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UNDERDEVELOPMENT AND THE ENFORCEMENT OF LAWS AND CONTRACTS

by

Scott Freeman*

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Federal Reserve Bank of Dallas

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This paper presents a model of endogenously determined contract enforcement with two equilibria. In one, contracts are enforced and market activity is unhampered. In the other, contracts are not enforced, discouraging market activity, which leaves the nation without the resources and incentives to enforce contracts. Even identically endowed nations may therefore find themselves in very different equilibria. The model is offered to explain the wide and persistent gap between developed and undeveloped economies.

*Associate Professor of Economics, University of Texas, Austin, Texas and Visiting Scholar, Research Department, Federal Reserve Bank of Dallas. I wish to thank Stephen Polasky, Jon Sonstelie, Linda Tesar, and Neil Wallace for their helpful comments. The paper has also benefitted from the suggestions of seminar participants at Innocenzo Gasparini Institute for Economic Research, Instituto Navale di Napoli, Stanford University, and Universita di Cagliari. The views expressed in this paper are solely those of the author and should not be attributed to University of Texas or to the Federal Reserve Bank of Dallas or the Federal Reserve System.

1. Introduction

One of the greatest puzzles in all of economics and certainly the puzzle with the greatest impact on welfare is the gap between rich and poor nations. The persistence and magnitude of this gap defies all the standard explanations of classical economics. If the gap is due to differences in physical or human capital, the classical model predicts the movement or internal accumulation of such capital to close the gap. This we do not observe.[1]

What then can account for the enormous and persistent gap between rich and poor nations? The most common answer in the recent literature is that some form of increasing, or at least, non-diminishing returns generates sustainable differences in output and growth.[2] However, underdeveloped nations do not appear to be merely smaller versions of developed economies; they exhibit significant differences in political and economic structures. It is among these differences that this paper will search for the key to the gap in economic performance.

An obvious difference between developed and undeveloped economies is their legal systems. Laws and private contracts are rarely enforced in undeveloped economies.[3] It is easy to imagine how a poorly developed legal system prevents economies from developing. Without the enforcement of laws and contracts, participation in market activity is discouraged by the likely prospect that anyone engaging in market activity is unlikely to receive its full benefits. More generally, any misappropriation of market activity, by dishonest contractors, bandits, or corrupt government officials, discourages participation in the market.

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[1]See, for example, Lucas (1990).

[2]For a useful survey, see Romer (1989).

[3]Even within developed economies we find the coincidence of the most desperate pockets of poverty and the areas without effective law enforcement.

A more difficult question is why any nation, knowing the consequences, would fail to develop its legal infrastructure. A theory that starts from assumptions that some countries have more honest citizens or greater enforcement skills would not go very far in increasing our understanding of the barriers to development. We need our theory to explain not only the cost of an ineffective legal system but also why poor nations do not improve their legal system.

This paper is an attempt to formalize the role of the legal infrastructure in economic development. Its starting point is a model, presented in section 2, in which two nations, identical in tastes and technology, may display a wide difference in investment and output. In the model the enforcement of laws and contracts is needed in order to encourage productive market activity. The degree of this enforcement is chosen by a coalition of optimizing agents interested in encouraging production. The model displays two distinct equilibria -- a "rich" one, in which all laws and contracts are enforced, leaving market activity unimpeded by dishonest behavior, and a "poor" one, in which there is no enforcement, resulting in a lack of market activity, which limits the ability and the will of the government to enforce laws and contracts.

In sections 3 and 4, the paper alters the assumptions of the model in ways that illustrate environmental factors that may contribute to the likelihood that a nation may find itself poor and engulfed by corruption. The basic model is extended to show that reserves, commitment, economic coordination, and political stability can be helpful in reaching a rich equilibrium with honest behavior. The model suggests that honest behavior is more likely in an economy in the following circumstances: i) if the economy has reserves or credit that could be used to enforce honest behavior but are not subject to losses through corruption; ii) if the government can commit itself in advance to the enforcement of contracts and laws; iii) if producers can coordinate investment at a level high enough to make enforcement worthwhile; iv) if the government is stable enough to make credible a reputation for enforcement.

The extensions of the model generate additional interesting predictions. Economies with lower-value investment projects will deal with a smaller variety of agents (e.g., suppliers) in the market and will make more extensive use in production of family or social ties. There is a rich/poor gap in the sense that large differences in output may result from small differences in endowments or productivity. Dynamic versions of the model generate patterns of economic growth that include sustained, nonconverging rates of output growth, permanent economic stagnation, and abrupt take-offs in output growth. We will also find a reason that developing nations may wish to encourage investment beyond the level that would be chosen under laissez-faire even if production of one firm has no direct external effect on the productivity of another.

2. Multiple Equilibria in a Model of Contract and Law Enforcement

The model:

There are continua of measure 1 of two types of people -- producers and controllers -- in an economy lasting two periods.

Each producer is endowed in the first period with y units of non-storable time, which can be divided between leisure or production. The utility of a producer is described by a twice-continuously differentiable quasi-concave function $U(h, c)$ of his (non-negative) leisure and consumption, respectively. Consumption occurs in the second period. The first derivatives of u_h and u_c of $U(h, c)$ are finite for $h \geq 0, c \geq 0$.

A producer produces $f(k)$ units of the consumption good from k units of time, where $f(.)$ is a continuously differentiable, increasing, concave function with $f(0) = 0$ and $f'(0) < \infty$. To produce goods, a producer must deal with controllers. The market production of each producer is evenly exposed to the entire continuum of controllers. Each controller has the ability to expropriate all output falling under its control.

At the start of period 2 each controller may attempt to flee from the economy with the goods under his control. Fleeing controllers may be caught at a cost of θ (a positive constant) period 2 goods for each one caught. If $g \geq 0$ represents the period 2 resources spent on enforcement, the number of fleeing controllers caught equals g/θ. Each fleeing controller has an equal chance of being caught.[1] Let n denote the fraction of controllers that attempt to flee. It follows that the probability π that any given fleeing controller is apprehended satisfies

$$n\,\pi = g/\theta \qquad \text{for } 0 \leq g \leq \theta n.$$

$$\pi = 1 \qquad \text{for } g \geq \theta n. \qquad (1.1)$$

Resources devoted to enforcement must be committed before any controller can be apprehended. An apprehended controller can be forced to relinquish the misappropriated goods and may be punished by a means that reduces his utility by some finite z. Notice that goods returned from apprehended controllers can not be used to capture other controllers.

We may interpret the relations between controllers and producers in various ways. First, think of the two groups as parties to private contracts for production. Let controllers own a nontransferable input (specialized labor, management skills) that is essential to the production of a market good but not available to producers. Suppose the input of producers enters the production process before that of controllers, and the resulting output first enters the hands of controllers. Then producers will be forced to write contracts offering their input in return for future output, thus exposing themselves to losses from reneging on contracts. Collective action may then be needed to enforce these voluntary contracts.

Controllers may also be thought of as bandits and burglars, who are able to steal market production but not leisure. In this case the government is enforcing laws

[1]This enforcement technology is derived from an idea of Jon Sonstelie's and was applied to the question of the concentration of street crime in Freeman, Grogger, and Sonstelie (1989).

against theft. A related interpretation would define controllers as corrupt elements of the government -- perhaps police, soldiers, or bureaucrats -- that use their power over public commerce to solicit bribes or otherwise acquire market goods.

Equilibrium:

Let k denote the period 1 allocation of time to production by each producer. (Since the measure of producers and controllers is the same, k also represents the inputs under the control of each controller.) A sub-game perfect Nash equilibrium is then defined as values of g, k, and n consistent with the following sequence of decisions:

i) each producer individually chooses his input k to maximize his utility, taking as given the the behavior of the controllers;

ii) each controller decides whether or not to flee in order to maximize expected utility, taking as given the behavior of the other controllers;

iii) producers collectively choose the resources g to be devoted to enforcement, subject to the constraint that the enforcement resources do not exceed the amount repaid by non-fleeing controllers.

The enforcement decision (iii) is simple. Although enforcement is a public good, there is no disagreement about its provision because all producers face the same problem. Producers will choose to apprehend a fleeing controller if and only if the value of the goods taken, $f(k)$, exceeds the cost of enforcement, θ. Because all contracts have the same value, producers will apprehend either all who flee or no one:

$$g = \begin{cases} 0 & \text{if } f(k) < \theta, \\ \theta n & \text{if } f(k) \geq \theta\ . \end{cases} \tag{1.2}$$

The decision of each controller (ii) strongly depends on the decisions of the other controllers. An *honest* controller, one who doesn't flee, consumes zero goods. A *dishonest* or *corrupt* controller has a utility of $-z$ if caught and $f(k)$ if not caught. An controller will wish to flee if the expected return to fleeing exceeds 0. In Figure 1 the expected return to fleeing $(1-\pi)f(k) - \pi z = (1- g/\theta n)f(k) - zg/\theta n$ is shown for given positive values of g and k as a function of n.

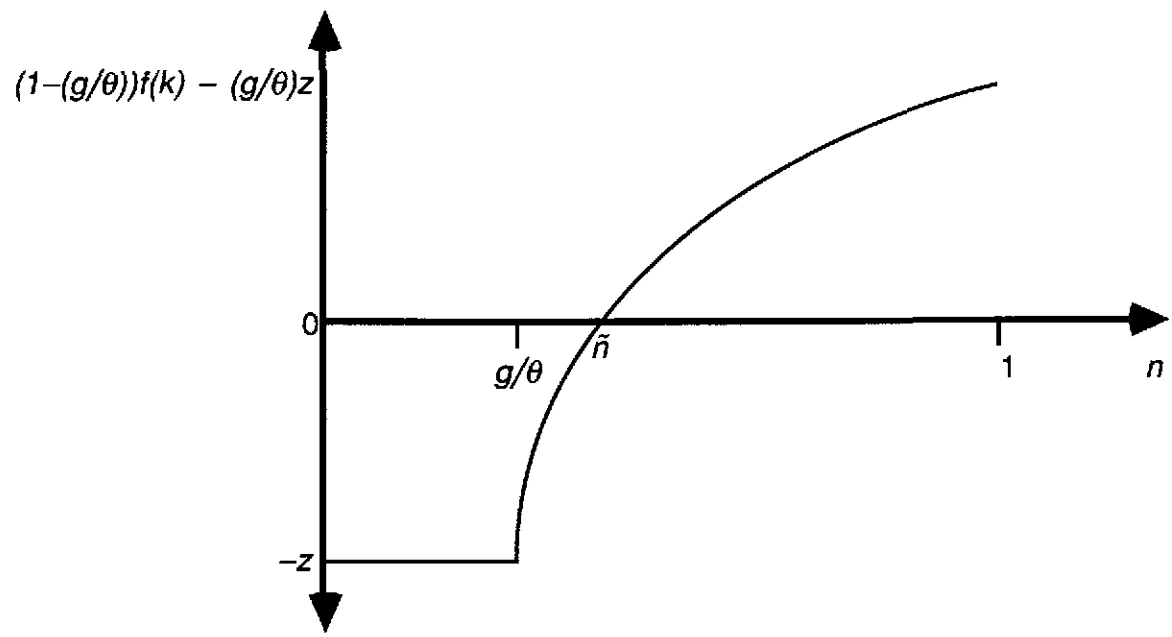

Figure 1

[The horizontal segment of the returns to dishonesty graphed in Figure 1 represents the range over which capture is certain ($\pi = 1$).]

From Figure 1 we can identify three candidates for equilibrium, $n = 0$, $n = 1$, and $n = \tilde{n}$. If $0 \leq n < \tilde{n}$, the expected return to dishonesty is below zero, implying that all controllers will be honest ($n = 0$). This candidate for equilibrium exists because the small number of dishonest controllers makes it certain that any single controller deviating from honesty will be caught. In contrast, if $\tilde{n} < n \leq 1$, the large number of dishonest controllers makes it likely that any single controller can get away with dishonest behavior. In this case all controllers will choose dishonesty ($n = 1$). These two candidates for equilibrium are stable. There is a third candidate for equilibrium at $n = \tilde{n}$, where the returns to honesty and dishonesty are equal. This equilibrium candidate, however, is unstable. If an arbitrarily small but strictly positive measure of controllers were to deviate from their equilibrium behavior, all others would deviate in the same direction so that all would be dishonest or all honest.

The analysis will concentrate on the stable equilibrium candidates at the two extremes ($n = 1$ and $n = 0$). The equilibrium condition can then be written formally as

$$n = \begin{cases} 0 & \text{if } (1 - g/\theta n)f(k) - zg/\theta n < 0 \\ 1 & \text{if } (1 - g/\theta n)f(k) - zg/\theta n > 0 \end{cases} \qquad (1.3)$$

The input decision (i) is more standard. The expected return to input is a function of the measure of honest controllers, n. A producer perfectly diversified across controllers receives $f(k)$ from each of $1\text{-}n$ honest controllers and from each of πn apprehended dishonest ones.[1] Each producer faces the budget constraints

$$y = h + k \qquad (1.4)$$

$$(1\text{-}n) f(k) + n\pi f(k) = c + g \qquad (1.5)$$

A producer choosing inputs, k, to maximize personal utility will obey the first order Kuhn-Tucker condition

$$\frac{u_h}{u_c} < (1\text{-}n) f'(0) + n\pi f'(0) = (1\text{-}n) f'(0) + (g/\theta) f'(0) \qquad \text{for } k = 0$$

$$\frac{u_h}{u_c} = (1\text{-}n) f'(k) + n\pi f'(k) = (1\text{-}n) f'(k) + (g/\theta) f'(k) \qquad \text{for } y > k > 0$$

$$\frac{u_h}{u_c} > (1\text{-}n) f'(y) + n\pi f'(y) = (1\text{-}n) f'(y) + (g/\theta) f'(y) \qquad \text{for } k = y. \qquad (1.6)$$

[1] It is assumed here that all controllers are active. Since the populations of both savers and controllers have been set to one, k may be interpreted as both investment per controller and investment per saver.

Together, conditions (1.2), (1.3), and (1.6) define equilibria in k, g, and n.

In an equilibrium of complete honesty ($n = 0$), the model becomes a standard model of saving in which production is undertaken until its marginal product equals the marginal rate of substitution ($f'(k) = \frac{u_h}{u_c}$).[1] Let us label this level of input k^*. Any single controller who deviates from the strategy of honesty can be caught. Producers will have an incentive to catch any dishonest controller if the value of the goods he controls, $f(k)$, exceeds the cost of enforcement, θ. No enforcement costs are actually incurred in equilibrium because no one is dishonest. (Recall that enforcement effort is chosen *after* controllers decide whether or not to flee.) If $f(k) < \theta$, the threat of enforcement is not credible and there exists no equilibrium with honest behavior.

In an equilibrium of complete dishonesty ($n = 1$), no enforcement is undertaken ($g = 0$) so that controllers rationally anticipate that there is no chance of being caught for dishonesty. Anticipating the lack of enforcement, no one will save ($k = 0$). Enforcement fails to occur for two reasons, each of which is sufficient to stop enforcement on its own. First, since everything is stolen by the dishonest controllers, the producers find themselves without the means to enforce honest behavior. We may call this a *revenue constraint*. Second is an *incentive constraint*. If dishonesty is pervasive, the lower rate of return received by producers induces them to reduce their inputs. Inputs thus fall below the level for which the benefit of enforcement exceeds the cost (i.e., as k approaches 0, $f(k) < \theta$).

The multiplicity of equilibria illustrates the important interconnection of legal infrastructure and production activity. Two economies, with identical technologies of production and enforcement, may arrive at entirely different outcomes. One may find itself prosperous with laws and contracts that are always honored, while another may

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[1]A solution with $k = 0$ and $\frac{u_h}{u_c} \leq f'(0)$ is also possible but is not very interesting.

find itself both too poor to be able to enforce the system of laws and contracts that would enable it to acquire wealth and too poor to make enforcement worthwhile.

In either equilibrium no enforcement costs are incurred and no expropriation of positve value occurs. As a result, not even the controllers are better off in the equilibrium with dishonesty, and thus the equilibrium with honesty is Pareto superior to that with dishonesty. The welfare cost of dishonesty is not represented by enforcement costs nor by the goods that are actually taken from their rightful owners but by the lack of investment in productive enterprises.

3. Eliminating Corruption

In order to illustrate the key assumptions that lead to the existence of an equilibrium with complete corruption, in the following sections we examine the model under some alternative assumptions. It is hoped that we may thereby learn what might eliminate or contribute to the existence of corrupt, low-output equilibria. Recall that an economy stuck in a poor, corrupt equilibrium was unable to move to the superior equilibrium because of both a revenue constraint and an incentive constraint. Let us now consider first assumptions that would relax in turn the revenue and incentive constraints.

Getting around the revenue constraint:

In the model of the preceeding section, the existence of an equilibrium with low inputs and pervasive dishonesty is in part a consequence of the assumed need to finance enforcement from the goods that had not been stolen. As a result, enforcement can not be self-financing. The revenue constraint is removed if the assumption is dropped or if enforcement can be funded out of internal reserves or loans from abroad that are not themselves subject to losses from dishonest behavior. These reserves or loans must be large enough to capture enough controllers to reduce the return from dishonesty below zero even if all controllers were to behave dishonestly. The government must also be able to credibly commit to repaying whatever loans it requires.

Corruption itself may also make it difficult to raise or apply revenue to the job of enforecement. Dishonest behavior is as likely to come from corrupt bureaucrats as from common thieves or swindlers. Therefore, there may be little reason to assume that reserves, foreign loans to the government, or the enforcement effort itself will not be also subject to losses from corruption. If dishonesty pervades the government, no single official will fear apprehension as the result of misappropriating funds, whether the source of the funds is internal or external. Nor will he fear detection if he accepts a bribe in return for overlooking the misbehavior of others.

Getting around the incentive constraint:

If the revenue constraint is nevertheless not binding, an economy may free itself from the possibility of the corrupted equilibrium only if it can also get around the incentive constraint. The incentive constraint stems from the assumed sequence of decisions. It was assumed that the enforcement decision is made after the savings decision and the choice of honest or dishonest behavior. This sequence implies that an economy in an equilibrium of dishonesty will rationally choose not to enforce contracts or laws because the value of the investment at risk approaches zero, thereby falling below the cost of enforcement. This incentive constraint can be surmounted in any one of the following ways -- a commitment to enforcement, agreement among producers to a high level of inputs, or a reputation for enforcement (in an infinitely repeated version of the model).

Commitment: The sequence of decisions is crucial to the existence of multiple equilibria in the model. If the government were able to make a binding commitment to enforce all contracts and laws, the equilibrium with dishonest behavior could be eliminated. Indeed, if this commitment is binding but does not require any expenditures before the choice of honest or dishonest behavior (for example, if the government makes a constitutional pledge), the dishonest equilibrium is eliminated without incurring any costs since all controllers will act honestly.

It is difficult, however, to imagine pledges that can not be broken if reneging on the pledge later proves to be in the best interest of all. If reneging is possible, the commitment is not credible, and a stronger form of commitment is required.

There is no problem of credibility if the government actually spends resources to create enforcement capability before dishonest behavior can occur. The equilibrium sequence of decisions would then be altered as follows:

i) each producer chooses his investment k to maximize his utility, taking as given the equilibrium value of n;

ii) producers collectively expend resources for enforcement, g;

iii) each controller decides whether or not to flee in order to maximize expected utility, taking as given the behavior of the other controllers.

Controllers take as given the enforcement power allocated by producers. If these resources are sufficient to catch enough controllers to reduce the controllers' expected return below zero, even if all controllers are dishonest, then complete honesty is the unique equilibrium. Because resources must actually be spent on enforcement, honesty is not costlessly achieved, as it was in the honest equilibrium where the government acted after the controllers.

If the enforcement effort committed is insufficient to capture all controllers, the dishonest equilibrium may still exist. If all other controllers were dishonest, any single controller would find that his capture is less than certain because the large number of dishonest controllers exceeds the number that can be caught using the resources allocated to enforcement. If his chances of capture are sufficiently small, he will also choose dishonesty and there will exist an equilibrium in which all controllers are dishonest.

Input Coordination: A less expensive way to commit to the enforcement of contracts requires that producers jointly agree to a high level of investment in productive inputs. Recall that the incentive constraint on enforcement resulted from the reduction in the value of contracts that occurs when each producer fears more reneging. No single producer can commit to investment worth the costs of enforcement because of the assumption that each producer spreads his inputs over a range of controllers so that the inputs of any single, infinitesimally small producer that are entrusted to any single controller are insignificant. When investment in productive inputs falls to the extent that $f(k) < \theta$, all realize that contracts will not be enforced. If producers agree that each of them will invest k such that $f(\hat{k}) \geq \theta$, producers will give themselves the incentive to enforce every contract on which a controller reneges. In this way the producers may collectively commit to the enforcement of all contracts. The commitment is credible because the act of investment precedes the controllers' decision whether to be honest or dishonest, but convinces controllers that enforcement will take place. It incurs no direct enforcement costs because dishonesty is deterred.[1]

To reach the level of investment at which producers will enforce contracts may require more investment than producers would choose on their own. In an (interior) equilibrium when controllers always behave honestly, a producer will choose an input level k^* satisfying $u_h/u_c = f'(k^*)$. If $f(k^*) < \theta$, producers must choose either to force themselves to invest enough to make contracts worth enforcing [$\hat{k}$ such that $f(\hat{k}) = \theta$]

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[1]Input coordination works here as it does in Bryant (1983) and other models in which there are multiple Pareto-ranked equilibria in the absence of the coordination of investment.

or to give up on output and enforcement (set $k = 0$). They will choose $\hat{k}$ if the utility at $\hat{k}$ exceeds the utility at $k = 0$, which occurs if $U(y - \hat{k},\ \theta)\ -\ U(y, 0)\ \geq\ 0$.

Investment coordination would not be needed if each producer dealt with only one controller, whom he could specifically target for capture if the controller flees. In this case it is possible that each producer alone can invest enough to commit himself to enforcing a contract $[f(\hat{k})\ \geq \theta\ ]$. Such a private provision of enforcement effort is efficient only if there are no increasing returns to scale in enforcement. This case is studied in greater detail in section 4.

The Trap of Underdevelopment: The coordination of inputs (together with the assumption of unlimited reserves) removes the multiplicity of equilibria for any single economy but does not end the dramatic gap between rich and poor economies. If the economy does not have the resources to invest enough to make enforcement worthwhile ([i.e., if $f(k^*) < \theta$)], the only equilibrium is the corrupt one. Low values of productivity $f(k^*)$, or desired investment, k^* (which is an increasing function of the initial endowment, y), or high values of enforcement costs make this equilibrium more likely. In this way poor nations, those who start with low levels of productivity and endowments, may find it impossible to reach a reach an honest equilibrium. Moreover, if growth in technology and endowments is endogenously determined by market activity, the poor nation may have no prospect of growing to the point where the honest equilibrium is possible.

To illustrate the gap between rich and poor, consider a continuum of nations that differs continuously in α, a productivity parameter such that output equals $\alpha f(k)$. Let $k(\alpha)$ denote the input that would be chosen in an honest equilibrium as a function of α. If consumption is a normal good, output, $\alpha f(k(\alpha))$, will be an increasing, continuous function of α defined by the producers' first order condition in an honest equilibrium $[u_h/u_c = \alpha f'(k)]$. Let α^{**} denote the value of α for which $\alpha f(k(\alpha)) = \theta$. As before, if $\alpha f(k(\alpha)) < \theta$, producers must choose either to invest enough to make contracts worth enforcing [$\hat{k}$ such that $\alpha f(\hat{k}) = \theta$] or to invest nothing (set $k = 0$). They will choose $\hat{k}$ if the utility at $\hat{k}$ exceeds the utility at $k = 0$, which occurs if

$$U(y - \hat{k}, \theta) - U(y, 0) \geq 0 \qquad (3.1)$$

When evaluated at equality, (3.1) implicitly defines some $\alpha*$ below which $k = 0$ and above which $k = \hat{k}$ (the left-hand side of (3.1) being increasing in α). Figure 2 illustrates this cross-section of equilibria by graphing output as a function of α.

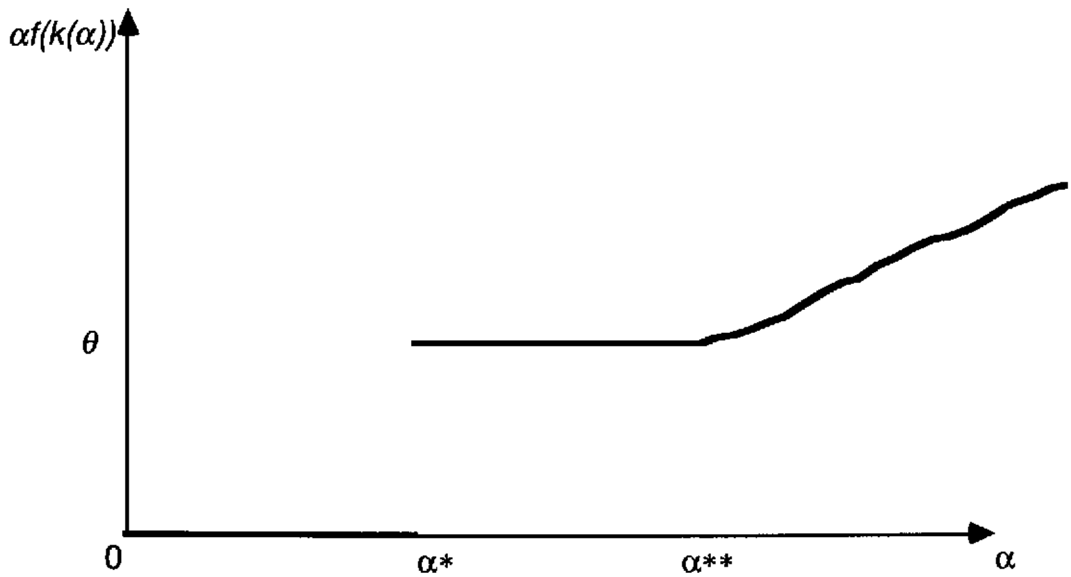

Figure 2

Similar cross-sections would be found for economies differing in y or θ or in some parameter reflecting the desire to save.

Figure 2 dramatically illustrates the gap between rich and poor. Nations with only a marginal difference in technology around $\alpha*$ find themselves producing greatly differing levels of output.

The model's implications for growth will depend on whether growth is endogenous or exogenous. Imagine a repeated version of the model in which the output from one period can be used as an input to production in the next period. If the productive technology grows exogenously (represented by a value of α that starts near zero but grows), an economy will languish for a while in the region of no output until α reaches $\alpha*$. At that point the economy will experience a dramatic take-off in output.

If, however, growth in the technology parameter requires economic activity, an economy that starts with a value of α below $\alpha*$ will never reach the take-off threshold because the absence of market activity prevents an increase in technology.

Reputation in a Repeated Game: A government can also surmount the incentive constraint altogether if it can acquire a reputation for enforcing contracts and laws. If the game between producers and controllers is repeated indefinitely, the government may be able to develop a reputation for enforcement that will keep controllers honest. If the government can develop such a reputation, it can eliminate the dishonest equilibrium even if the single period costs of enforcement should always exceed the value of the contracts.

Suppose for example that the government has reserves sufficient to catch all dishonest controllers but the cost of catching any single controller exceeds what can be recovered [$\theta > f(k)$]. If the controllers act before the government in a game played only once, they can be sure that the government will choose not to enforce contracts. If, however, the game is repeated indefinitely, the government can play a strategy of always enforcing contracts, to which the best response of controllers is to always behave honestly. Here the infinitely lived government plays a game against an infinite sequence of one period lived controllers, an analog to Selten's (1978) chain-store game. Kreps and Wilson (1982) and Fudenberg and Levine (1989) demonstrate that if there is some uncertainty about the nature of the infinitely lived player's strategy or its payoffs, it will pay the infinitely lived player to develop a reputation as a Stackleberg leader. In this model, the government will develop a reputation for always enforcing contracts, inducing controllers to always behave honestly.[1] Because controllers respond to this reputation by acting honestly, no resources are actually used in enforcing contracts.[2]

Notice that a reputation for enforcing contracts and laws does more than eliminate the dishonest equilibrium when there would otherwise be a multiplicity of equilibria [i.e., when $f(k^*) > \theta$]. A reputation for enforcement even induces honesty when there exists no equilibrium with honesty in the two period model [the case of $f(k^*) < \theta$].

The difference in the equilibrium of a two-period game and its infinitely repeated counterpart illustrates the importance of political stability in development. A government with a short expected tenure is less able to develop a reputation for contract enforcement and other anti-corruption measures than a government embedded in a stable legal tradition with no anticipated end.[3]

4. Limiting Producers' Exposure to Controllers:

An assumption key to the existence of a dishonest equilibrium is that each infinitesimally small producer must deal with a wide span of controllers; as a result it is never worthwhile for a single producer to go after any controller who has wronged him. A wronged producer would be willing on his own to go after a fleeing controller as long as the value of his personal investment is not exceeded by the cost of enforcement [$f(k) \geq \theta$]. Therefore, if producers are unable to commit to enforcement by coordinating their investments to a sufficiently high level, a producer will want to limit

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[1]For a discount factor sufficiently close to one.

[2] If controllers, not the government, were infinitely lived and could coordinate their activity, they are the ones who would develop a reputation. Recall that when controllers play a strategy of taking everything, they get nothing because production is entirely discouraged. Therefore they would want to develop a reputation for not taking everything, in order to encourage production, a fraction of which they can misappropriate -- much as a government does not want a reputation for taxing at 100%.

[3]What determines which countries will enjoy stable government is not addressed here.

the number of controllers to which he is exposed. If, for example, we interpret controllers as contractors supplying an essential but generic input to production, producers will wish to contract with a single supplier of the input. With his entire investment in the hands of a single supplier, a single producer acting on his own will have a greater incentive to enforce honest behavior on that supplier. If he knows that the producer will want to enforce contracts, the supplier will behave honestly.

Of course, there may be costs to reducing the variety of people with whom one deals. The services of controllers may not be entirely interchangeable, so that a reduction in a producer's variety of contacts with controllers reduces his productivity.

Let us now alter our model to allow producers a choice of the number of controllers with whom they will deal. Assume that each producer is not infinitesimally small but that there are a large number of independent producers (each of measure one). There is a continuum of controllers, measuring M in total. Each producer will select m, the measure of controllers with whom he will deal. To make this choice non-trivial, let us assume that output per producer is a continuously differentiable function $F(k,m)$, increasing in both investment and the measure of controllers with whom he deals. Each controller dealing with a producer controls an equal share of the producer's output; i.e., he can abscond with $\frac{F(k,m)}{m}$ goods. Let us assume for simplicity that a producer gets no utility from leisure ($u_h = 0$) so that he always invests his entire endowment of time ($k = y$). (This allows us to concentrate on the choice of m.) All enforcement is privately provided and can be targeted at any specific controller. It costs θ goods to catch a fleeing controller. Enforcement by a producer returns only those goods stolen from him.

Given that enforcement is now to be independently financed, a controller will abscond with all of the investment in his control of each producer who will lack the incentive to capture him. A producer will want to capture a fleeing controller if the value of the investment in that controller's hands, $\frac{F(y,m)}{m}$, is not less than the cost of enforcement, θ. An equilibrium with honesty thus requires that $F(y,m) \geq m\theta$. Since $F(y,m)$ is increasing in m, a producer will want the largest m meeting this incentive constraint. An interior equilibrium ($0 < m < M$) requires that $F(y,m) - m\theta = 0$ and $F_m(y,m) - \theta < 0$. These conditions implicitly define the equilibirum value of m as a function of desired investment, y, and the cost of enforcement, θ. It is easily verified that in equilibrium, m is an increasing function of y and a decreasing function of θ; i.e., where investment projects are small or enforcement costs are high (perhaps in less developed economies), producers will choose to interact with a minimal variety of controlling agents, lowering the return to their investment.

(Producers might also limit their exposure to dishonesty by restricting their economic contacts to groups with mutual trust such as families or distinct social groups within which trust naturally exists or can be easily enforced.[1] This is consistent with the prevalence of family-owned businesses in developing countries as well as the domination of commerce by small minorities like the Indians and Portuguese in Africa or the Chinese in Asia outside of China.)

A Model of Sustained Growth:

Notice that greater investment of the productive input (k) results in a greater variety of contacts (m), which causes an increase in the marginal product of the productive input. This suggests that a dynamic version of the model, along the lines of Romer's (1987) model of growth through specialization, may be able to generate sustained growth.

[1]It may be that a small minority socially separated from the majority can enforce honest behavior within the group through the threat of ostracism, a threat more easily enforced in a small group than a large one and more painful to those not socially accepted in the larger society.

Let a producer's output in period t be $\int_0^{m_t} (x_t^i)^\alpha \, dx_t^i$ (with $0 < \alpha < 1$), a function of m_t, the number of controllers with whom the producer deals, and x_t^i, defined as the amount invested with any single controller. Assume that m_t and x_t^i can take on any positive values. In the assumed absence of investment coordination, a producer with a given level of resources k_t available for investment will choose x_t^i and m_t to maximize output subject to the incentive constraint that the value of his investment with each controller is not exceeded by the cost of enforcement $(x_t^i)^\alpha \geq \theta$. This constraint ensures that the controller knows that the producer will want to capture and punish any dishonest controller. The producer's optimal investment strategy is to spread his investment equally across controllers $(x_t^i) = k_t/m_t$ and set m_t to satisfy the incentive constraint, $(k_t/m_t)^\alpha = \theta$, or $m_t = \theta^{1/\alpha}k_t$. A producer's output then equals

$$m_t(k_t/m_t)^\alpha = (m_t)^{1-\alpha}(k_t)^\alpha = (k_t/\theta^{1/\alpha})^{1-\alpha}(k_t)^\alpha = k_t\theta^{1-1/\alpha} \qquad (4.1)$$

If the output from one period can be used as the input in the next or as current consumption, i.e.,

$$k_t\theta^{1-1/\alpha} = c_t + k_{t+1} \ , \qquad (4.2)$$

we have a dynamic version of the model akin to neoclassical growth models. For an illustration, consider the model with the log-linear preferences $\sum_{t=0}^{\infty} \beta^t \ln(c_t)$. The maximization of utility as represented by these preferences, subject to (4.1) and (4.2), has as its solution

$$k_{t+1} = \beta\theta^{1-1/\alpha}k_t \qquad (4.3)$$

If $\beta\theta^{1-1/\alpha} > 1$, the equilibrium displays sustained growth. Increased output in each period enables each producer to deal with a greater variety of controllers, further increasing output. We see that the rate of output growth is sustained forever at $\beta\theta^{1-1/\alpha}$, a constant. If instead, $\beta\theta^{1-1/\alpha} < 1$, ouput continually declines. The growth rate is increasing in β, the importance the individual places on the future, decreasing in the cost of enforcement (note that $1\text{-}1/\alpha$ is negative), and increasing in exogenous productivity (α).

5. Conclusion

This paper presents a simple model of the interconnectedness of underdevelopment and dishonest behavior of various sorts. The two are intertwined in that when there is a great degree of corruption, market activity goes unrewarded, and without rewards, the market fails to produce the resources and the *ex post* incentives required to eliminate dishonesty.

The mutual importance of contract or law enforcement and market production is most dramatically illustrated by the multiplicity of equilibria displayed by the model of section 2. Two identical economies can find themselves in widely different stable equilibria, one with a developed market and honest behavior and the other with widespread corruption discouraging all market activity. The key to the multiplicity of equilibria is that one's chances for getting away with dishonest behavior depends on the number of others acting in the same way. In the honest equilibrium no one will deviate from honest behavior because such behavior, being isolated, will be certainly caught and punished. If, however, all others are behaving dishonestly, one's chances of apprehension will fall because the resources available for enforcement are reduced.

The characterization of differences in economic development as different realizations of a model with multiple equilibria has several precedents, including Bryant (1983), Kiyotaki (1988), and Murphy, Shliefer, and Vishny (1989). All feature increasing returns to scale in many uncoordinated productive sectors. Government coordination of these independent sectors allows the economies to select the Pareto dominant equilibrium. Although similar in spirit to these efforts, the model of this paper does not assume increasing returns in production. A more notable difference is that the model may display multiple equilibria even though the government is following its optimal policy. The model is closer in construction to microeconomic models of multiple equilibria involving illegal behavior like Freeman, Grogger, and Sonstelie (1989) or Smith and Wright (1991).

While models with multiple equilibria explain why nations may find themselves in distinct, nonconverging groups of rich and poor, they do not address the question of what may lead a nation into one category or the other. To answer this question, the model was altered in a variety of ways to determine what might induce the presence or absence of corrupt, underdeveloped economies. Many of the barriers to development were related to government weaknesses. Government instability, the inability to commit to enforcement or the repayment of foreign loans, and the inability to coordinate investment were each shown to make a nation more likely to remain stuck in a state of underdevelopment.

Even if all the political problems can be solved in a way that eliminates the multiplicity of equilibria, however, poor nations will find themselves more vulnerable to corruption than rich nations if the value of their investment projects is less than the cost of enforcement, opening an unbridgeable chasm between the rich and poor. The chasm opens because poor nations, lacking the incentives or reserves to discourage corruption, may fall into a trap of corruption that destroys the incentives for market activity. Nations only marginally poorer than others in endowments may thus find themselves greatly poorer than these others in output. Even more disheartening is that if market activity is necessary for growth, the poor economies, with their market activity discouraged by corruption, will be unable to grow rich enough to end the corruption that holds them back.

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