies that when $\phi_t \geq \min\{\hat{\phi}, 1/2\}$, the equilibrium level of enforcement is unaffected although the equilibrium features the separating contract when $\phi_t \geq 1/2$. When $(b^B - C)/(pR + \alpha - I) \leq \phi_t < \min\{\hat{\phi}, 1/2\}$, however, bad entrepreneurs expect that the separating contract enhances the ability to secure financing and lower the level of enforcement τ_t further. Thus, the equilibrium level of τ_t is determined by (35) with equality but not $\underline{\tau}(\phi_t)$.

The adverse effect of the contractual innovation is clearer in the dynamic model. Let us consider the good parents' optimization problem given by (19) when parents expect that weak enforcement regime will appear. In Figure 6 of Section 4, the good parents exert positive educational effort because in the equilibrium under Assumption 5, having a good kid yields higher payoff than having a bad kid: $V^{GG}(\phi_t) > V^{GB}(\phi_t)$. The separating contract, however, can dramatically diminishes the incentive for the good parents to exert educational effort. Figure 12

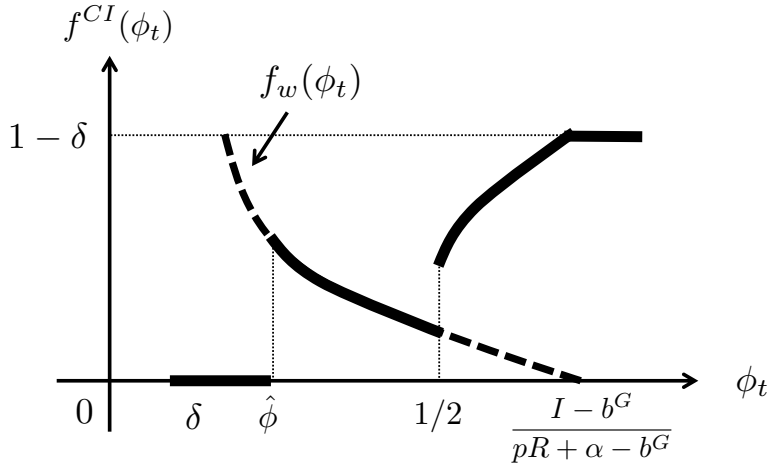


Figure 12: The optimal level of education with sophisticated contracts

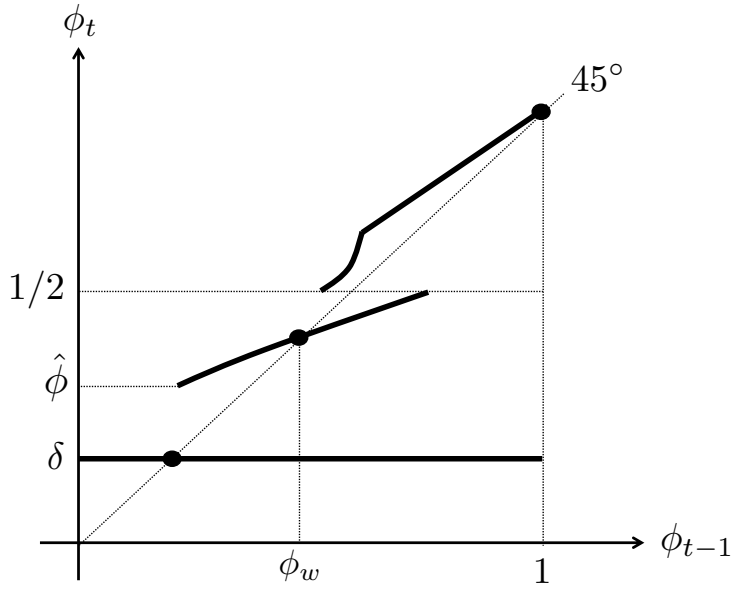


Figure 13: Trust Collapse

displays the optimal level of education in the presence of contractual innovation, $f^{CI}(\phi_t)$. When $\phi_t < \min\{\hat{\phi}, 1/2\}$, the bad entrepreneur lowers enforcement up to (35) holding with equality. This means that good parents of generation $t-1$ are indifferent to the type of their kids (i.e., $V^{GG}(\phi_t) = V^{GB}(\phi_t)$) and have no incentive to make family education.

When $\phi_t \geq 1/2$, the level of educational effort is nondecreasing in ϕ_t as with Figure 4. However, the effect of contractual innovation on level of educational effort is ambiguous. The separating contract increases not only the good parents' payoff of having a good kid by extracting higher compensation but also the one of having a bad kid. Because the bad type does not cheat and just receives the transfer specifies at the contract, the good parents do not feel guilty from the cheating of their bad kids.

The dynamics of trust (21) with $f^G_{t-1} = f^{CI}(\phi_t)$ is represented in Figure 13. As with dynamics with simple contracts as shown in Figure 8, the economy with contractual innovation features multiple steady states. The important difference is that there exists the steady state in which nobody exerts educational effort and the level of trust reaches the minimum level, δ. An economy with any initial condition can end up in the steady state δ. If a parent expects that other parents do not educate their children and the strength of enforcement weakens up to the level at which (35) holds with equality, the parent also does not have any incentive to make education and the initial expectation is justified. Thus, contractual innovation would not make the economy escape from the trap or would lead to trust collapse.

The whole discussion is summarized in the following proposition.

Proposition 6 *Consider the dynamic economy with contractual innovation, starting with an initial condition $\phi_0 > 0$. Suppose that Assumptions 1–5 hold and*

$$\delta \leq \frac{I - b^B}{2(pR + \alpha - I)} \left(-1 + \sqrt{1 + 4\frac{pR + \alpha - I}{I - b^B}} \right). \tag{36}$$

The equilibrium level of enforcement is

$$\tau^{CI}(\phi_t)=\begin{cases}\dfrac{b^B-\phi_t(pR+\alpha-I)}{C} & \text{if } \dfrac{b^B-C}{pR+\alpha-I}\leq\phi_t<\min\left\{\hat{\phi},\dfrac{1}{2}\right\},\\ \tau(\phi_t) & \text{otherwise,}\end{cases} \tag{37}$$

where $\tau(\phi_t)$ is given by (14). The dynamics of trust is governed by $\phi_t=\delta+\phi_{t-1}f^{CI}(\phi_t)$ where the optimal level of educational effort exerted by the good type, f^{CI}, is given by

$$f^{CI}(\phi_t)=\begin{cases}1-\delta & \text{if } \max\left\{\dfrac{1}{2},\dfrac{b^B-C}{pR+\alpha-I-(1-\delta)/\gamma}\right\}\leq\phi_t,\\ \gamma\left[pR+\alpha-I-\dfrac{b^B-C}{\phi_t}\right] & \text{if } \dfrac{1}{2}\leq\phi_t<\dfrac{b^B-C}{pR+\alpha-I-(1-\delta)/\gamma},\\ f_w(\phi_t) & \text{if } \hat{\phi}\leq\phi_t<\dfrac{1}{2},\\ 0 & \text{if } \phi_t<\min\left\{\hat{\phi},\dfrac{1}{2}\right\},\end{cases} \tag{38}$$

and $f_w(\phi_t)$ is given by (24). Then, there exists an equilibrium path towards the steady state in which the level of trust is δ.

Proof. See Appendix F. ■

6 Summary and Concluding Remarks

The rolls of values and formal institutions in economic development has attracted considerable attention from scholars and policy makers. Both factors contribute largely to shape incentives of making contracts and ultimately have an impact on economic development. Moreover, values and institutions cannot be treated separately; values shape institutions, and in turn institutions affect values. Thus, the coevolution of values and formal institutions is at the center stage of the development process. In this paper, we have particular interests in trust as cultural values and enforcement on financial contracts as institutions because we have several unanswered questions. Why are trust and formal institutions complements? Why is there significant cross-country

heterogeneity in levels of trust, financial institutions, and economic development? Why have some countries been trapped in the state of mistrust, weak enforcement, and underdevelopment over the long period of time? Why do technical change and contractual innovation seem to be ineffective to close the gap in economic performances between developed and developing countries?

To address these questions, we develop the model in which civicness and institutions are endogenously determined and co-evolve, having the consequent effect on financial and economic development. This approach allows us to obtain three main results. First, the model features the complementarity between trust and formal legal institutions through regime change, leading to an underdevelopment trap, namely the situation with distrust and weak financial institutions. Second, both history and expectations play a roll in making the economy caught in such trap. If history sets the initial low level of trust, mistrust resulting from such historic shock impedes the development of institutions and persists through cultural transmission. If history sets the initial intermediate level of trust, pessimistic expectations on future level of trust drive the economy to the state of distrust. Third, technological innovation and contractual innovation may impede economic progress by deteriorating trust.

We conclude with some remarks on issues we did not dig deep into in this paper. While we describe quality of legal enforcement as an endogenous outcome in dynamic situations, the analysis is, however, based on static voting. In reality, it seems more natural that institutions have some dynamic linkage. For example, when there is intergenerational wealth transfer, the current policies affect the ex post wealth inequality, social mobility and the distribution of political power in the future. The dynamic collective decisions will derive even more important implications and are promising areas left for future research.

From a policy perspective, our model suggests that public education may be the key roll in escaping from the underdevelopment trap. However, the provision of public school is also determined in the political process. To spend resources in public education and escape from a low-trust trap, uncivic citizens need to agree with such policy. Although they benefit from

higher trust, it causes the shift of political power to civic citizens, who will implement strong enforcement. The fear of losing political power might induce uncivic citizens to oppose to public education. The political economy of public education is also an important issue for understanding a formation of trust.

Appendix A Proof of Lemma 1

Proof. In the equilibrium with financing, the condition (9) and the following limited liability condition must hold:

$$\tau C \geq \frac{I-\phi pR}{1-\phi p}. \tag{39}$$

Let us define

$$\Psi_1(\phi)=I-\phi\left(pR+\alpha-b^G\right), \quad \Psi_2(\phi)=\frac{I-\phi(pR+\alpha)}{1-\phi} \quad \text{and} \quad \Psi_3(\phi)=\frac{I-\phi pR}{1-\phi p}.$$

We have $\Psi_1'<0$, $\Psi_1''=0$, $\Psi_2'=-(pR+\alpha-I)/(1-\phi)^2<0$, $\Psi_2''<0$, and $\lim_{\phi\to 1}\Psi_2=-\infty$. Ψ_1 and Ψ_2 are crossed at two points, 0 and $(I-b^G)/(pR+\alpha-b^G)\in(0,I/(pR+\alpha-b^G))$. Figure 1 describes these two functions.

If $\phi\in[0,(I-b^G)/(pR+\alpha-b^G)]$, we have $\Psi_2\geq\Psi_1$. We also have

$$\begin{aligned}\Psi_2-\Psi_3&=\frac{\phi}{(1-\phi)(1-\phi p)}[(1-p)(I-\phi pR)-(1-\phi p)\alpha]\\&\geq\frac{\phi}{1-\phi p}\left[(1-p)b^G-\alpha\right]\\&>0\end{aligned}$$

where the second inequality is from $\phi\leq(I-b^G)/(pR+\alpha-b^G)$ and the third inequality holds from Assumption 3. Thus $\underline{\tau}(\phi)$, denoted by a lowest level of τ above which financing occurs, is determined by $\underline{\tau}(\phi)=\Psi_2(\phi)/C$.

If $\phi \in ((I-b^G)/(pR+\alpha-b^G), I/(pR+\alpha-b^G)]$, we have $\Psi_2 < \Psi_1$. We also have

$$\begin{aligned}\Psi_1 - \Psi_3 &= \frac{\phi}{1-\phi p}\left[-p(I-\phi pR)-(1-\phi p)(\alpha-b^G)\right] \\ &> \frac{\phi}{1-\phi p}\left[(1-p)b^G-\alpha\right] \\ &> 0\end{aligned}$$

where the second inequality is from $\phi > (I-b^G)/(pR+\alpha-b^G)$ and the third inequality holds from Assumption 3. Thus $\underline{\tau}(\phi)$ is determined by $\underline{\tau}(\phi) = \Psi_1(\phi)/C$.

Finally, if $\phi > I/(pR+\alpha-b^G)$, we set $\underline{\tau}(\phi) = 0$. ■

Appendix B Proof of Lemma 2

Proof. Given the optimal education effort (22), the dynamic equation (21) boils down to

$$\phi_{t-1} = \Lambda(\phi_t) = \begin{cases} \Lambda_1(\phi_t) & \text{if } \phi_t < \dfrac{I-C}{pR+\alpha-b^G-(1-\delta)/\gamma}, \\ \Lambda_2(\phi_t) & \text{otherwise,} \end{cases} \tag{40}$$

where

$$\Lambda_1(\phi_t) = \frac{(\phi_t-\delta)\phi_t}{\gamma[\phi_t(pR+\alpha-b^G)-(I-C)]} \tag{41}$$

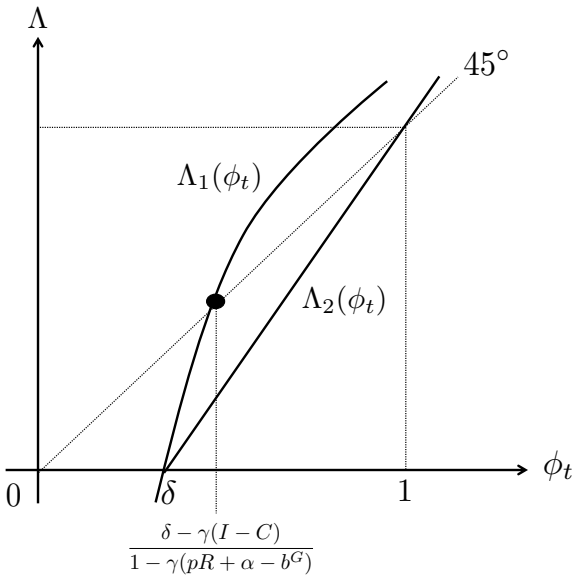
and

$$\Lambda_2(\phi_t) = \frac{\phi_t-\delta}{1-\delta}. \tag{42}$$

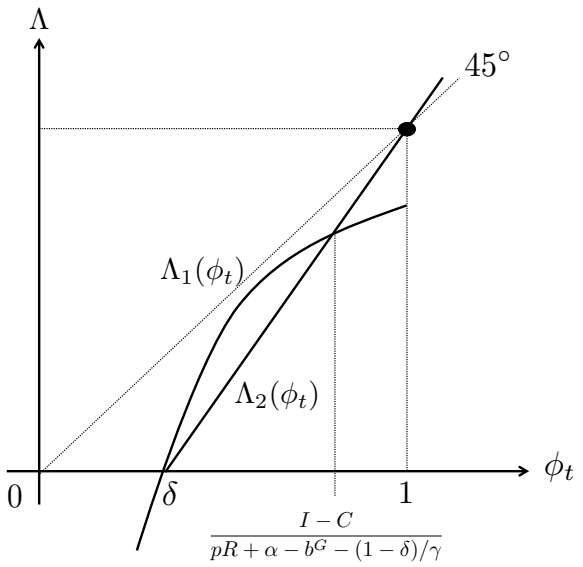
Because $\delta > \underline{\phi}$, the denominator of Λ_1 is positive when $\phi_t \geq \delta$. We have $\Lambda_1(\delta) = 0$ and

$$\Lambda_1'(\phi_t) = \frac{\phi_t^2(pR+\alpha-b^G)-(2\phi_t-\delta)(I-C)}{\gamma[\phi_t(pR+\alpha-b^G)-(I-C)]^2} > 0$$

for any $\phi_t \geq \delta$ because the numerator is positive when $\phi_t = \delta$ and is increasing in ϕ_t. We also



(a) The case when γ is low such that $\gamma < (1-\delta)/(pR+\alpha-b^G-I+C)$



(b) The case when γ is high such that $\gamma \geq (1-\delta)/(pR+\alpha-b^G-I+C)$

Figure 14: A fixed point when $\tau(\phi_t)=1$

have

$$\Lambda_1''(\phi_t)=\frac{-2(I-C)[\delta(pR+\alpha-b^G)-(I-C)]}{\gamma[\phi_t(pR+\alpha-b^G)-(I-C)]^3}<0,$$

for any $\phi_t \geq \delta$. Moreover, as $\phi_t \to \infty$, $\Lambda_1'(\phi_t) \to \gamma^{-1}/(pR+\alpha-b^G)$. Thus, when $\gamma \leq 1/(pR+\alpha-b^G)$, there is a fixed point such that $\phi_t=\phi_{t+1}=\phi_\infty=\Lambda_1(\phi_\infty)$ given by

$$\phi_\infty=\frac{\delta-\gamma(I-C)}{1-\gamma(pR+\alpha-b^G)}. \tag{43}$$

When $\gamma > 1/(pR+\alpha-b^G)$, $\Lambda_1(\phi_t) < \phi_t$, implying that there is no fixed point such that $\phi_\infty=\Lambda_1(\phi_\infty)$. Also, we have a fixed point in which $\phi_\infty=\Lambda_2(\phi_\infty)=1$.

Figure 14 shows $\Lambda_1(\phi_t)$ and $\Lambda_2(\phi_t)$ graphically. Both functions intersect at two points: δ and $(I-C)/(pR+\alpha-b^G-(1-\delta)/\gamma)$.

Let ϕ_s denote a steady state when $\tau(\phi_s)=1$. If γ is low such that $(I-C)/(pR+\alpha-b^G-(1-\delta)/\gamma) > 1$ holds (Figure 14a), we have the unique steady state $\phi_s=\phi_\infty \in (\delta,1)$ given by (43) and ϕ_t evolves according to $\phi_{t-1}=\Lambda_1(\phi_t)$ for $\phi_t \in [\delta,1]$. If γ is high such that $(I-C)/(pR+\alpha-b^G-(1-\delta)/\gamma) \leq 1$ holds (Figure 14b), we have the unique steady state $\phi_s=1$

and the dynamic equation is given by (40). ■

Appendix C Proof of Lemma 3

Proof. Under the assumption that $pR+\alpha-b^G \leq I$, $\underline{\tau}(\phi_t)>0$ for any ϕ_t. First, suppose that $\phi_t \geq (I-b^G)/(pR+\alpha-b^G)$. From (21) and (24), we have $\phi_t=\delta$. Thus, $\delta \geq (I-b^G)/(pR+\alpha-b^G)$, which is inconsistent with Assumption 5. Thus, we focus on the situation in which $\delta<\phi_t<(I-b^G)/(pR+\alpha-b^G)$, where $(I-b^G)/(pR+\alpha-b^G)<1$ from Assumption 1.

The dynamic equation (21) with $f^G_{t-1}=f_w(\phi_t)$ given by (24) is rewritten as

$$\phi_{t-1}=\Omega(\phi_t)=\begin{cases}\Lambda_2(\phi_t) & \text{if } \phi_t<\dfrac{I-b^G-(1-\delta)/\gamma}{pR+\alpha-b^G-(1-\delta)/\gamma},\\ \Omega_1(\phi_t) & \text{otherwise,}\end{cases} \tag{44}$$

where $\Lambda_2(\phi_t)$ is given by (42) and

$$\Omega_1(\phi_t)=\frac{(\phi_t-\delta)(1-\phi_t)}{\gamma[I-b^G-\phi_t(pR+\alpha-b^G)]}. \tag{45}$$

We have $\Omega_1(\delta)=0$ and $\Omega_1(\phi_t)>0$. Moreover,

$$\begin{aligned}\Omega_1'(\phi_t)&=\frac{(-2\phi_t+1+\delta)[I-b^G-\phi_t(pR+\alpha-b^G)]+(\phi_t-\delta)(1-\phi_t)(pR+\alpha-b^G)}{\gamma[I-b^G-\phi_t(pR+\alpha-b^G)]^2}\\ &=\frac{(1-\phi_t)[I-b^G-\phi_t(pR+\alpha-b^G)]+(\phi_t-\delta)(pR+\alpha-I)}{\gamma[I-b^G-\phi_t(pR+\alpha-b^G)]^2}>0\end{aligned} \tag{46}$$

holds because the numerator is decreasing in ϕ_t and when $\phi_t \to (I-b^G)/(pR+\alpha-b^G)$ the numerator is positive. We also have $\Omega_1(\phi_t)\to\infty$ as $\phi_t\to(I-b^G)/(pR+\alpha-b^G)$. This implies that there exists one fixed point $\phi_w=\Omega_1(\phi_w)\in(\delta,(I-b^G)/(pR+\alpha-b^G))$.

Figure 15 illustrates the functions $\Lambda_2(\phi_t)$ and $\Omega_1(\phi_t)$. Both functions intersect at δ and $(I-b^G-(1-\delta)/\gamma)/(pR+\alpha-b^G-(1-\delta)/\gamma)$, which is lower than ϕ_w. Thus, the dynamic equation (44) has the unique fixed point ϕ_w. ■

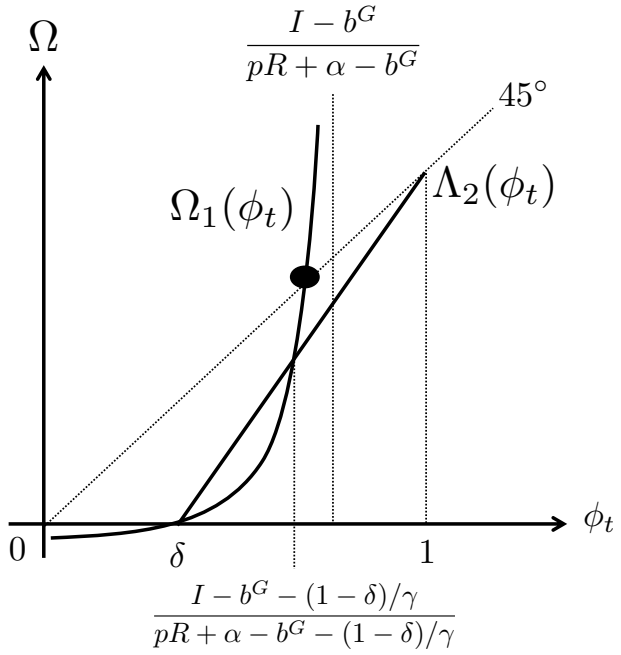


Figure 15: A fixed point when $\tau(\phi_t)=\underline{\tau}(\phi_t)$

Appendix D Proof of Proposition 4

Proof. From (23), (26) and (27), ϕ_s and the width of the region, $[\phi^*, \min\{\phi^{**}, 1\}]$, are nondecreasing in R. Totally differentiating (25) with respect to ϕ_w and R, we have

$$\begin{aligned}
\frac{\partial \phi_w}{\partial R} &= -\frac{\partial \Omega_1(\phi_w)}{\partial R}\frac{1}{\Omega_1'(\phi_w)-1} \\
&= \frac{-\phi_w p(1-\phi_w)(\phi_w-\delta)}{(1-\phi_w)[I-b^G-\phi_w(pR+\alpha-b^G)]+(\phi_w-\delta)(pR+\alpha-I)-\gamma[I-b^G-\phi_w(pR+\alpha-b^G)]^2} \\
&= \frac{-\phi_w p}{\delta(1-\phi_w)/(\gamma\phi_w^2)+(pR+\alpha-I)/(1-\phi_w)} \\
&< 0
\end{aligned}$$

where we have the second equality by using (46) and the third equality by using (25). We also have

$$\begin{aligned}\frac{\partial \tau(\phi_w)}{\partial R} &= \frac{\partial}{\partial R}\left[\frac{I-\phi_w(pR+\alpha)}{C(1-\phi_w)}\right] \\ &= \frac{p\phi_w}{C(1-\phi_w)}\left(-1+\frac{\gamma\phi_w^2(pR+\alpha-I)}{\delta(1-\phi_w)+\gamma\phi_w^2(pR+\alpha-I)}\right) \\ &< 0.\end{aligned}$$

Then, aggregate output is given by $Y(\phi_t)=\phi_t pR$. The effect of an increase in R on Y is

$$\frac{\partial Y(\phi_t)}{\partial R} = \phi_t p + pR\frac{\partial \phi_t}{\partial R}. \tag{47}$$

Thus, we have

$$\frac{\partial Y(\phi_w)}{\partial R} = \frac{\gamma\phi_w^3 p}{\delta(1-\phi_w)^2+(pR+\alpha-I)\gamma\phi_w^2}\left[\phi_w pR+\alpha-I+\frac{\delta}{\gamma}\left(\frac{1}{\phi_w}-1\right)^2\right] \tag{48}$$

$$= \frac{\phi_w^3 p(1-\phi_w)}{\delta(1-\phi_w)^2+(pR+\alpha-I)\gamma\phi_w^2}\left[\frac{\delta}{\phi_w^2}-1-\gamma b^G+\gamma\alpha\right] \tag{49}$$

where we have the second equality by substituting (25). When $\delta < (1+\gamma b^G-\gamma\alpha)\phi_w^2$, we obtain $\partial Y(\phi_w)/\partial R < 0$. ■

Appendix E Proof of Proposition 5

Proof. Differentiating (23) with respect to δ, we obtain

$$\frac{\partial \phi_s}{\partial \delta} = \begin{cases} \dfrac{1}{1-\gamma(pR+\alpha-b^G)} > 0 & \text{if } \dfrac{I-C}{pR+\alpha-b^G-(1-\delta)/\gamma} > 1, \\ 0 & \text{otherwise.} \end{cases}$$

Total differentiation of (25) with respect to ϕ_w and δ yields

$$\begin{aligned}\frac{\partial \phi_w}{\partial \delta} &= -\frac{\partial \Omega_1(\phi_w)}{\partial \delta}\frac{1}{\Omega_1'(\phi_w)-1} \\ &= \frac{(1-\phi_w)[I-b^G-\phi_w(pR+\alpha-b^G)]}{(1-\phi_w)[I-b^G-\phi_w(pR+\alpha-b^G)]+(\phi_w-\delta)(pR+\alpha-I)-\gamma[I-b^G-\phi_w(pR+\alpha-b^G)]^2} \\ &= \frac{\phi_w(1-\phi_w)^2}{\delta(1-\phi_w)^2+\gamma(pR+\alpha-b^G)\phi_w^2} \\ &> 0\end{aligned}$$

where we have the second equality by using (46) and the third equality by using (25). We also have $\partial \tau(\phi_w)/\partial \delta < 0$.

Moreover, if $\phi_s < 1$, we have

$$\begin{aligned}\frac{\partial \phi_s}{\partial \delta} - \frac{\partial \phi_w}{\partial \delta} &= \frac{\gamma(pR+\alpha-b^G)\phi_w(\phi_w+(1-\phi_w)^2)-(\phi_w-\delta)(1-\phi_w)^2}{[1-\gamma(pR+\alpha-b^G)][\delta(1-\phi_w)^2+\gamma(pR+\alpha-b^G)\phi_w^2]} \\ &= \gamma\phi_w\frac{(pR+\alpha-b^G)(\phi_w+(1-\phi_w)^2)-(1-\phi_w)[I-b^G-\phi_w(pR+\alpha-b^G)]}{[1-\gamma(pR+\alpha-b^G)][\delta(1-\phi_w)^2+\gamma(pR+\alpha-b^G)\phi_w^2]}\end{aligned}$$

where the denominator is positive and the numerator can be rewritten as

$$\gamma\phi_w(pR+\alpha-b^G)(1-\phi_w)\left[\frac{\phi_w}{1-\phi_w}+1-\frac{I-b^G}{pR+\alpha-b^G}\right].$$

Because this numerator is also positive from Assumption 1, we have $\partial \phi_s/\partial \delta > \partial \phi_w/\partial \delta$. ■

Appendix F Proof of Proposition 6

Proof. For $\phi_t \in [0,1]$, (5) with equality and (35) with equality intersects only at $(I-b^B)/(I-b^G)$ and (8) with equality and (35) with equality intersects only at

$$\frac{I-b^B}{2(pR+\alpha-I)}\left(-1+\sqrt{1+4\frac{pR+\alpha-I}{I-b^B}}\right).$$

Let us define

$$\hat{\phi} \equiv \max\left\{\frac{I-b^B}{I-b^G}, \frac{I-b^B}{2(pR+\alpha-I)}\left(-1+\sqrt{1+4\frac{pR+\alpha-I}{I-b^B}}\right)\right\}. \tag{50}$$

When $\hat{\phi} \leq \phi_t < 1/2$, $\tau^{CI}(\phi_t) = \underline{\tau}(\phi_t)$ and the pooling contract occurs in the equilibrium. The equilibrium payoffs during the working phase for the good and bad type are (15) and (16), respectively. When $(b^B - C)/(pR+\alpha-I) \leq \phi_t < \min\{\hat{\phi}, 1/2\}$, $\tau^{CI}(\phi_t)$ is determined by (35) with equality and the equilibrium features the separating contract. When $1/2 \leq \phi_t$, $\tau^{CI}(\phi_t) = 1$ and the separating contract appears on the equilibrium path. The equilibrium payoffs during the working periods in the case of separating contract are given by

$$U^{G,sep}(\phi_t) = \begin{cases} \phi_t(pR+\alpha-I) & \text{if } \dfrac{b^B-C}{pR+\alpha-I} \leq \phi_t < \min\left\{\hat{\phi}, \dfrac{1}{2}\right\} \\ pR+\alpha-I-\dfrac{1-\phi_t}{\phi_t}(b^B-C) & \text{if } \dfrac{1}{2} \leq \phi_t \end{cases} \tag{51}$$

for the good type and

$$U^{B,sep}(\phi_t) = \begin{cases} \phi_t(pR+\alpha-I) & \text{if } \dfrac{b^B-C}{pR+\alpha-I} \leq \phi_t < \min\left\{\hat{\phi}, \dfrac{1}{2}\right\} \\ b^B-C & \text{if } \dfrac{1}{2} \leq \phi_t \end{cases} \tag{52}$$

for the bad type.

At the retirement phase, while the bad type does not educate the child from Assumption 2, the good type does. When $\hat{\phi} \leq \phi_t < 1/2$, the optimal level of education is given by (24). When $\delta \leq \phi_t < \min\{\hat{\phi}, 1/2\}$, $V^{GG}(\phi_t) = U^{G,sep}(\phi_t) = U^{B,sep}(\phi_t) = V^{GB}(\phi_t)$, implying that the optimal level of education is 0. When $1/2 \leq \phi_t$, because $V^{GG}(\phi_t) = U^{G,sep}(\phi_t) > U^{B,sep}(\phi_t) = V^{GB}(\phi_t)$, the optimal level of education is given by the following first-order condition

$$f^G_{t-1} \leq \gamma\left[U^{G,sep}(\phi_t) - U^{B,sep}(\phi_t)\right] = \gamma\left[pR+\alpha-I-\frac{b^B-C}{\phi_t}\right], \quad \text{with equality if } f^G_{t-1} < 1-\delta \tag{53}$$

We characterize the economy by putting the optimal educational choice (38) into the dynamic equation (21). When (36) holds, $f^{CI}(\delta)=0$, implying that $\phi_t=\delta$ satisfies (21) for any ϕ_{t-1}. Thus, any economy can reach the steady state δ.

Finally, we analyze the complete dynamics and steady states. When $\hat{\phi}\leq\phi_t<1/2$, trust evolves according to (44). If $\hat{\phi}<\phi_w$ and $2I-pR-\alpha\leq(1-2\delta)/\gamma+b^G$ (from Assumption 6), ϕ_w is also a steady state; otherwise, δ is the unique steady state under weak enforcement regime.

When $\phi_t\geq 1/2$, the dynamic equation (21) boils down to

$$\phi_{t-1}=\Upsilon(\phi_t)=\begin{cases}\Upsilon_1(\phi_t) & \text{if } \phi_t<\dfrac{b^B-C}{pR+\alpha-I-(1-\delta)/\gamma},\\ \Lambda_2(\phi_t) & \text{otherwise,}\end{cases} \tag{54}$$

where

$$\Upsilon_1(\phi_t)=\frac{(\phi_t-\delta)\phi_t}{\gamma[\phi_t(pR+\alpha-I)-(b^B-C)]} \tag{55}$$

and $\Lambda_2(\phi_t)$ is given by (42). Because (8) with equality and (35) with equality intersects at once for $\phi_t\in[0,1]$, (36) implies that $(b^B-C)/(pR+\alpha-I)\leq\underline{\phi}<\delta$ and the denominator of Υ_1 is positive when $\phi_t\geq\delta$. We have $\Upsilon_1(\delta)=0$,

$$\Upsilon_1'(\phi_t)=\frac{\phi_t^2(pR+\alpha-I)-(2\phi_t-\delta)(b^B-C)}{\gamma[\phi_t(pR+\alpha-I)-(b^B-C)]^2}>0$$

for any $\phi_t\geq\delta$, and as $\phi_t\to\infty$, $\Upsilon_1'(\phi_t)\to\gamma^{-1}/(pR+\alpha-I)$. We also obtain $\Upsilon_1''(\phi_t)<0$ for any $\phi_t\geq\delta$. When $\gamma\leq 1/(pR+\alpha-I)$, there is a fixed point such that $\phi_t=\phi_{t+1}=\phi_\infty=\Upsilon_1(\phi_\infty)$ given by

$$\phi_\infty=\frac{\delta-\gamma(b^B-C)}{1-\gamma(pR+\alpha-I)}. \tag{56}$$

When $\gamma>1/(pR+\alpha-I)$, $\Upsilon_1(\phi_t)<\phi_t$, implying that there is no fixed point such that $\phi_\infty=\Upsilon_1(\phi_\infty)$.

When $\gamma<(1-\delta)/(pR+\alpha-I-b^B+C)$, the dynamic equation is given by $\Upsilon(\phi_t)=\Upsilon_1(\phi_t)$

for $\phi_t \in [1/2, 1]$ and if

$$\frac{1}{2} \leq \Upsilon_1(\phi_\infty) \quad \text{or} \quad \frac{1-2\delta}{\gamma} \leq pR + \alpha - I - 2b^B + 2C, \tag{57}$$

then the steady state under strong enforcement regime is given by (56). When $\gamma \geq (1-\delta)/(pR+\alpha-I-b^B+C)$, the dynamic equation is given by (54) and the steady state under strong enforcement regime is given by 1. ■

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