Trust and Law in Credit Markets*

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Abstract

This study examines the interactions between trust and contract enforcement in a model of credit markets with asymmetric information. Civic entrepreneurs cross-subsidize uncivic ones intending to cheat and thus demand strong enforcement to reduce its burden. When civic values are instilled by parents who respond to expectations about the future quality of enforcement, the model creates an underdevelopment trap, with mistrust and weak enforcement, in which the economy receiving a trust-destroying shock could be caught. We argue that technological innovation and contractual innovation may be detrimental to the underdeveloped economy by undermining trust and enforcement quality, but that public education may help such an economy escape the trap.

JEL Classification: O10, O16, Z13.

Keywords: culture, trust, institutions, financial market, asymmetric information, innovation.

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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, many empirical studies have attempted to identify the determinants of financial development. On the one hand, following La Porta et al. (1998), the literature emphasizes the influence of the legal systems that enhance creditors' ability to seize collateral on credit market development (e.g., Djankov et al., 2007 and Besley et al., 2012). On the other hand, Guiso et al. (2004, 2008) demonstrate that trust, namely the faith that borrowers do not cheat based on their embedded civic values, mitigates markets' anxiety about being cheated and encourages the supply of credit.

Recent research, however, finds that legal institutions and trust cannot be treated separately (Alesina and Giuliano, 2015). They interact with each other, and can even be complementary given that the quality of institutions is positively associated with measures of trust, as shown among countries (Algan and Cahuc, 2014, Tables 2.6a), in European regions (Tabellini, 2008a), and in Italian provinces (Guiso et al., 2004). These observations raise two key questions. Why can the interactions between institutions and trust result in an underdeveloped economy that fails to strengthen enforcement and cultivate trust? And what are the implications of the complementarity between institutions and trust for development policies?

In this study, we develop a model in which different civic values influence the quality of contract enforcement chosen in a political process, whereas parents' expectations about future enforcement quality determine their education incentives to instill civic values in their children and influence the formation of trust. When markets cannot drive out uncivic entrepreneurs who steal borrowed funds, the model features complementarity between trust and enforcement, generating an underdevelopment trap in which a lack of trust and weak enforcement coexist. Once the economy experiencing trust-destroying shocks is caught in such a trap, technological and contractual innovations fail to improve, or even aggravate,

mistrust and weak enforcement. We argue that public civic education may be effective for eliminating the vicious cycle and helping the economy escape the trap.

In our credit market model, entrepreneurs borrow funds by offering financial contracts and then decide whether to invest those funds in projects or divert them to personal use secretly. To mitigate the agency problem, entrepreneurs pledge their wealth as collateral in case of default. Entrepreneurs also have private information on their civic values. Civic entrepreneurs feel guilty for cheating, whereas uncivic entrepreneurs incur effort costs induced by investing. When the difference in values is large, in equilibrium only civic entrepreneurs show trustworthy behavior, thereby motivating us to measure the level of trust in the economy as the proportion of civic entrepreneurs.

As a result of informational asymmetry, equilibrium financial contracts force civic entrepreneurs to cross-subsidize uncivic ones. This cross-subsidization generates conflicts of interest between the civic and the uncivic over the quality of contract enforcement. Strong enforcement that increases the possibility of losing collateral after default is detrimental to uncivic entrepreneurs, but instead benefits civic entrepreneurs by lowering the degree of cross-subsidization. Thus, under a majority voting system, a level of trust determines enforcement quality. A high-trust economy in which civic entrepreneurs are widely dominant chooses the strongest enforcement. By contrast, a low-trust economy in which uncivic entrepreneurs are widely dominant chooses the weakest enforcement conditional on being funded, which implies that the equilibrium level of enforcement depends on entrepreneurs' ability to raise funds.

In our model, trust evolves over time because civic values are endogenously determined through parental education. Following Bisin and Verdier (2001) and Tabellini (2008b), we assume imperfect empathy: although parents care about the utilities of their children, they evaluate their children's behavior based on their own values. Such an approach implies that parents exert educational effort to instill their own values and this effort choice is influenced by the future circumstances of their children. This cultural transmission mechanism, com-

bined with the political process that influences enforcement levels, generates complementarity between values and enforcement, leading to multiple steady states. If parents anticipate strong enforcement in the child's generation, they exert educational effort to make their children civic. That economy comprises a large proportion of civic children and thus will realize strong enforcement, meaning that the initial beliefs are justified. This steady state is characterized by a high level of trust, strong enforcement, and high aggregate output. If, instead, parents anticipate weak enforcement in the next generation, it discourages their incentives to exert civic education. The resulting economy is then composed of a large proportion of uncivic children and thus will lead to weak enforcement, implying that the initial expectations are again justified. This steady state features a low level of trust, weak enforcement, and low aggregate output.

In which steady state the economy will end up depends on the precondition. When civic values are widely dominant initially, the economy will reach the steady state with a high degree of economic development. However, when uncivic values are widely dominant initially, the economy will be trapped in the state of underdevelopment. One noteworthy feature is that during the transitional path toward the underdevelopment trap, as trust rises over time, enforcement weakens. This is because higher trust increases entrepreneurs' ability to borrow funds, thereby allowing uncivic entrepreneurs, who retain political power, to weaken enforcement further. Thus, this result offers a new insight into the relationship between culture and institutions; that is, while trust and enforcement are complements in the long run, they may be substitutes in the short run.

The presence of the underdevelopment trap enables us to derive a number of policy implications. First, technological innovations and contractual innovations fail to eliminate the underdevelopment trap or even are detrimental to underdeveloped economies by exacerbating the lack of trust and weak enforcement. Technological innovation enhances the productivity of projects and benefits civic entrepreneurs investing in them. However, in the low-trust economy, the benefits are exploited by uncivic entrepreneurs. As entrepreneurs'

ability to attract funds improves, uncivic entrepreneurs weaken enforcement, which discourages parental education. If the adverse effect on the formation of trust is large, technological advancement, despite its direct and positive effect, lowers aggregate output. Contractual innovations allow civic entrepreneurs to be distinguished from uncivic ones and reduce the cost of cross-subsidization. The beneficial effect on civic entrepreneurs is again taken advantage of by uncivic ones in the low-trust economy, who weaken enforcement, which leads to the deterioration of trust. These results help explain why there is still a large disparity between advanced and developing countries even though ideas and knowledge can spread so rapidly that any country has access to the innovations developed in advanced countries.

Second, in contrast to these adverse effects of innovations, public civic education has the potential to help the economy escape the trap. If educational resources are concentrated among a small proportion of children so that they become civic, this alleviates informational asymmetry and improves the contractual terms in credit markets. Because civic entrepreneurs benefit from this improvement, family-led civic education is encouraged. Despite the presence of exploitation by uncivic entrepreneurs, such education policy cultivates trust. If educational resources are used extensively and contribute to narrowing the difference between civic and uncivic values, private contracts, combined with sufficient enforcement quality, can induce even uncivic entrepreneurs to invest in projects and resolve the fundamental frictions stemming from information asymmetry. The resulting economy achieves high degrees of financial and economic development, even though uncivic values have become rampant.

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

A vast body of research has studied the primary determinants of formal institutions that affect financial markets and has suggested two distinct hypotheses. The first view is that the cross-country variation in formal institutions is shaped by historic events such as 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

a result of the political economy process. The preferences of groups with political power are reflected in decisions on legal protection. Recent contributions include Rajan and Zingales (2003), Pagano and Volpin (2005, 2006), Perotti and von Thadden (2006), and Biais and Mariotti (2009). Ševčík (2012) and Matsuoka et al. (forthcoming) include insights from both views by analyzing the joint dynamics of economic development and investor protection. Although this study also reflects both views, our emphasis is placed on the role of cultural traits in generating the persistence of institutions.

Our study also contributes to an extensive literature that has recognized the importance of civic values and trust in determining economic performance (e.g., Putnam, 1993, Fukuyama, 1995, Knack and Keefer, 1997, La Porta et al., 1997, Algan and Cahuc, 2010, and Tabellini, 2010). Following the seminal work of Bisin and Verdier (2001), the theoretical works in this field have focused on the cultural transmission of values, such as those regarding trustworthiness (Francois and Zabojnik, 2005) and corruption (Hauk and Saez-Marti, 2002).[1] In contrast to these studies, we treat institutions as endogenous to study their interactions with trust.

There is a recent burgeoning literature on the coevolution of culture and formal institutions. Such an interplay is analyzed in a variety of contexts, including interactions in the general setup (Bisin and Verdier, 2017), between cooperation and legal institutions that enhance cooperation (Tabellini, 2008b), between the culture of work and redistribution policies (Alesina and Angeletos, 2005 and Bénabou and Tirole, 2006), between honesty norms and institutions that encourage trading (Bidner and Francois, 2011), and between cultural values and labor market institutions (Aghion et al., 2011, Michau, 2013 and Alesina et al., 2015). Although we also emphasize the interactions between culture and institutions, the interest of this study is on the implications of the complementarity between trust and contract enforcement for financial and economic development.

[1] Kumar and Matsusaka (2009) develop an alternative model to study cultural evolution and development process, in which they distinguish social capital that relies on personal networks from social capital useful for enforcing contracts with strangers.

The most closely related works to our interests are Aghion et al. (2010) and Carlin et al. (2009), which focus on the coevolution of trust and government regulation. In Aghion et al. (2010), trust and entry regulation are substitutes because low-trust economies demand entry regulation to prevent uncivic entrepreneurs from imposing a negative externality, whereas under strong regulation entrepreneurs become uncivic to pay bribes and enter 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 the values of social capital. The difference from these works is that, in our model, trust and enforcement are complements in the long run. Moreover, the model with that complementarity sheds light on the mechanism through which innovations and public education affect financial and economic development.

Outline: The remainder of the paper is organized as follows. Section 2 provides the framework of the static model in which values are exogenous. Section 3 analyzes the equilibrium of the static model and shows the one-way effect of trust on the quality of enforcement. Section 4 extends the model to the dynamic setting in which values are endogenously determined through family education. The dynamic economy describes the divergence in development through the two-way effects between trust and enforcement. Section 5 analyzes the effects of technological and contractual innovations. Section 6 analyzes the effects of educational policies. Section 7 discusses robustness. Section 8 concludes.

2 The Static Model

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

There is a continuum of measure 1 of entrepreneurs and lenders. Both agents are risk-neutral and consume at the end of the period. Both are protected by limited liabilities.[2]

[2]We assume that the legal rules about limited liability cannot be changed in the political process.

There is a storage technology that produces zero profit. Each entrepreneur has a project requiring a fixed investment $I > 0$. The project produces cash flows $R > 0$ with probability $p \in (0, 1]$ and nothing with probability $1 - p$. While entrepreneurs have no funds, lenders receive a sufficiently large amount of cash. This implies that entrepreneurs need to rely on external financing to run their projects.

There is a moral hazard problem for entrepreneurs. Each entrepreneur who borrowed funds chooses either to invest them in projects or to steal them for private purposes. This cheating behavior results in default but leads to private benefits for entrepreneurs. Lenders cannot distinguish default after cheating from default after project failure.[3] Entrepreneurs' incentives are affected by their own cultural values, which are private information. A proportion $1-\phi$ of entrepreneurs are bad (or uncivic) types. They enjoy private benefit b^B from cheating and incur psychological effort cost $\Delta \geq 0$ from investing in projects. A proportion ϕ of entrepreneurs are good (or civic) types. They receive few private benefits $b^G \in (0, b^B)$ because they feel guilty from cheating. Instead, they do not incur any psychological cost from investing because they feel satisfaction from entrepreneurial activity. While we take ϕ to be exogenously given in the static model, we allow ϕ to evolve as a result of family-led civic education in Section 4.

Entrepreneurs have illiquid wealth, $C > 0$. This wealth cannot be transformed into cash and consumed until the end of the period. To alleviate the moral hazard problem, entrepreneurs can pledge the wealth as collateral in the case of default. However, the pledge is enforced imperfectly. Lenders seize collateral C with probability $\tau \in [0, 1]$, implying that an effective value of collateral is τC. We interpret the probability τ as a measure of institutional quality, with a higher value corresponding to better-quality institutions. The idea behind this interpretation is that the power of lenders against defaulting borrowers strengthens because of laws that improve creditor rights and their enforcement or property rights improvements (e.g., Besley et al., 2012). Before financing occurs, the strength of

[3]Even if both types of defaults are distinguishable and verifiable, the optimal contract does not change.

enforcement is determined in the political process in which each agent votes on τ under the majority rule. Although in reality some costs are present when bankruptcy laws and formal legal procedures are reformed, we assume that τ can change without any cost to focus on the main mechanism.

To secure financing, entrepreneurs make a take-it-or-leave-it offer to lenders. The financial contract specifies (i) that lenders contribute I, (ii) that lenders receive $r \in [0, R]$ and the entrepreneur receives $R-r$ when the investment succeeds, and (iii) that entrepreneurs pledge their wealth C as collateral and lenders try to seize it in the case of default.[4]

The timing of the events is as follows:

1. All agents vote on the quality of enforcement τ under majority rule.

2. Entrepreneurs offer a financial contract r to lenders and then they decide whether to accept. If lenders reject the offer, they use storage technology and consume their own endowment, and entrepreneurs consume collateral.

3. If lenders accept the offer, entrepreneurs borrow funds and face the moral hazard problem.

4. 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 must incorporate how to determine the quality of enforcement in the political process into the equilibrium definition. Our (economic and political) equilibrium is defined in the following way.

Definition 1 *An equilibrium is given by the strength of enforcement τ, entrepreneurs' decisions on cheating and contracts r, lenders' decision on financing, and their beliefs about entrepreneurs' types such that the following conditions are satisfied:*

[4]Even when entrepreneurs can choose the proportion of wealth they pledge as collateral, it is optimal to pledge the full amount of wealth C.

- *The choices on cheating and the contract r maximize the utility of entrepreneurs where enforcement τ and lenders' strategies and beliefs are taken as given;*
- *The financing decisions of lenders maximize their utility, where enforcement τ, their beliefs, and entrepreneurs' strategies are taken as given;*
- *Lenders' beliefs are consistent with Bayes' rule given the equilibrium strategies, whenever possible; and*
- *The strength of enforcement τ maximizes the utility of the median agent.*

Finally, we make three parametric assumptions. The first assumption guarantees that a project produces a positive net present value, but cheating conducted even by a bad entrepreneur is socially wasteful:

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

The second assumption assures that investments impose a significant burden on bad entrepreneurs so that they engage in cheating even when enforcement is perfect:

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

This assumption implies that in equilibrium, the share of good entrepreneurs ϕ is consistent with lenders' beliefs about the probability that an entrepreneur invests funds in projects. Thus, ϕ measures the extent to which lenders can trust an entrepreneur to behave in line with their interests.[5] Hereafter, following this interpretation, we refer to ϕ as a measure of trust. Section 6.2 analyzes the case in which Assumption 2 does not hold and financial contracts can induce bad entrepreneurs to invest.

The third assumption ensures that bad entrepreneurs find it profitable to cheat even in the perfect enforcement case:

[5]This is consistent with Gambetta's (2000) definition of trust. 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."

Assumption 3 $b^B > C$.

We discuss the robustness of our conclusion by extending the analysis to the situation $b^B \leq C$ in Section 7.1.

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 the level of trust affects the quality of enforcement.

3.1 Optimal Contracts

Given a level of trust ϕ and enforcement quality τ, we solve the optimal contract problem. Under Assumption 2 and Assumption 3, bad entrepreneurs would like to borrow funds and steal them; however, if their true type is revealed, they cannot secure financing. This motivates bad entrepreneurs to hide their true type by mimicking good ones. Because the simple financial contract r cannot prevent their mimicking, the equilibrium features a pooling contract.[6] We focus on the pooling contract that solves the following problem:[7]

[6] Even if entrepreneurs can offer a menu of contracts that depend on their types, in equilibrium bad entrepreneurs offer the same contract as good entrepreneurs to hide their true type. Thus, any separating equilibrium unravels. See Section 5.2 for the result of more sophisticated contracts that allow good entrepreneurs to be distinguished from bad ones.

[7] Although there are many pooling equilibria depending on off-the-equilibrium-path beliefs, the contract that solves the problem (1)-(3) is the unique optimal contract that satisfies the perfect sequential equilibrium concept.

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

subject to

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

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

The objective function (1) is the good entrepreneur's net expected payoff. The constraint (2) is the individual rationality (IR) 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 (IC) constraint. The left-hand (right-hand) side is the expected payoff of good entrepreneurs in the case of investing (cheating).

A lower r increases good entrepreneurs' payoff (1) and strengthens their incentives to invest. This leads the good entrepreneur to decrease r until (2) binds. Note that the limited liability constraint does not bind (i.e., $r > 0$) because Assumption 1 and Assumption 3 require that the collateral value is sufficiently low. As a result, (3) becomes

$$\phi\left(pR - b^G\right) + \tau C \geq I. \tag{4}$$

This condition means that if the pledgeable income including collateral is larger than the cost of financing, entrepreneurs can secure financing. If (4) is violated, no financing occurs.

In this pooling equilibrium, entrepreneurs must promise higher repayments than the case under symmetric information because there is a cross-subsidization: lenders make money on the good entrepreneur and lose money on the bad one. The value function of a good

entrepreneur is given by

$$U^G = \frac{1}{\phi}\left(\phi pR - I\right) + \frac{1-\phi}{\phi}\tau C. \tag{5}$$

A higher level of trust ϕ reduces the cost of cross-subsidizing bad entrepreneurs and increases the payoff of good entrepreneurs U^G. Moreover, since the financial contract entails cross-subsidization, the strength of enforcement τ influences good entrepreneurs' payoff. Stronger enforcement reduces lenders' loss owing to a bad entrepreneur and decreases the degree of cross-subsidization, leading to an increase in U^G. Indeed, when lenders expect an entrepreneur to be a good type (i.e., $\phi = 1$) and cross-subsidization does not occur, the strength of enforcement affects only the contractual term r but not the payoff U^G.

On the contrary, the value function of a bad entrepreneur is given by

$$U^B = b^B - \tau C. \tag{6}$$

U^B is independent of ϕ because the level of trust affects only the contractual term r, which is irrelevant to benefits from cheating. More importantly, U^B is decreasing in τ because stronger enforcement increases the probability of losing collateral after cheating. This preference is opposite to the one of good entrepreneurs (5) and this difference creates a conflict of interest over levels of enforcement.

To assure that financing occurs in the pooling equilibrium, in addition to the financing constraint (4), all entrepreneurs must find it profitable to borrow funds. Bad entrepreneurs receive a positive payoff under Assumption 3, whereas good entrepreneurs do so if the following IR constraint holds:

$$U^G \geq 0 \quad \text{or} \quad \tau C \geq \frac{I - \phi pR}{1-\phi}. \tag{7}$$

The following lemma characterizes the threshold level of τ above which (4) and (7) hold for each ϕ.

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

$$\underline{\tau}(\phi) \equiv \begin{cases} \dfrac{I - \phi pR}{C(1-\phi)} & \text{if } \phi \leq \dfrac{I - b^G}{pR - b^G}, \\ \dfrac{I - \phi(pR - b^G)}{C} & \text{if } \dfrac{I - b^G}{pR - b^G} < \phi \leq \dfrac{I}{pR - b^G}, \\ 0 & \text{if } \dfrac{I}{pR - b^G} < \phi, \end{cases} \tag{8}$$

(4) *and* (7) *hold. Then,* $\underline{\tau}(\phi)$ *is non-increasing in* ϕ*.*

Proof. See Appendix A. ■

When ϕ is low such that $\phi \leq (I - b^G)/(pR - b^G)$, the cost of cross-subsidizing bad entrepreneurs is so high that it is more difficult to satisfy the good entrepreneurs' profitability constraint (7) than the financing constraint (4). The lower bound $\underline{\tau}(\phi)$ is determined by (7) holding as an equality. When ϕ is high such that $\phi > (I - b^G)/(pR - b^G)$, it is more difficult to provide good entrepreneurs with incentives to invest and satisfy the financing constraint (4) than to meet their IR constraint (7). In this case, the threshold $\underline{\tau}(\phi)$ is determined by (4) holding as an equality. If ϕ exceeds a certain level, that is, $\phi > I/(pR - b^G)$, the threshold reaches the lowest level 0. Although the severer constraint changes depending on ϕ, a higher ϕ relaxes both constraints (4) and (7) further, decreasing the lower bound of enforcement quality $\underline{\tau}(\phi)$ until it reaches 0.

Given that $\underline{\tau}(\phi)$ is non-increasing in ϕ from Lemma 1 and τ increases up to 1, financing does not occur for any τ when ϕ is lower than the threshold given by

$$\underline{\phi} = \max\left\{\frac{I - C}{pR - C}, \frac{I - C}{pR - b^G}\right\}. \tag{9}$$

In the shaded region in Figure 1, the condition $\phi \geq \underline{\phi}$ holds and both constraints (4) and (7) are satisfied; thus, financing occurs.

Proposition 1 *Suppose that Assumptions 1–3 hold. If* τ *is high such that* $\tau \geq \underline{\tau}(\phi)$ *for any*

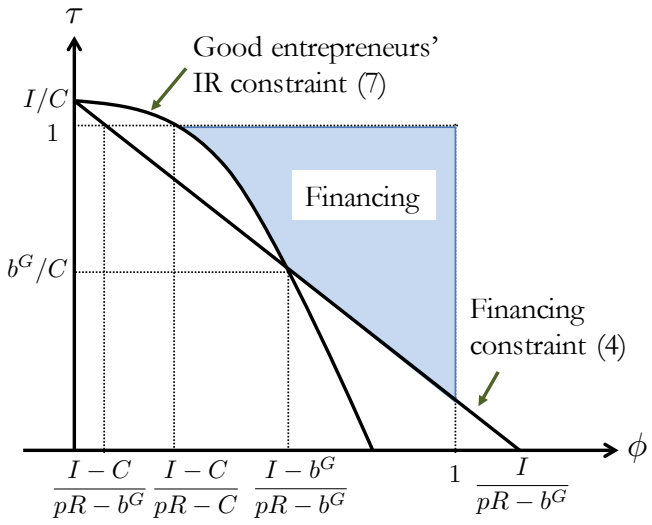


Figure 1: Financing conditions

$\phi \geq \underline{\phi}$, both types of entrepreneurs obtain financing by offering the contracts

$$r = \frac{I - (1 - \phi p)\tau C}{\phi p}. \tag{10}$$

Otherwise, no financing occurs.

Proposition 1 implies that the working of credit markets requires certain levels of trust and institutions. Moreover, as Guiso et al. (2004) emphasize, the effect of trust on the external cost of financing is larger in an economy with weaker enforcement (i.e., $\partial^2 r/(\partial\phi\partial\tau) < 0$).

3.2 The Equilibrium Quality of Enforcement

Given the level of trust ϕ, the strength of enforcement τ is determined by the preference of the median voter. Because lenders earn zero profit regardless of τ, we assume that they do not participate in the voting.[8] This means that the median voter is a good or a bad entrepreneur.

The equilibrium level of enforcement depends on ϕ, as shown in Figure 2. When good

[8]In general, lenders have some bargaining power within their financial contracts, where they earn higher profits the stronger enforcement is. However, our conclusion remains unchanged if lenders do not have political power to influence policy choices because for example, they cannot engage in lobbying activities effectively or are foreign investors.

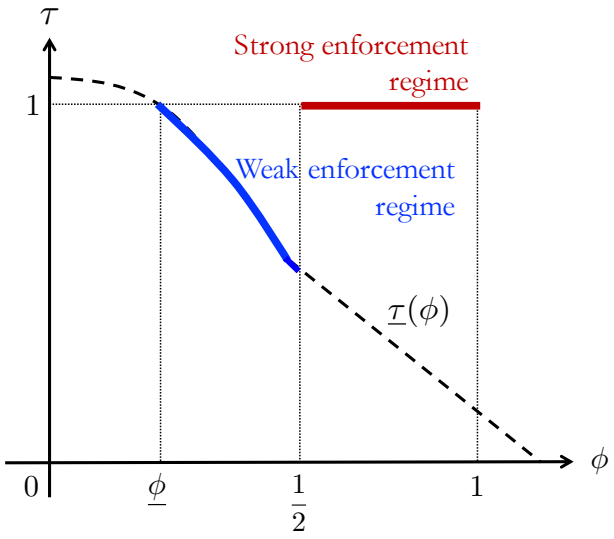


Figure 2: Equilibrium level of enforcement

entrepreneurs constitute a majority (i.e., $\phi \geq 1/2$), one of them becomes the median voter and chooses perfect enforcement (i.e., $\tau = 1$) from the payoff (5) to reduce the degree of cross-subsidization. In the case of $\phi = 1$, in which good entrepreneurs are indifferent to τ as long as they secure financing, we assume that $\tau = 1$ is set.[9] Thus, we refer to the situation in which a good entrepreneur becomes the median voter as the *strong enforcement regime*. When bad entrepreneurs constitute a majority (i.e., $\phi < 1/2$), one of them becomes the median voter and chooses $\tau = \underline{\tau}(\phi)$ for $\phi \in [\underline{\phi}, 1/2)$ and any τ for $\phi < \underline{\phi}$ because conditional on securing financing, they prefer weaker enforcement from the payoff (6). We call the situation that the bad type becomes the median voter the *weak enforcement regime*. The following assumption guarantees that financing can occur even under the weak enforcement regime: $\underline{\phi} < 1/2$, that is,

Assumption 4 $pR > 2(I - C) + \max\{C, b^G\}$.

Proposition 2 *Suppose that Assumptions 1–4 hold. If $\phi \geq 1/2$, the equilibrium level of enforcement is $\tau = 1$. If $\underline{\phi} \leq \phi < 1/2$, then it is $\tau = \underline{\tau}(\phi)$ given by (8). Otherwise, the equilibrium level of enforcement takes any value in $[0, 1]$.*

[9] This assumption is innocuous because in a dynamic model, we focus on the equilibrium path during which ϕ is lower than 1.

Proposition 2 exhibits the non-linear relationship between the level of trust and quality of enforcement. When the level of trust is low, a higher level of trust enhances entrepreneurs' ability to secure financing and thus allows bad entrepreneurs to weaken enforcement. However, once the economy cultivates trust up to a certain level, civic entrepreneurs obtain political power and set strong enforcement. In the next section, by endogenizing the choices of civic values, we show that in contrast to the result of the static model, the level of trust is positively associated with enforcement quality in the long run, which is consistent with the empirical regularity.

4 Dynamics

We extend the static model developed in Section 2 into the dynamic setting by allowing for the intergenerational cultural transmission. Parents can influence the civic values of their children, and through such parental education, trust evolves over time and interacts with enforcement. Section 4.1 describes the dynamic setting and Section 4.2 analyzes parents' incentives to educate their children. Section 4.3 shows that the complementarity between trust and enforcement leads to multiple steady states and Section 4.4 characterizes the transitional dynamics.

4.1 Dynamic Setting

Time is discrete, indexed by $t = 0, 1, 2, \ldots$, and goes on forever. We consider an overlapping generations model with a continuum of measure 1 of risk-neutral lenders and entrepreneurs. In each period, lenders provide funds to entrepreneurs. Entrepreneurs live for two periods (young and old), as shown in Figure 3. When they are young, entrepreneurs receive civic education from their parents and know their own type. When they are old, there are two phases: the working phase and retirement phase. During the working phase in period t, they experience the same events as those in the static model of Section 2; they receive illiquid

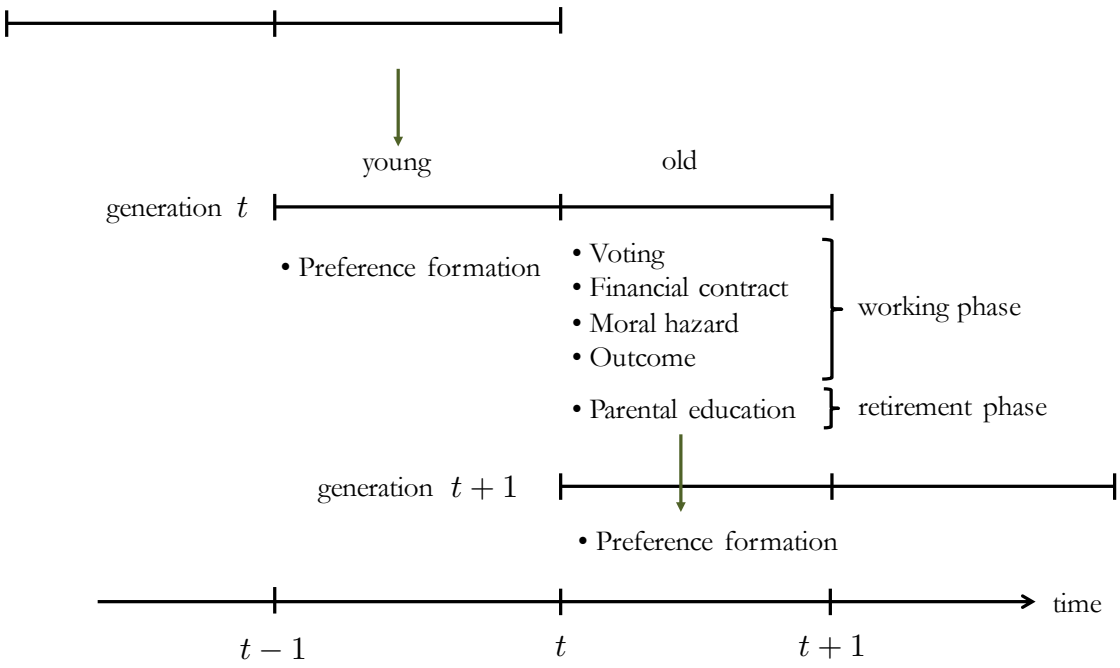


Figure 3: Time structure of the overlapping generations model

wealth, vote on the level of enforcement τ_t, offer financial contracts r_t, face moral hazard, and consume. During the retirement phase in period t, each entrepreneur has one child and exerts educational effort to instill civic values in the child individually. An old entrepreneur with type $i \in \{G, B\}$ (good or bad) can increase the probability that the child becomes good by $f_t^i \geq 0$ by incurring psychological cost $(f_t^i)^2/2\gamma$ with $\gamma > 0$.[10] Here, we assume that γ is sufficiently small to ensure that the optimal level of education does not reach the upper bound.

Following Bisin and Verdier (2001) and Tabellini (2008b), we adopt the "imperfect empathy" approach: parents are altruistic and take into account the utility of their children; however, they evaluate their children's actions based on their own preferences. This approach reflects the idea that parents are paternalistic. Let U_{t-1}^i and V_t^{ij} denote the expected net payoff to type-i entrepreneurs of generation $t-1$ deriving from their own activity in the working phase and the one deriving from the activity in the working phase of their type-j children, respectively. The expected lifetime utility of a type-i entrepreneur of generation

[10] If parents can increase the probability that their children become bad, namely f_t^i can take negative values, the proportion of good entrepreneurs is smaller. However, the qualitative result does not change.

$t-1$ is given by

$$U^i_{t-1} + (\delta + f^i_{t-1})V^{iG}_t + (1 - \delta - f^i_{t-1})V^{iB}_t - \frac{(f^i_{t-1})^2}{2\gamma}, \tag{11}$$

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

Lenders do not have information about the entrepreneurs of past generations. Under this situation, in period t, all entrepreneurs are considered that their true type is good with probability ϕ_t, which is a proportion of good entrepreneurs. Thus, the only state variable that changes over time is the level of trust ϕ_t.

We focus on Markovian strategies, such that the strategies selected by agents only depend on the current state variable ϕ_t. Because old entrepreneurs influence their children only through education, their lifetime utility (11) implies that their decisions in the working phase are made independently of their decisions in the retirement phase; that is, the entrepreneurs of generation t make decisions on voting, contracts, and cheating to maximize U^i_t. This allows us to apply the result of Section 3 to this dynamic setting. Proposition 1 and Proposition 2 imply that given ϕ_t, in equilibrium the contract and level of enforcement are given by

$$r_t = r(\phi_t) = \frac{I - (1 - \phi_t p)\tau(\phi_t)C}{\phi_t p}, \tag{12}$$

and

$$\tau_t = \tau(\phi_t) \begin{cases} = 1 & \text{if } 1/2 \leq \phi_t, \\ = \underline{\tau}(\phi_t) & \text{if } \underline{\phi} \leq \phi_t < 1/2, \\ \in [0,1] & \text{otherwise}, \end{cases} \tag{13}$$

respectively. When good (bad) entrepreneurs constitute the majority in period t, the strong (weak) enforcement regime emerges during the period. Correspondingly, the equilibrium

payoffs of entrepreneurs with type $i \in \{G, B\}$ in the working phase are given by

$$U_t^G = U^G(\phi_t) = pR - \frac{I}{\phi_t} + \frac{1-\phi_t}{\phi_t}\tau(\phi_t)C, \tag{14}$$

$$U_t^B = U^B(\phi_t) = b^B - \tau(\phi_t)C, \tag{15}$$

where (14) and (15) are derived from (5) and (6), respectively.

4.2 Educational Choice

Next, consider parental education. Because the payoffs of entrepreneurs of generation t in the working phase depend only on ϕ_t from (14) and (15), so does their parents' payoff; that is, $V_t^{ij} = V^{ij}(\phi_t)$. From (11), the parental optimization problem becomes

$$\max_{f_{t-1}^i \geq 0} (\delta + f_{t-1}^i)V^{iG}(\phi_t) + (1 - \delta - f_{t-1}^i)V^{iB}(\phi_t) - \frac{(f_{t-1}^i)^2}{2\gamma}. \tag{16}$$

When the type of a parent and a child is the same (i.e., $i = j$), the parent receives the same utility as the child: $V^{GG}(\phi_t) = U^G(\phi_t)$ and $V^{BB}(\phi_t) = U^B(\phi_t)$. When the type of a parent and a child is different (i.e., $i \neq j$), the idea of imperfect empathy comes in. Parents evaluate their children's actions based on their own values:

$$V^{BG}(\phi_t) = pR - \frac{I}{\phi_t} + \frac{1-\phi_t}{\phi_t}\tau(\phi_t)C - \Delta. \tag{17}$$

$$V^{GB}(\phi_t) = b^G - \tau(\phi_t)C. \tag{18}$$

(17) shows that bad parents consider that investment made by their good children entails psychological cost Δ, although their good children do not incur such a cost. (18) shows that good parents consider cheating by their bad children to be shameful conduct and evaluate the private benefits as b^G but not b^B, the benefits that their bad children indeed obtain.

Under Assumption 2, we have $V^{BG}(\phi_t) < V^{BB}(\phi_t)$, meaning that a bad parent receives

a higher payoff by having a bad child than by having a good child. Thus, bad parents do not have an incentive to educate their children, that is, $f_{t-1}^{B} = 0$ for any period. By contrast, in equilibrium, good parents always prefer to invest rather than cheat, implying that $V^{GG}(\phi_t) \geq V^{GB}(\phi_t)$ and they have an incentive to exert educational effort. The optimal educational level $f^{G}(\phi_t)$ is determined at the point at which its marginal benefit equals its marginal cost:

$$\frac{1}{\phi_t}\left[\phi_t\left(pR - b^{G}\right) + \tau(\phi_t)C - I\right] = \frac{f^{G}(\phi_t)}{\gamma}. \tag{19}$$

(19) indicates that parents' expectation about the future level of trust ϕ_t not only directly influences the optimal level of education, but also indirectly affects it through a change in enforcement quality. The effect from the future quality of enforcement to the current educational choices generates the mechanism through which the complementarity between trust and enforcement emerges.

To simplify the analysis, we assume that on the equilibrium path the level of enforcement $\tau(\phi_t)$ is positive; that is, $\underline{\tau}(\phi_t) > 0$ for any $\phi_t \in [\delta, 1/2)$.[11] By substituting the equilibrium level of enforcement (13) into (19), we have the optimal level of educational effort:

$$f^{G}(\phi_t) = \begin{cases} f_s(\phi_t) = \gamma\left[pR - b^{G} - \dfrac{I - C}{\phi_t}\right] & \text{if } \dfrac{1}{2} \leq \phi_t, \\ f_w(\phi_t) = \max\left\{\gamma\left(\dfrac{I - \phi_t pR}{1 - \phi_t} - b^{G}\right), 0\right\} & \text{if } \delta \leq \phi_t < \dfrac{1}{2} \end{cases} \tag{20}$$

When parents expect that $\phi_t \geq 1/2$ and the strong enforcement regime appears, there is *cultural complementarity*; that is, the optimal level of education $f_s(\phi_t)$ is increasing in ϕ_t, meaning that good parents have more incentive to exert educational effort as good types will be more dominant in the population of the next generation. A higher ϕ_t decreases the extent of cross-subsidization by good entrepreneurs and raises their payoff $U^{G}(\phi_t)$ and their good parents' payoff $V^{GG}(\phi_t)$, encouraging parental education.

[11] If $\tau(\phi_t) = 0$ in a certain range of ϕ_t, multiple steady states might emerge under the weak enforcement regime. However, because such multiplicity is outside our interests, we focus on the situation in which $\tau(\phi_t) > 0$ for any ϕ_t.

When parents expect that $\phi_t < 1/2$ and the weak enforcement regime appears, their educational level is given by $f_w(\phi_t)$. For any $\phi_t \in [\delta, (I - b^G)/(pR - b^G))$, although good parents receive zero payoff from their good children ($V^{GG} = 0$), they exert educational effort because they must incur a negative payoff from their bad children ($V^{GB} < 0$). In this situation, there is *cultural substitution*; that is, the educational level $f_w(\phi_t)$ is decreasing in ϕ_t, meaning that good parents have less incentive to educate their children as good types will be more dominant in the children's generation. The higher degree of trust enhances entrepreneurs' ability to attract funds and induces bad entrepreneurs to weaken enforcement. Since this benefits bad children and hurts good children, parental education is discouraged. For any $\phi_t \in [(I - b^G)/(pR - b^G), 1/2)$, a good parent is indifferent between having a good and a bad child ($V^{GG} = V^{GB}$) and thus do not have an incentive to exert educational effort. Hereafter, we assume that the exogenous probability that a good child is born δ is low such that $\delta < (I - b^G)/(pR - b^G)$ to guarantee that good parents exert positive levels of educational efforts under the weak enforcement regime.

4.3 Dynamic Analysis: Steady States

We move onto the analysis of the dynamics. Trust evolves according to

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

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

By combining (21) with (20), we characterize the complete dynamics of the level of trust. Figure 4 plots the evolution of trust and the steady states. When old entrepreneurs expect $\phi_t \geq 1/2$ in the next period, as the current level of trust ϕ_{t-1} increases, they are more willing to exert educational effort because of cultural complementarity, leading trust to accumulate faster. The strong enforcement regime has at most one steady state at which the level of

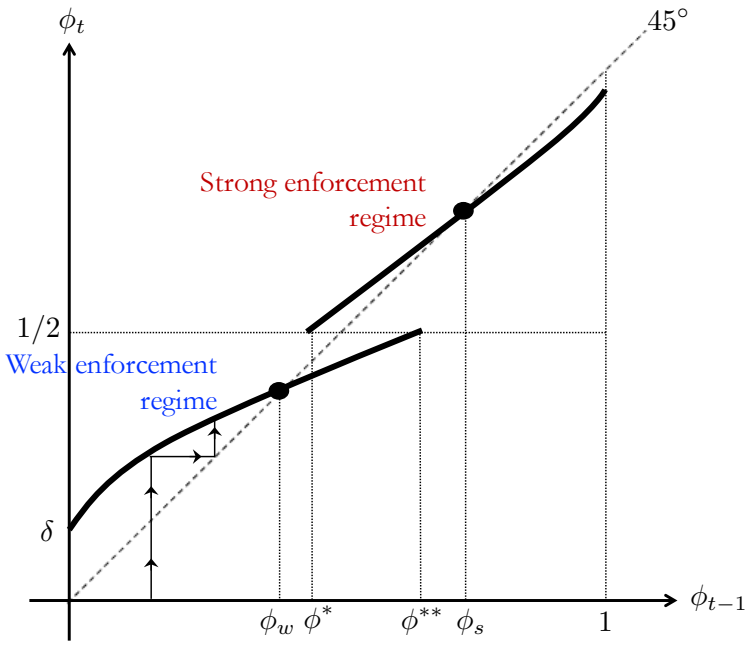


Figure 4: Multiple stable steady states

trust is given by

$$\phi_s = \frac{\delta - \gamma(I - C)}{1 - \gamma(pR - b^G)}. \tag{22}$$

When old entrepreneurs expect $\phi_t < 1/2$ in the next period, as the current level of trust ϕ_{t-1} is higher, they are less willing to exert educational effort because of cultural substitution, slowing the cultivation of trust. The weak enforcement regime also has at most one steady state at which the steady-state level of trust ϕ_w is such that

$$\phi_w = \frac{(\phi_w - \delta)(1 - \phi_w)}{\gamma[I - b^G - \phi_w(pR - b^G)]}. \tag{23}$$

To ensure the existence of both steady states, we assume that $\phi_w < 1/2$ and $\phi_s \geq 1/2$:

Assumption 5

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

This assumption is more likely to hold when productivity p or R is higher, or fixed cost I is lower (we discuss the effect of higher productivity in detail in Section 5.1). Under Assumption 5, there are multiple steady states with different levels of trust, enforcement,

and economic development. One steady state is characterized by a high level of $\phi_s \geq 1/2$, perfect enforcement, and high aggregate output $\phi_s(pR - I)$, whereas the other steady state is characterized by a low level of trust $\phi_w < 1/2$, weak enforcement $\underline{\tau}(\phi_w)$, and low aggregate output $\phi_w(pR - I)$.

Proposition 3 *Suppose that Assumptions 1–5 hold. There exist two steady states: the one with ϕ_s given by (22) has greater trust, stronger enforcement, and higher aggregate output than the other with ϕ_w given by (23).*

Proof. See Appendix B. ■

Across the multiple steady states, there is a positive relationship among the level of trust, quality of enforcement, degree of financial development (measured by the cost of external financing r), and level of aggregate output. This is consistent with the observed variation across countries or regions.

These multiple steady states come from the complementarity between trust and enforcement through a regime change. In a high-trust economy, good entrepreneurs have political power and demand strong enforcement. Such strong enforcement in turn encourages civic education exerted by parents and cultivates trust. On the contrary, in a low-trust economy, bad entrepreneurs exert their political power and weaken enforcement. The weak enforcement in turn diminishes the educational incentives and leads to a low level of trust.

4.4 Dynamic Analysis: Transitional Dynamics

Figure 4 suggests that both the initial level of trust ϕ_0 and parents' expectations play a role in selecting the steady state at which the economy will end up. If $\phi_w < \phi^* \equiv (1/2 - \delta)/f_s(1/2)$, in an economy with the initial level of trust $\phi_0 < \phi^*$, there exists a unique equilibrium path converging to the steady state represented by ϕ_w, along which entrepreneurs choose the educational level $f_w(\phi_t)$ and the weak enforcement regime persists. If $\phi_s > \phi^{**} \equiv (1/2 - \delta)/f_w(1/2)$, in an economy with the initial level of trust $\phi_0 \geq \phi^{**}$, there is a

unique equilibrium path converging to the steady state represented by ϕ_s, along which the educational level is $f_s(\phi_t)$ and the strong enforcement regime persists. In these situations, preconditions determine the equilibrium path and resulting steady state.

Otherwise, multiple equilibria are possible. In an economy in which the level of trust reaches a region, $[\phi^*, \phi^{**}]$, if a good parent anticipates that other parents exert high (low) levels of educational effort and the level of trust in the next period is high (low) such that the strong (weak) enforcement regime appears, the good parent also exerts high (low) levels of educational effort, resulting in the high-trust (low-trust) economy. Thus, expectations matter in selecting the steady state in which the economy will eventually reach.

Proposition 4 *Suppose that Assumptions 1–5 hold. 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. Otherwise, both steady states can be reached.*

Proposition 4 resonates with the empirical findings on the persistent effects of historic shocks on levels of trust, institutions, and economic development. When 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) influences beliefs in the trustworthiness in society, the resulting trust persists in the long run and has long-lasting effects on economic development. Our model suggests that a historic shock that cultivates (destroys) trust is long-lasting because it leads to strong (weak) enforcement through the political process, which in turn encourages (discourages) the formation of trust through parental education.

La Porta et al. (1998, 2008) emphasize the influence of the legal origin on the legal protection of investors and the degree of financial development. French civil law countries are more likely to adopt weak legal protection and have less developed financial markets than English common law countries. Our model helps explain this legal origin theory based on La Porta et al.'s (2008) argument that the French civil law system embeds the beliefs that a country needs to be concerned with private disorder, whereas a 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 through conquest and colonization changes peoples' mindsets and brings about distrust in other people, the transplantation of common law encourages the formation of trust in others. Therefore, by interpreting the transplantation of civil (common) law as a trust-destroying (trust-building) historic shock, we can argue that such a shock has a long-lasting effect on institutions through the interaction with the political process and parents' education choices.

Moreover, Proposition 4 has empirical implications. Whether trust and legal enforcement are complements or substitutes 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 the short run, however, trust and enforcement may be substitutes. Along the adjustment path converging to the steady state characterized by the low level of trust ϕ_w, greater trust increases entrepreneurs' ability to receive financing and thus allows a society to weaken enforcement further. When bad entrepreneurs have political power, they attempt to increase their rents by taking advantage of beneficial effects for good entrepreneurs. This mechanism is also important to understand the effect of innovations in the next section.

5 The Effect of Innovation

We next focus on two types of innovations: technological innovation, which increases the productivity of projects, and contractual innovation, which enhances the flexibility of contracts. Both types of innovations promote transactions and benefit entrepreneurs, who need a large amount of funds to run their productive projects. However, less developed economies have not received the benefits of these innovations even though their ideas and knowledge spread instantly across countries (Basu and Weil, 1998 and Acemoglu and Zilibotti, 2001). In this section, we show that innovations enrich a developed economy that has already cultivated trust but impoverish an underdeveloped economy that has been plagued by mistrust.

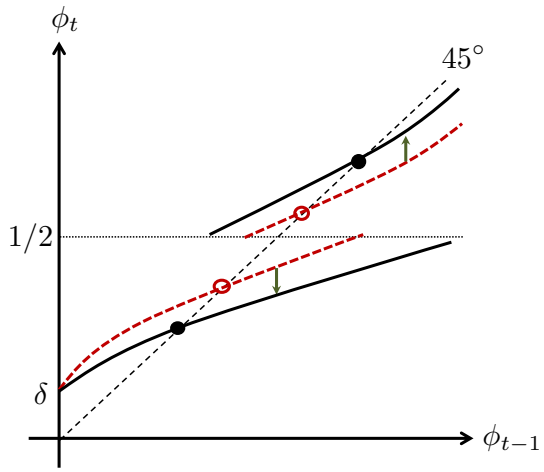


Figure 5: The effect of technological change (increase in R)

5.1 Technological Innovations

We consider the effect of technological advancements captured by an increase in project return R.[12] Figure 5 depicts its effect on the evolution of trust. In the strong enforcement regime, the increase in R raises the good entrepreneur's payoff and this encourages education exerted by good parents, followed by an upward shift in the curve corresponding to the dynamic equation (21). The steady-state level of trust ϕ_s and corresponding aggregate output are higher. In the weak enforcement regime, however, higher R enhances entrepreneurs' ability to attract funds and allows uncivic entrepreneurs to weaken enforcement, which discourages educational effort and makes the curve corresponding to (21) shift downward. The steady-state level of trust ϕ_w then decreases. If this negative effect exceeds the positive effect of the increase in R, steady-state aggregate output also drops.

Moreover, the region in which the enforcement regime in the next period depends on expectations, $[\phi^*, \phi^{**}]$, widens. In a wider range of the initial level of trust, expectations determine the long-run outcome. In a narrower range of the initial level of trust, the precondition matters in selecting the steady state in which the economy will end up. This means that technological innovations increase the relative importance of expectations over the initial condition.

[12] An increase in p and a decrease in I are also interpreted as technological progress. These changes have the same effect as an increase in R.

Proposition 5 *Suppose that R increases. ϕ_s and aggregate output at the steady state ϕ_s increase. ϕ_w and $\tau(\phi_w)$ decrease. When $\delta < (1+\gamma b^G)\phi_w^2$, aggregate output at the steady state ϕ_w also decreases. Moreover, the width of the region, $[\phi^*, \phi^{**}]$, increases.*

Proof. See Appendix C. ■

Proposition 5 implies that technological progress exacerbates the level of inequality in trust, institutions, and aggregate output between steady states even though any economy can access the same technology. As a result of technological innovations, the economy that reaches the high-trust steady state cultivates trust further and becomes more prosperous, whereas the economy that ends up in the low-trust steady state suffers from lower institutional quality and a more severe trust deficit, which causes poorer economic performance. While the existing literature emphasizes the differences in the capital/labor ratio (Basu and Weil, 1998) and in skill supplies (Acemoglu and Zilibotti, 2001), in our model, the difference in the level of trust determines the effectiveness of technological innovations. This result may explain why Latin American countries stagnated in the 1990s despite technological advances. These countries exhibited a low level of trust in other people and experienced a further decline in trust after market liberalization, which increased the opportunity to acquire advanced knowledge and incorporate better technology.[13] Our theory suggests that the adverse effect of the decline in trust might offset the beneficial effect of technology transfer and prevent economic development.

5.2 Contractual Innovations

We have thus far focused on a simple financial contract that determines only compensation in the case of success. Such a restriction on contracting results in the pooling contract. In this section, we consider more sophisticated contracts that allow a good entrepreneur to be

[13]The Latinobarómetro measures trust as the share of respondents who say "You can trust most 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 declined from 20 percent in 1996 to 15 percent in 2000. For each country, for example, the level of trust declines from 23 to 11 percent in Argentina, from 11 to 4 percent in Brazil, and from 33 to 23 percent in Uruguay.

distinguished from a bad one. We show that although such a separating contract benefits the good entrepreneur, in the long run it may allow a society under the weak enforcement regime to worsen enforcement quality and cause trust to collapse.

We modify the contract structure in two ways as in Tirole (2006, Chapter 6). First, contractual terms contain not only the lenders' stake r but also the probability of providing funds I, $x \in [0,1]$, and the lump-sum payment to an entrepreneur in the case of no financing, $T \geq 0$. Second, these contractual terms depend on entrepreneurs' type. Thus, in period t, an entrepreneur offers an "option contract," $\{(r_t, x_t, T_t), (\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)\}$, that is, if lenders accept the contract, the entrepreneur chooses between (r_t, x_t, T_t) and $(\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)$. Without loss of generality, we assume that the option contract is incentive compatible; that is, good entrepreneurs prefer the contractual terms (r_t, x_t, T_t) to $(\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)$ and bad entrepreneurs prefer $(\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)$ to (r_t, x_t, T_t). Given the level of trust ϕ_t and strength of enforcement τ_t, the optimal contract solves the following problem:

$$\max_{r_t, x_t, T_t, \tilde{r}_t, \tilde{x}_t, \tilde{T}_t} x_t \left[p(R - r_t + C) + (1-p)(1-\tau_t)C\right] + (1 - x_t)(T_t + C) \tag{24}$$

subject to

$$\phi_t \left[x_t\{pr_t + (1-p)\tau_t C - I\} - (1 - x_t)T_t\right] + (1 - \phi_t)\left[\tilde{x}_t(\tau_t C - I) - (1 - \tilde{x}_t)\tilde{T}_t\right] \geq 0, \tag{25}$$

$$p(R - r_t) - (1-p)\tau_t C \geq b^G - \tau_t C, \tag{26}$$

$$x_t \left[p(R - r_t + C) + (1-p)(1-\tau_t)C\right] + (1 - x_t)(T_t + C)$$
$$\geq \tilde{x}_t \left[p(R - \tilde{r}_t + C) + (1-p)(1-\tau_t)C\right] + (1 - \tilde{x}_t)(\tilde{T}_t + C), \tag{27}$$

$$\tilde{x}_t \left[b^B + (1-\tau_t)C\right] + (1 - \tilde{x}_t)(\tilde{T}_t + C) \geq x_t \left[b^B + (1-\tau_t)C\right] + (1 - x_t)(T_t + C). \tag{28}$$

The objective function (24) is the gross utility of good entrepreneurs. (25) is lenders' IR constraint. (26) requires that good entrepreneurs prefer investing to cheating. (27) requires that good entrepreneurs choose (r_t, x_t, T_t) and (28) requires that bad ones choose $(\tilde{r}_t, \tilde{x}_t, \tilde{T}_t)$.

The optimal contract must be designed to induce good entrepreneurs to invest and set $x_t = 1$. This implies that there is no need to provide good entrepreneurs with the transfer, that is, $T_t = 0$. It is desirable for good entrepreneurs to prevent bad ones from receiving funds I through a minimum lump-sum payment because their cheating is socially wasteful from Assumption 1. This implies that $\tilde{x}_t = 0$ and $\tilde{T}_t$ is determined at which (28) binds, that is, $\tilde{T}_t = b^B - \tau_t C$. In that case, $\tilde{r}_t$ becomes irrelevant to any payoff and constraint and takes any value in $[0, R]$. Because a lower r_t increases the payoff (24) and relaxes both constraints (26) and (27), good entrepreneurs decrease r_t until (25) binds.

Consequently, this contract is feasible if (27) is satisfied, which is rewritten as

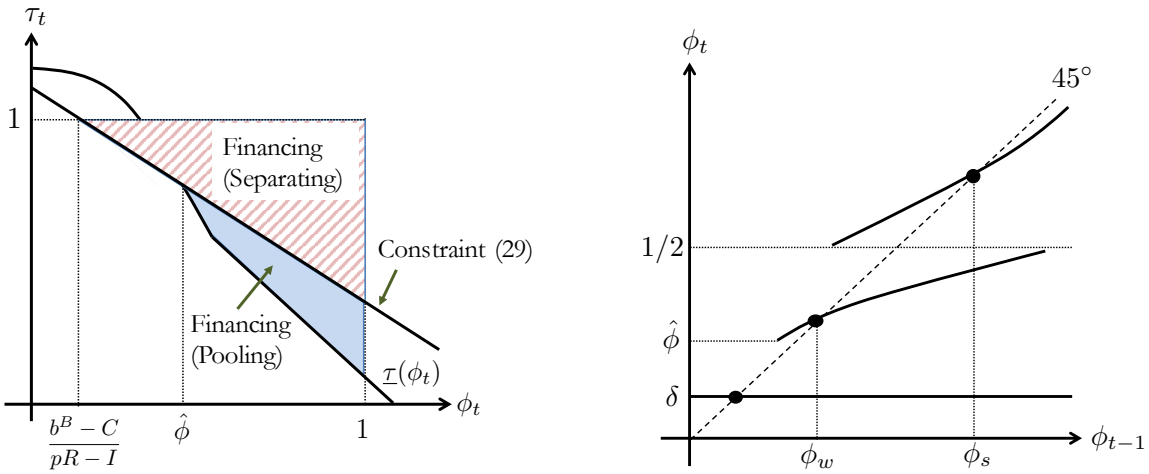
$$\tau_t C \geq b^B - \phi_t(pR - I), \tag{29}$$

where when this condition holds, (26) and the limited liability constraints also hold. Because bad entrepreneurs can receive a lump-sum payment $\tilde{T}_t$ even without any activity, good entrepreneurs have an incentive to mimic bad ones to receive that payment. If (29) is violated, the separating equilibrium unravels and instead a pooling equilibrium emerges in which any entrepreneur secures financing or no one does, as shown in Proposition 1. If (29) holds, we assume that entrepreneurs offer the separating contract because it benefits good entrepreneurs and does not hurt bad ones compared with the pooling contract.[14]

The equilibrium contract is depicted in Figure 6a. Contractual innovation enhances entrepreneurs' ability to attract funds and provide a low-trust economy with the opportunity to obtain financing. When the level of trust ϕ_t is higher than a threshold given by $\hat{\phi}$, however, it is less feasible to offer the separating contract than the pooling one because of the incentive problem of good entrepreneurs. Thus, there is a region in which only pooling contracts are feasible, as shown in the shaded blue area.

Although contractual innovation is beneficial at the stage of contracting, it can be detri-

[14]Based on the perfect sequential equilibrium concept as discussed in footnote 7, as long as (29) holds, the unique equilibrium features the separating contract.



(a) Financing condition (b) Trust collapse

Figure 6: The effect of contractual innovation

mental to good entrepreneurs once we consider the political economy. Figure 6a implies that when $\phi_t \geq \min\{\hat{\phi}, 1/2\}$, the equilibrium level of enforcement is unaffected. By contrast, when $(b^B - C)/(pR - I) \leq \phi_t < \min\{\hat{\phi}, 1/2\}$, bad entrepreneurs lower the level of enforcement τ_t further because contractual innovation enhances entrepreneurs' ability to secure financing. Thus, the equilibrium level of τ_t is determined at which (29) binds.

The deterioration of enforcement quality under the weak enforcement regime discourages parental education. When (29) binds, a good parent is indifferent between having a good and a bad child (i.e., $V^{GG} = V^{GB}$) and thus has no incentive to exert educational effort. As shown in Figure 6b, this generates the steady-state economy with the lowest level of trust δ in which no one exerts educational effort. An economy with any initial condition can end up in the steady state δ; that is, if a parent expects that other parents will not educate their children, the parent also has no incentive to exert educational effort and the initial expectation is justified. Thus, contractual innovation does not help an economy escape the underdevelopment trap and rather can lead to trust collapsing.

Proposition 6 *Consider a dynamic economy with contractual innovation, starting with an*

initial condition $\phi_0 > 0$. *Suppose that*

$$\delta \leq \frac{I - b^B}{2(pR - I)} \left(-1 + \sqrt{1 + 4\frac{pR - I}{I - b^B}} \right). \tag{30}$$

The dynamics of trust are governed by $\phi_t = \delta + \phi_{t-1} f^{CI}(\phi_t)$, *where*

$$f^{CI}(\phi_t) = \begin{cases} \gamma \left[pR - I - \dfrac{b^B - C}{\phi_t} \right] & \text{if } \dfrac{1}{2} \leq \phi_t, \\ f_w(\phi_t) & \text{if } \hat{\phi} \leq \phi_t < \dfrac{1}{2}, \\ 0 & \text{if } \phi_t < \min\left\{ \hat{\phi}, \dfrac{1}{2} \right\}. \end{cases} \tag{31}$$

Then, there exists an equilibrium path toward the steady state with the level of trust δ.

Proof. See Appendix D. ■

6 The Effect of Educational Policies

Although we have focused on family-led civic education, public education also plays an important role in nurturing civic virtues. In this section, we consider two types of public civic education policies and show that they are effective for an economy to escape the underdevelopment trap. The first is to spend resources on a few children to increase the proportion of those with civic values. In Section 6.1, such concentrated educational investment encourages parental education and cultivates trust. The second policy is to use educational resources extensively and narrow the difference in values between children with civic values and those with uncivic values. In Section 6.2, such extensive investment in education enables private contracts supported by sufficient enforcement quality to resolve agency problems and allows the economy to achieve economic prosperity without relying on civic values.

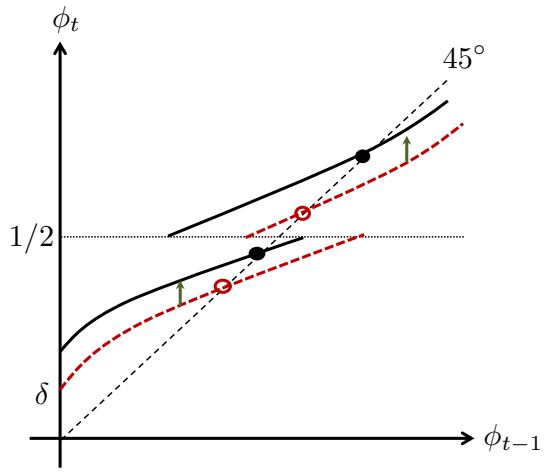


Figure 7: The effect of concentrated educational investment (increase in δ)

6.1 Concentrated Educational Investment

We now return to the model of Section 4. We consider the concentrated educational investment that increases the proportion of good entrepreneurs regardless of parental education, δ. A higher δ not only directly increases the number of good children but also raises the optimal level of parental education by improving contractual terms $r(\phi_t)$. The combination of public and family-led civic education fosters trust in the strong enforcement regime and the steady-state level of trust ϕ_s increases, as shown in Figure 7. In the weak enforcement regime, although higher trust leads to a lower quality of enforcement and discourages parental education, this crowding-out effect is dominated by the direct effect of public education. As a result, the steady-state level of trust ϕ_w also increases.

Proposition 7 *We have*

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

Proof. See Appendix E. ■

Proposition 7 implies that the effect of public education policy on inequality between steady-state economies depends on the scale of public education spending. If the effect of educational policy is small (i.e., an increase in δ is small), the economy that reaches the

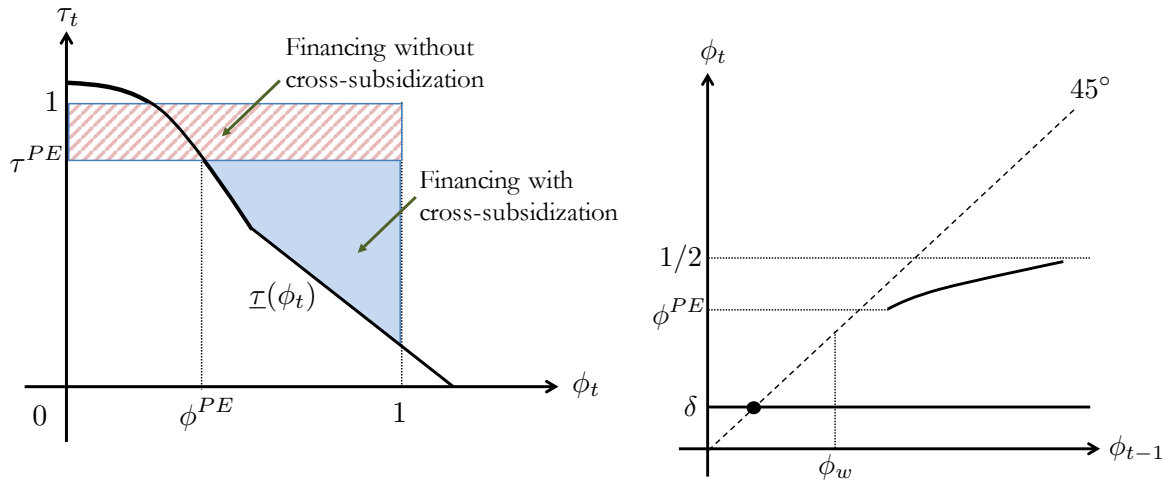
low-trust steady state experiences the smaller increase in the level of trust and aggregate output than the economy that reaches the high-trust steady state, exacerbating the level of inequality. If the effect of public education is sufficiently large (i.e., an increase in δ is large), the economy that has been trapped in the low-trust steady state jumps on the path toward a high-trust steady state. Thus, any economy converges to the high-trust steady state and the initial inequality vanishes.

6.2 Extensive Educational Investment

Extensive public education helps agents with uncivic values revise their own value and narrows their differences from agents with civic values. We capture this effect as a decrease in Δ and focus on the situation in which Δ becomes small such that Assumption 2 does not hold. Figure 8a displays the effect of extensive educational investment on financial contracts. When the level of enforcement τ_t is lower than the threshold $\tau^{PE} \equiv (b^B - pR + I + \Delta)/C$, financial contracts remain unaffected and feature the cross-subsidization of bad entrepreneurs by good ones. However, when $\tau \geq \tau^{PE}$, financial contracts can induce even bad entrepreneurs to invest in projects. This implies that good entrepreneurs can obtain financing without incurring the cost of cross-subsidization and then the economy achieves the first-best level of aggregate output, $pR - I$.

At the stage of voting, when $\phi_t \geq 1/2$, good entrepreneurs select any $\tau_t \geq \tau^{PE}$ because without cross-subsidization, they receive the entire social surplus and their payoff is independent of the level of enforcement. When $\phi^{PE} < \phi_t < 1/2$, where ϕ^{PE} is such that $\tau^{PE} = \underline{\tau}(\phi^{PE})$, bad entrepreneurs choose $\underline{\tau}(\phi_t)$. When $\phi_t \leq \phi^{PE}$, they choose any $\tau_t \geq \tau^{PE}$ because the payoff of bad entrepreneurs who secure financing without cross-subsidization is also independent of the level of enforcement.

Parents' optimization problem (16) and the dynamics of ϕ_t (21) change, as shown in Figure 8b. If anticipating that ϕ_t is in the range $[1/2, 1]$ or $[\delta, \phi^{PE}]$, parents expect that the resulting strength of enforcement is higher than τ^{PE} and have no incentive to exert



(a) Financing condition (b) Unique steady state

Figure 8: The effect of extensive educational investment

educational effort because both good and bad children will invest, leading to $V^{GB}(\phi_t) = V^{GG}(\phi_t)$. The realized proportion of good entrepreneurs must then be $\phi_t = \delta$. This means that there exists a steady state at which $\phi_t = \delta$ and that the situation in which $\phi_t \geq 1/2$ or $\delta < \phi_t < \phi^{PE}$ is out of the equilibrium path. Thus, the steady state under the strong enforcement regime ϕ_s disappears and, if $\phi_w < \phi^{PE}$, the steady state under the weak enforcement regime also vanishes. In this situation, there exists a unique steady state δ to which any economy converges.

Although the proportion of good entrepreneurs is only δ, this steady-state economy achieves the first-best level of aggregate output because any entrepreneur invests in the project. Our analysis suggests that if public education aligns the incentives of bad entrepreneurs with those of good entrepreneurs, high degrees of financial and economic development can be supported only by institutions.

7 Robustness

In this section, we discuss the assumptions and check the robustness of our conclusions.

7.1 Collateral Value

We assumed that the collateral value is lower than the private benefit from Assumption 3. Under this assumption, bad entrepreneurs always find it profitable to cheat. If the collateral value is high such that $C > b^B$, for any $\tau_t > b^B/C$, cheating is no more profitable and bad entrepreneurs choose to exit financial markets. However, in the weak enforcement regime, bad entrepreneurs can avoid such a situation by weakening enforcement. In equilibrium, as the collateral value rises, the quality of enforcement is lower, leaving the effective collateral value $\tau_t C$ constant. Therefore, collateral does not work as a sorting device in the weak enforcement regime and the change in the collateral value does not affect educational incentives and the dynamics of trust.

7.2 Implementation of Laws

We have thus far assumed that any legal rule that influences the quality of enforcement is implemented when it is determined through voting. In other contexts, it could be that the implementation of law is imperfect and that its degree depends on the level of civicness in the economy. The underlying idea behind this is that in a society in which uncivic values are more dominant, public officials are more likely to be corrupt and have lower ability to implement legal rules. We can incorporate this idea by introducing the upper bound of τ_t depending on the proportion of the good type ϕ_t. In the voting stage, agents choose any level of enforcement in the region of $[0, \overline{\tau}(\phi_t)]$, where $\overline{\tau}(\phi_t)$ is increasing in ϕ_t. This restriction prevents agents from selecting a high quality of enforcement in an economy with low ϕ_t. However, because such a low-trust economy prefers weak enforcement, this alternative setup does not change our conclusion.

8 Concluding Remarks

This study examines the coevolution of trust and contract enforcement and derives its implications for development. When financial contracts are characterized by cross-subsidization, the model features complementarity between trust and enforcement. This leads to an underdevelopment trap with mistrust and weak enforcement, creating room for policy intervention. Technological and contractual innovation adversely affect an economy trapped in such a state by exacerbating the lack of trust and institutional quality, whereas public education has the potential to drive the economy out of the trap.

We conclude with remarks on issues not covered in any depth in this study. While in our model, the quality of legal enforcement evolves endogenously, we do not consider the dynamics of institutional quality. However, the current institutional quality could affect the future institutional quality because an adjustment cost is present or the distribution of political power changes. The analysis of such a dynamic linkage is a promising area left for future research.

From a policy perspective, our model emphasizes the effect of public education. However, the provision of public schooling could be the result of a political decision. In that context, uncivic citizens that constitute the majority might disagree with investment in public education because they fear that this policy increases the proportion of civic citizens and causes a shift of political power to them. The political economy of public education is also an important issue for understanding the formation of trust.

Appendix A Proof of Lemma 1

Proof. Let us define

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

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

If $\phi \in [0, (I - b^G)/(pR - b^G)]$, we have $\Psi_2 \geq \Psi_1$. This means that (4) and (7) hold when $\tau \geq \underline{\tau}(\phi) = \Psi_2(\phi)/C$. If $\phi \in ((I - b^G)/(pR - b^G), I/(pR - b^G)]$, we have $\Psi_2 < \Psi_1$. This means that (4) and (7) hold when $\tau \geq \underline{\tau}(\phi) = \Psi_1(\phi)/C$. If $\phi > I/(pR - b^G)$, (4) and (7) hold for any τ and thus we set $\underline{\tau}(\phi) = 0$. ■

Appendix B Proof of Proposition 3

Proof. First, given that $f_{t-1}^G = f_s(\phi_t)$, the dynamic equation (21) is rewritten as

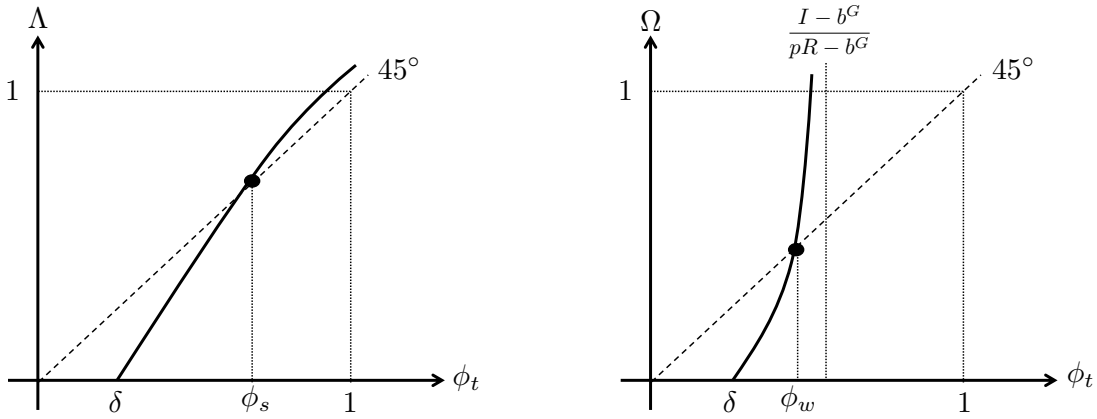
$$\phi_{t-1} = \Lambda(\phi_t) = \frac{(\phi_t - \delta)\phi_t}{\gamma[\phi_t(pR - b^G) - (I - C)]}. \tag{32}$$

As shown in Figure 9a, we have $\Lambda(\delta) = 0$ and for any $\phi_t \geq \delta$,

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

because $\delta > \underline{\phi} \geq (I - C)/(pR - b^G)$ from (9). Since we assume that γ is sufficiently small to rule out the corner solution, we have $\Lambda(\phi_t) > (\phi_t - \delta)\phi_t/(1 - \delta)$, which implies that $\Lambda(1) > 1$. Thus, there exists a unique fixed point ϕ_s such that $\phi_s = \Lambda(\phi_s) \in (\delta, 1)$ given by (22). When $\phi_s \geq 1/2$, ϕ_s is the steady state under the strong enforcement regime.

Next, consider $f_{t-1}^G = f_w(\phi_t)$. If $\phi_t \geq (I - b^G)/(pR - b^G)$, from (20) and (21), we have $f_w(\phi_t) = 0$ and $\phi_t = \delta$, implying that $\delta \geq (I - b^G)/(pR - b^G)$. Because this is inconsistent with the assumption that $\delta < (I - b^G)/(pR - b^G)$, ϕ_t must be in the range $(\delta, (I - b^G)/(pR - b^G))$,



(a) When $f^G_{t-1} = f_s(\phi_t)$ (b) When $f^G_{t-1} = f_w(\phi_t)$

Figure 9: A fixed point

where $(I - b^G)/(pR - b^G) < 1$ from Assumption 1. The dynamic equation (21) becomes

$$\phi_{t-1} = \Omega(\phi_t) = \frac{(\phi_t - \delta)(1 - \phi_t)}{\gamma[I - b^G - \phi_t(pR - b^G)]}. \tag{33}$$

As shown in Figure 9b, $\Omega(\delta) = 0$,

$$\begin{aligned}\Omega'(\phi_t) &= \frac{(-2\phi_t + 1 + \delta)[I - b^G - \phi_t(pR - b^G)] + (\phi_t - \delta)(1 - \phi_t)(pR - b^G)}{\gamma[I - b^G - \phi_t(pR - b^G)]^2} \\ &= \frac{(1 - \phi_t)[I - b^G - \phi_t(pR - b^G)] + (\phi_t - \delta)(pR - I)}{\gamma[I - b^G - \phi_t(pR - b^G)]^2} > 0,\end{aligned} \tag{34}$$

and $\Omega(\phi_t) \to \infty$ as $\phi_t \to (I - b^G)/(pR - b^G)$. Thus, there exists a unique fixed point ϕ_w such that $\phi_w = \Omega(\phi_w) \in (\delta, (I - b^G)/(pR - b^G))$. When $\phi_t < 1/2$, ϕ_w is the steady state under the weak enforcement regime. ■

Appendix C Proof of Proposition 5

Proof. From (20) and (22), ϕ_s and the width of the region, $[\phi^*, \phi^{**}]$, are increasing in R. By totally differentiating (23) with respect to ϕ_w and R, we have

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

where the second equality is derived from (34) and the third equality is derived from (23). We also have

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

Then, aggregate output is given by $Y(\phi_t) = \phi_t pR$. While $Y(\phi_s)$ is increasing in R, the effect of an increase in R on $Y(\phi_w)$ is

$$\begin{aligned}\frac{\partial Y(\phi_w)}{\partial R} &= \phi_w p + pR\frac{\partial \phi_w}{\partial R} = \frac{\gamma\phi_w^3 p}{\delta(1-\phi_w)^2+(pR-I)\gamma\phi_w^2}\left[\phi_w pR - I + \frac{\delta}{\gamma}\left(\frac{1}{\phi_w}-1\right)^2\right] \\ &= \frac{\phi_w^3 p(1-\phi_w)}{\delta(1-\phi_w)^2+(pR-I)\gamma\phi_w^2}\left[\frac{\delta}{\phi_w^2}-1-\gamma b^G\right],\end{aligned}$$

where we obtain the second equality by substituting (23). When $\delta < (1+\gamma b^G)\phi_w^2$, we obtain $\partial Y(\phi_w)/\partial R < 0$. ■

Appendix D Proof of Proposition 6

Proof. Let us define $\hat{\phi}$ such that $\underline{\tau}(\hat{\phi})C = b^B - \hat{\phi}(pR - I)$:

$$\hat{\phi} \equiv \max\left\{\frac{I - b^B}{I - b^G}, \frac{I - b^B}{2(pR - I)}\left(-1 + \sqrt{1 + 4\frac{pR - I}{I - b^B}}\right)\right\}. \tag{35}$$

Because $\delta < (I - b^B)/(pR - b^B) < (I - b^B)/(I - b^B)$, when (30) holds, we have $\delta < \hat{\phi}$.

The equilibrium level of enforcement is

$$\tau^{CI}(\phi_t) = \begin{cases} \dfrac{b^B - \phi_t(pR - I)}{C} & \text{if } \dfrac{b^B - C}{pR - I} \leq \phi_t < \min\left\{\hat{\phi}, \dfrac{1}{2}\right\}, \\ \tau(\phi_t) & \text{otherwise,} \end{cases} \tag{36}$$

where $\tau(\phi_t)$ is given by (13). In equilibrium, if $\hat{\phi} \leq \phi_t < 1/2$, the pooling allocation occurs and entrepreneurs' payoffs are given by (14) and (15); otherwise, the separating allocation appears and entrepreneurs' payoffs in the working phase are given by

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

for the good type and

$$U^{B,sep}(\phi_t) = \begin{cases} \phi_t(pR - I) & \text{if } \dfrac{b^B - C}{pR - I} \leq \phi_t < \min\left\{\hat{\phi}, \dfrac{1}{2}\right\} \\ b^B - C & \text{if } \dfrac{1}{2} \leq \phi_t \end{cases} \tag{38}$$

for the bad type.

When $\hat{\phi} \leq \phi_t < 1/2$, the optimal level of education is given by (20). When $(b^B - C)/(pR - I) \leq \phi_t < \min\{\hat{\phi}, 1/2\}$, $V^{GG}(\phi_t) = U^{G,sep}(\phi_t) = U^{B,sep}(\phi_t) = V^{GB}(\phi_t)$, implying that $f^G_{t-1} = 0$. 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 $f^G_{t-1} = \gamma[pR - I - (b^B - C)/\phi_t]$. Thus, we have the

optimal educational choice given by (31). By placing this into the dynamic equation (21), we drive the dynamics of trust, as shown in Figure 6b. This implies that for any ϕ_{t-1}, if parents expect $\phi_t = \delta$, the economy converges to the steady state δ. ■

Appendix E Proof of Proposition 7

Proof. We obtain $\partial\phi_s/\partial\delta > 0$ from (22) and $\partial\tau(\phi_s)/\partial\delta = 0$ because $\tau(\phi_s) = 1$. The total differentiation of (23) with respect to ϕ_w and δ yields

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

where we obtain the second equality by using (34) and get the third equality by using (23). We also have $\partial\tau(\phi_w)/\partial\delta < 0$.

Moreover, we have

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

where the denominator is positive because γ is sufficiently small. ■

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