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Taxation, Public Services, and the Informal Sector in a Model of Endogenous Growth

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The informal sector exists when overregulation (high tax rates and a high cost for entering the formal sector) is coupled with an inefficient and corrupt system of compliance control. Informality adversely affects economic growth because the contribution of public services to productivity decreases as the informal sector expands.

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Summary findings

Large informal sectors are an important characteristic of developing countries. Braun and Loayza build a dynamic model in which the informal sector exists when overregulation (high tax rates and a high cost for entering the formal sector) is coupled with an inefficient and corrupt system of compliance control.

They consider a production technology in which public services are essential and subject to congestion. The public services are financed by taxes collected from the formal sector. Informal producers evade taxes and, because of their illegal status, can use only some public services, cannot use capital or insurance markets, and are subject to stochastic penalties.

Braun and Loayza find that the relative size of the informal sector is negatively related to the severity of the penalties and positively related to tax rates and the extent of informal use of public services.

They also find that economies with larger informal sectors have lower capital return and growth rates because the contribution of public services to productivity decreases with informality.

They argue that self-interested bureaucracies create an economic environment that makes informality attractive or simply unavoidable because they profit from the presence of the informal sector.

This paper — a product of the Macroeconomics and Growth Division, Policy Research Department — is part of a larger effort in the department to study the effects of regulation on inequality and economic growth. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Rebecca Martin, room N11-043, extension 39026 (39 pages). August 1994.

TAXATION, PUBLIC SERVICES, AND THE INFORMAL SECTOR IN A MODEL OF ENDOGENOUS GROWTH*

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I. INTRODUCTION

The informal sector is the set of economic units which do not comply with one or more government-imposed taxes and regulations but whose product is considered as legal.[1]

The presence of large informal sectors in all economic activities is one of the most important characteristics of developing countries: Informal sectors employ between 35 and 65 percent of the labor force and produce 20 to 40 percent of GDP.[2]

The informal sector arises when an excessive regulatory system is coupled with an inefficient and corrupt system of compliance control. An excessive regulatory system makes the formal economy costly and unattractive by imposing high entry costs to legality, through license fees and registration requirements, and high costs to remaining legal, through taxes, red tape, and labor, environmental, and various other regulations.[3]

However, escaping taxes and regulations is not costless: An informal status entails many disadvantages. When an informal activity is detected, stiff penalties, in the form of pecuniary fines or capital confiscation, are applied. Furthermore, because of their illegal status, they do not enjoy full and enforceable property rights over their capital and product. This has a number of deleterious consequences: First, informal producers are poorly protected by the police and the judicial courts from crimes committed against their property. Second, since they lack the capacity to enter into legally binding contractual obligations, their access to capital markets, for

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[1]For an overview of the definition and characteristics of informal economies, see Chapter 1.

[2]Chickering and Salahdine (1991), p. 3.

[3]De Soto (1989).

financial, insurance, and corporative purposes, is seriously limited. And third, they find obstacles to use some other public services, such as social welfare, skill training programs, and government-sponsored credit facilities.

The bureaucracy, as the institution controlling and monitoring the regulatory system, plays a crucial role in the formation of informal economies. If the bureaucracy profits in some way from the presence of the informal sector, it will create an environment that makes informality attractive or simply unavoidable.

In this paper we model the presence of informal sectors in the economy and their relationship to economic growth. To accomplish this goal, we use the framework of the endogenous growth literature.[4] Specifically, we use the work in which government's participation in production, through the provision of public goods and services, is considered explicitly, as in Barro (1990), and Barro and Sala-i-Martin (1992).

In the sense that the informal sector is modeled as not paying taxes, this paper can be considered as a general equilibrium model of tax evasion.[5] However, we depart from the tax evasion literature by considering informality as an alternative to legality, entailing different production relations to government institutions and services, other firms, and capital markets.

We also depart from the prevailing modelling approach to informal economies, approach which focuses on labor market segmentation and rural-urban migration.[6]

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[4]See Romer (1986), Lucas (1988), Barro (1990), and Rebelo (1991).

[5]One of the earliest and most influential theoretical papers on tax evasion is Allingham and Sandmo (1972). Cowell (1990) and Tanzi and Shome (1993) survey the recent theoretical and empirical literature on the subject. Alm, McClelland, and Schulze (1992) present experimental evidence on the individual reasons for tax compliance.

[6]See Chaudhury (1989), Rauch (1991), Gupta (1993), and Chapter 3.

In a general sense, we follow the methodology outlined by Becker (1968) to the study of illegal behavior: Economic agents in our model are interested in optimizing the expected value of intertemporal utility and choose, accordingly, whether or not to belong to the informal sector.

In Section II we set up the model. We consider a production technology in which publicly-provided goods and services are essential to private production and are financed by tax revenues from the formal sector. Examples of these publicly-provided goods are transportation facilities, public utilities, education and health programs, judicial courts, public credit agencies, and domestic security (police, prisons). These public services are rival (subject to congestion) and to some extent excludable: Informal producers can only use some of them. In Section III we study the steady state of the economy, a state when both formal and informal sectors grow at the same constant rate. We find that the relative size (in terms of capital or output) of the informal sector is negatively related to the severity of the penalties and positively related to tax rates, the extent of informal use of public services, and the exogenous productivity of the economy. Furthermore, we find that the return on capital and, thus, the economic growth rate is negatively affected by the relative size of the informal sector; this is so because of the inherent disadvantages of informal activities and because the informal sector does not contribute to financing productive public services. Finally, we find that the presence of entry costs into the formal economy produces a steady state with a larger relative size of the informal sector and a lower rate of economic growth, when compared to the case with no access costs to formality.

In Section IV we analyze government's behavior. We first assume that government is optimizing a given social welfare function, and we find that the social optimum involves the disappearance of the informal sector. We then analyze the case when government is partially controlled by a self-interested bureaucracy, which profits from the presence of the informal sector

through the appropriation of penalty revenues. We argue that short-sighted and socially-unaccountable bureaucracies are the most harmful to economic growth and social welfare.

In Section V we introduce uncertainty in production to study how the inability to use insurance and capital markets, which allow risk diversification, makes informality less attractive. Section VI concludes.

II. PRODUCTION TECHNOLOGY AND UTILITY OPTIMIZATION

The economy is populated by a continuum of agents in the interval [0,1]. Each of them is endowed with a (possibly different) starting level of a broad measure of capital, which is meant to include physical as well as human capital. They can operate a basic technology to produce a single good in the form of consumables or capital. Raw labor is not an input of production. Agents maximize the expected value of discounted utility (U):

$$U = E_0 \int_0^\infty u(c(t)) e^{-\rho t} dt \tag{1}$$

There are two different sectors in the economy to which agents choose to belong: the formal and the informal sectors. We refer to the people belonging to each sector as the "formals" and "informals," respectively. Formals pay taxes in the form of a proportional income tax, the proceeds of which are used to finance the provision of public services. The net-of-tax flow of output to formal producers is given by[7]

[7]The superscripts F and I correspond to the formal and informal sectors, respectively. Agents are indexed by the subscript i. Aggregate quantities omit this subscript.

$$y_i^F = \alpha^F k_i \tag{2}$$

where α^F is the net-of-tax expected return on capital, i.e. flow of production per unit of capital.

For informal producers, the flow of output is given by

$$y_i^I = \alpha^I k_i \tag{3}$$

where α^I denotes the return on capital in the informal sector. Informals do not pay taxes. However, they must pay a penalty when caught. Penalties consist of a fraction of the capital belonging to informal agents. We assume that the proceeds from penalties are appropriated by government officials (the bureaucracy) for their own good (we expand on this issue in section V); therefore, penalty revenues are not used to finance public services.

We follow Barro and Sala-i-Martin (1992) in assuming that the net-of-tax return on capital depends on the available amount of public services relative to aggregate production:

$$\alpha^F = A(1-\tau)\left(\frac{g}{y'}\right)^{\alpha}$$

$$\alpha^I = A\left(\epsilon\frac{g}{y'}\right)^{\alpha}$$

where A is an exogenous productivity parameter, g is the flow of public services, τ is the tax rate, ϵ is the fraction of public services used by informal producers, and $y' = (1-\tau)^{-1}y^F + \epsilon y^I$ is aggregate production which congests public services[8]. Informals have access to the same basic technology, but they use only the fraction ϵ, $0<\epsilon<1$, of available public services. That is, informal producers can use only some public services without being caught with probability 1;

[8]Note that since the informal sector only uses the fraction ϵ of public services, we assume that y' only includes the fraction ϵ of total informal output.

then, trying to avoid being caught, they choose not to use some public services. Examples of public services not enjoyed by informal producers are the police, courts of law, and government-sponsored credit and training programs.

Let β be the ratio of informal to formal output. That is,

$$\beta = \frac{y^I}{(1-\tau)^{-1}y^F}$$

Assuming that government uses the proceeds of taxes only to finance public services, we have

$$g = \tau((1-\tau)^{-1}y^F)$$

So that,

$$\alpha^F = A(1-\tau)\left(\frac{\tau}{1+\epsilon\beta}\right)^{\alpha}$$
$$\alpha^I = A\left(\frac{\epsilon\tau}{1+\epsilon\beta}\right)^{\alpha} \tag{4}$$

The effect of a bigger informal sector, higher β, is clear from (4). Informal producers congest public services but do not contribute to financing them; therefore, an increase in the relative size of the informal sector lowers productivity for every one in the economy. It is also clear from (4) that, for a given tax rate, formal producers would like the informal sector to shrink to extinction.

Optimization

We concentrate on the study of the steady state of the economy, which is defined as the state where the ratio of informal to formal production is constant and the aggregate economy grows at a constant rate.

Define the current value function $V(k_i(t),t)$ as the optimal value of expected discounted utility, measured as of time t. The value function depends on the individual capital stock at time t, that is, $k_i(t)$. In general, the value function also depends on the future evolution of the economy (which, of course, is not under the control of the individual); this dependence is allowed for by the independent argument t in the value function. However, in the steady state, the form of the value function does not change with time (other than through changes in the individual's capital stock) because the problem faced by the individual is the same at any point in time. Since we study the economy in the steady state, our value functions will not be time dependent. Then, we simply write the value function as $V(k_i)$.

The Formal Sector

The formal agent's problem is to maximize U subject to

$$dk_i = \alpha^F k_i dt - c_i dt \tag{5}$$

Assume that instantaneous utility is logarithmic. For formal agents, $V^F(k_i)$ satisfies the following Bellman equation

$$\rho V^F(k_i) = \underset{c_i}{MAX} \{ \log(c_i) + V_k^F(k_i)(\alpha^F k_i - c_i) \} \tag{6}$$

where V_k^F is the partial derivative of V^F with respect to capital. The F.O.C. for maximization is

$$\frac{1}{c_i} = V_k^F(k_i)$$

That is, the consumer equates the marginal utility of current consumption to the marginal utility of capital. Therefore, V^F satisfies the following differential equation:

$$\rho V^F(k_i) = -\log(V_k^F(k_i)) + \alpha^F V_k^F(k_i) k_i - 1$$

with boundary condition

$$\lim_{t\to\infty} V^F(k_i)e^{-\rho t} = 0$$

The solution for V^F is given by

$$V^F(k_i) = \frac{1}{\rho}\log(\rho k_i) + B^F \tag{7}$$

where,

$$B^F = \frac{1}{\rho^2}(\alpha^F - \rho)$$

From the F.O.C., it is clear that consumption is given by $c_i = \rho k_i$, a fixed fraction of wealth. Therefore, the individual's capital stock evolves according to

$$dk_i = (\alpha^F - \rho)k_i dt \tag{8}$$

Let the distribution of capital in the economy at time t be given by the density function $f_t(k)$. That is, $f_t(k_0)dk$ is the "amount" of people with $k_i = k_0$ at time t. Also, let μ_t be the fraction of people that belongs to the formal sector at time t; then

$$\mu_t = \int_F f_t(k)dk$$

where the integral is taken over the set F of formal agents. Total capital in the formal sector (k^F) at time t is given by

$$k^F = \int_F kf_t(k)dk = \mu_t E(k_i / i \in F)$$

When no capital flows to or from the formal sector, aggregation over formal individual

budget constraints dictates the evolution of aggregate capital in the formal sector[9]:

$$\frac{dk^F}{dt} = (\alpha^F - \rho)k^F$$

Therefore, when no capital flows to or from the formal sector, its growth rate of capital (γ^F) is given by

$$\gamma^F = \alpha^F - \rho \tag{9}$$

The Informal Sector

Informals do not pay taxes, but they face a positive probability of being caught and, thus, having to pay a penalty, at any point in time. The penalty consists of the fraction b of capital or its equivalent in goods. Formally, the occurrence of this event is assumed to follow a Poisson process. The Poisson process is continuous in time but allows discreet or discontinuous changes in the state space. Let $q_i(t)$ be an independent Poisson process with the following probability structure:

Prob {event does not occur in the time interval dt} = $1 - \lambda dt$

Prob {event occurs once in the interval dt} = λdt

Prob {event occurs more than once in the interval dt} = 0

We also assume that q_i and q_j are independent for different individuals i and j.

The budget constraint for informal agent i is

[9]In fact, as is explained below, in the steady state with no entry costs, capital flows from the informal to the formal sector. Therefore, the growth rate of capital in the formal sector will be different from that in equation (9).

$$dk_i = \alpha^I k_i dt - c_i dt - bk_i dq_i \tag{10}$$

Equation (10) is the short-hand expression for the stochastic integral of $k_i(t)$. Note that, as opposed to the usual continuous diffusion process, q_i is continuous in time but not in the state space. Thus, if the Poisson event occurs, there is a discontinuous jump in k_i by the amount $-bk_i$. This jump is different in nature to a flow change, which is the case with the first two components of the change in k_i.

Note that if informals could buy a penalty insurance, the stochastic nature of the penalties would be irrelevant. This possibility is precluded by the assumption that informals cannot use insurance markets; in this way, the effect of stochastic penalties on expected utility is preserved.

Informals maximize U subject to (10). Let $V^I(k_i)$ be the optimal value of total expected utility U, measured as of time t, and starting in state k_i. The Bellman equation for V^I is

$$\rho V^I(k_i) = \underset{c_i}{MAX} \{\log(c_i) + V_k^I(k_i)(\alpha^I k_i - c_i) + \lambda[V^I(k_i(1-b)) - V^I(k_i)]\} \tag{11}$$

Equation (11) states that the maximized flow return $log(c_i)$ plus the expected change in V^I has to be equal to ρV^I. The first part of the expected change in total utility corresponds to the continuous variation in capital given by production and consumption. The last part is the discontinuous change in utility caused by penalties. The F.O.C. for maximization is given by

$$\frac{1}{c_i} = V_k^I(k_i)$$

Substituting the F.O.C. into the Bellman equation, we get the following differential equation for V^I:

$$\rho V^I(k_i) = -\log(V_k^I(k_i)) + \lambda[V^I(k_i(1-b)) - V^I(k_i)] - 1$$

with boundary condition

$$\lim_{t\to\infty} V^I(k_i(t))e^{-\rho t} = 0$$

The solution for V^I is given by

$$V^I(k_i) = \frac{1}{\rho}\log(\rho k_i) + B^I \tag{12}$$

where,

$$B^I = \frac{1}{\rho^2}[\alpha^I - \rho + \lambda\log(1-b)]$$

Note that the term $log(1-b)$ corresponds to the loss in utility caused by the expectation of capital expropriation. From the F.O.C., consumption is given by $c_i = \rho k_i$. Given optimal consumption, the informal individual capital stock evolves according to

$$dk_i = (\alpha^I - \rho)k_i dt - bk_i dq_i \tag{13}$$

Let the measure of informal people at time t be $(1-\mu_t)$. Then aggregate informal capital is

$$k^I = (1-\mu_t)E(k_i / i\epsilon I)$$

When no capital flows to or from the informal sector, the evolution of informal aggregate capital is dictated by the change in average capital in the sector. That is, to get the equation of motion for aggregate informal capital (k^I), we take expected values (over individuals) in (13). Since the q_i processes are uncorrelated $E(k_i dq_i / i\epsilon I) = E(k_i / i\epsilon I)\ \lambda dt$. Then,

$$dk^I = (\alpha^I - \rho - \lambda b)k^I dt$$

Hence, when no capital flows to or from the informal sector, the informal capital growth rate (γ^I)

is given by

$$\gamma^I = \alpha^I - \rho - \lambda b \tag{14}$$

III. STEADY STATE

Agents in the economy choose at any point in time whether to belong to the formal or the informal sector. We do not allow the simultaneous participation in both sectors.

In the steady state the ratio of informal to formal production or capital is constant (constant β) and the economy grows at a constant rate. We analyze first the case when there is free entry into either sector and afterwards the case when there are some entry costs into the formal sector.

No Entry Costs to the Formal Sector

In steady state informal agents want to switch to the formal sector whenever

$$V^I(k_i) \leq V^F(k_i)$$

or,

$$g(\beta) \leq P \tag{15}$$

where,

$$g(\beta) = \alpha^I - \alpha^F = \frac{A\tau^\alpha}{(1+\epsilon\beta)^\alpha}[\epsilon^\alpha - (1-\tau)]$$

$$P = -\lambda \log(1-b) > 0$$

P is related to the decrease in utility due to expected capital expropriation. The function $g(\beta)$ can be thought of as the difference in utilities before fines.

By the same token, in the steady state formals want to move to the informal sector when $g(\beta) \geq P$.

In order for the informal sector to be present in the economy, at least $g(\beta=0)$ has to be positive and greater than P, that is,

$$\tau^{\alpha}[\epsilon^{\alpha} - (1-\tau)] > \frac{P}{A} \tag{16}$$

Note that the left-hand side of (16) is increasing in the tax rate. This means that, given the other parameters, the tax rate has to be high enough if there is to be an informal sector. The intuition for this is clear: The only advantage of being in the informal sector is not paying taxes.

Figure 1 shows $g(\beta)$ as a function of β for the case where (16) obtains. Since P and A are both positive, the inequality in (16) implies $[\epsilon^{\alpha} - (1-\tau)] > 0$, which is the condition for $g'(\beta) < 0$. The negative slope of the function $g(\beta)$ means that an increase in congestion (through an increase in β) affects the informal sector rate of return more severely than it affects the formal sector one.

Figure 1 helps us identify the steady-state level of β and how it is affected by changes in the parameters; Figure 1 is not used to describe transitional dynamics. In the steady state, any individual is indifferent between the two sectors. This occurs when the ratio of formal to informal production is β^*, where $g(\beta^*)=P$.[10] The growth rates of both sectors adjust so as to keep β equal to β^*; as we explain below, this requires a net flow of capital from the informal to the formal sector. Note that values of β lower than β^* do not represent steady states because at those points $g(\beta) > P$, which means that all individuals prefer to be in the informal sector, thus creating a change in β. By the same token, for values of β higher than β^*, $g(\beta) < P$, which

[10]The superscript "*" denotes steady state.

means that all individuals prefer to be in the formal sector.

Let τ_o be the cut-off tax rate at and below which there is no informal sector in the economy, given the other parameters. That is, τ_o is implicitly given by equation (16) with equality:

$$\tau_o^{\alpha}[\epsilon^{\alpha}-(1-\tau_o)] = \frac{P}{A} \tag{17}$$

Then, the steady state level of β, β^*, is given by

$$\beta^* = \begin{cases} 0 & \tau < \tau_o \\ \dfrac{\tau A^{\frac{1}{\alpha}}[\epsilon^{\alpha}-(1-\tau)]^{\frac{1}{\alpha}}}{\epsilon P^{\frac{1}{\alpha}}} - \dfrac{1}{\epsilon} & \tau > \tau_o \end{cases} \tag{18}$$

The effect of changes in different parameters on the value of β^* can be explained using Figure 1. An increase in the probability of being caught (λ) or in the size of the penalty (b) increases P, thus producing a decline in the relative size of the informal sector. Higher tax rates hurt formals relative to informals; and hence when τ goes up, $g(\beta)$ moves upwards and to the right, thus increasing β^*. In fact, considering β^* as a function of tax rates, β^* is 0 for $\tau \leq \tau_o$, and it increases monotonically with τ for $\tau > \tau_o$ (see Figure 2).

When informal producers can use a higher fraction of available public services (higher ϵ), the relative size of the informal sector in the steady state obviously increases. A somewhat less obvious result is that improvements in exogenous productivity, measured by the parameter A, result in a relatively bigger informal sector. The reason for this result is that for high tax rates and given $[\epsilon^{\alpha} - (1-\tau)] > 0$, the informal sector captures a relatively larger fraction of the productivity improvement.

Growth

Recall the definition of β,

$$\beta = \frac{y^I}{y^F(1-\tau)^{-1}} = (1-\tau)\frac{\alpha^I k^I}{\alpha^F k^F} = \epsilon^\alpha \frac{k^I}{k^F}$$

Then for $d\beta/dt = 0$, the growth rates of the formal and informal sectors have to be the same. From equations (9) and (14), we know that if no capital flows from one sector to the other,

$$\gamma^I - \gamma^F = g(\beta^*) - \lambda b = -\lambda[\log(1-b)+b] > 0$$

This means that if no capital switches sectors, the growth rate of informal capital is greater than that of formal capital, and, thus, β increases. This situation can not correspond to a steady state. Therefore, in steady state there will be a constant movement of capital from the informal to the formal sector. The amount of capital that switches sectors, k^s, is obtained from the condition of equal growth rates and is given by

$$\frac{k^s}{k^F} = -\lambda \frac{[\log(1-b)+b]}{1+\frac{\epsilon^\alpha}{\beta^*}}$$

Note that the first order approximation for $log(1-b)$ is given exactly by $-b$, thus if b is small k^s will be very close to 0.

The growth rate of the economy is given by

$$\gamma = \begin{cases} \alpha^F - \rho + \dfrac{k^s}{k^F} & \beta^* > 0 \\ \alpha^F - \rho & \beta^* = 0 \end{cases} \qquad (19)$$

Substituting for β^* in the expression for α^F,

$$\alpha^F = \begin{cases} \dfrac{(1-\tau)P}{\epsilon^{\alpha}-(1-\tau)} & \tau>\tau_o \\ A(1-\tau)\tau^{\alpha} & \tau<\tau_o \end{cases} \tag{20}$$

Assume that b is small enough so that the growth rate is very close to α^F-ρ. Given the negative effect of β^* on α^F, the growth rate is decreasing in β^* when $\beta^*>0$. Hence, as can be seen in equation (20), when $\beta^*>0$, the growth rate decreases with τ and ϵ and increases with λ and b.

When the steady-state size of the informal sector is 0 ($\tau \leq \tau_o$), the model collapses to the one analyzed by Barro and Sala-i-Martin (1992), in which α^F, as function of τ, is first increasing, reaches a maximum at $\tau=\tau^*=\alpha/(1+\alpha)$, and then declines. In our model, the behavior of α^F with respect to τ depends on whether τ_o is bigger or smaller than τ^*. Figures 3A and 3B graph α^F for $\tau_o<\tau^*$ and $\tau_o>\tau^*$, respectively. In both cases, for $\tau>\tau_o$, α^F always declines with τ.

Note that the rate of return (α^F), and, thus, the growth rate, is always declining with the tax rate when there is an informal sector in the economy ($\beta^*>0$), even in the case when higher taxes could have positive effects on productivity, in the absence of an informal sector (see Figure 3A). The case when $\tau_o<\tau^*$ is particularly interesting because it shows that the optimal tax policy in the absence of an informal sector (τ^*) renders suboptimal return and growth rates when an informal sector is allowed for. The following explains why α^F and, thus, the growth rate always decreases with higher tax rates: When the tax rate rises, the relative size of the informal sector increases (β^* goes up). Suppose that despite such initial increase in β^*, α^F was higher than before. Considering the definitions for the rates of return in equation (4) and the assumption that $[\epsilon^{\alpha} - (1-\tau)]>0$, it must be the case that α^I increases proportionally more than α^F; clearly, this is not a steady-state equilibrium ($g(\beta)=\alpha^I-\alpha^F$ is no longer equal to P). Utilities are equalized across

sectors only when β^* increases so much that α^F is lower than it was before taxes went up.

Entry Costs to Formality

We model the access costs to formality as a one-time fee paid to government; this fee is assumed to be proportional to the capital to become formal. As explained in the introduction, this access cost reflects regulations imposed by government and its bureaucracy. These regulations serve no direct purpose, and, hence, they are a waste of resources from the social perspective. Let this one-time cost be given by the fraction δ of capital, where $0<\delta<1$.

Informals will switch to the formal sector when formal utility less entry costs exceeds informal utility; that is, when

$$V^I(k_i) \leq V^F((1-\delta)k_i)$$

or,

$$g(\beta) \leq P' \tag{15'}$$

where,

$$\begin{aligned} P' &= P + \rho\log(1-\delta) \\ &< P \end{aligned}$$

Note that P' can be positive or negative.

Since formals face no entry costs to the informal sector, they will switch to the informal sector when

$$g(\beta) \geq P$$

Hence, there is a zone of inaction, where nobody wants to switch sectors.

There are two cases to consider. The first occurs when the entry cost rate (δ) is low enough so that $P > P' > \lambda b$. In this case, we assume that $g(\beta=0) > P'$.[11] This case is presented in Figure 4A.[12] The steady state level of β is given by the intersection of $g(\beta)$ and P'. At β^*, no formal agents want to move to the informal sector. On the other hand, informal agents are indifferent between the two sectors. Note that if no capital flows from one sector to the other, the informal sector will grow at a faster rate ($g(\beta^*) > \lambda b$). Therefore, in order to keep β^* constant, there will be a constant flow of capital from the informal to the formal sector, as is the case when there are no access costs. The ratio of informal to formal production in the steady state (β^*) is given by

$$\beta^* = \begin{cases} 0 & \tau < \tau_o' \\ \dfrac{\tau A^{\frac{1}{\alpha}}[\epsilon^\alpha - (1-\tau)]^{\frac{1}{\alpha}}}{\epsilon (P')^{\frac{1}{\alpha}}} - \dfrac{1}{\epsilon} & \tau > \tau_o' \end{cases} \tag{21}$$

where,

$$\tau_o'^{\alpha}[\epsilon^\alpha - (1-\tau_o')] = \frac{P'}{A} \tag{22}$$

The second case occurs when the entry cost rate (δ) is high enough so that $P > \lambda b \geq P'$. In this case, we assume that $g(\beta=0) > \lambda b$.[13] This second case is presented in Figure 4B. β^* is given by the intersection of $g(\beta)$ and λb. In this steady state, neither formal nor informal agents

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[11]This assumption is analogous to the one in equation (16) for the case of no entry costs; it makes possible the presence of an informal sector in steady state.

[12]In drawing Figures 4A and 4B, we assume that P' is positive. The analysis is the same if P' is negative.

[13]See footnote 11.

want to switch sectors, and both of them grow at the same rate ($g(\beta^*)=\lambda b$). We have not modeled the transition to the steady state; nevertheless, the following is a rough characterization of the transition in a neighborhood around the steady state, neighborhood in which there is no flow of capital from one sector to the other: In Figure 4B, between β_1 and β_2 no agent switches sectors; however, between β_1 and β^*, $g(\beta)>\lambda b$, so that $\gamma^I>\gamma^F$, implying that β approaches β^*; and, between β^* and β_2, $g(\beta)<\lambda b$, so that $\gamma^I<\gamma^F$, implying that β approaches β^*.

In this second case, the ratio of informal to formal production in the steady state (β^*) is given by

$$\beta^* = \begin{cases} 0 & \tau < \tau_o'' \\ \dfrac{\tau A^{\frac{1}{\alpha}}[\epsilon^\alpha-(1-\tau)]^{\frac{1}{\alpha}}}{\epsilon(\lambda b)^{\frac{1}{\alpha}}} - \dfrac{1}{\epsilon} & \tau > \tau_o'' \end{cases} \tag{21'}$$

where,

$$\tau_o''^{\alpha}[\epsilon^\alpha-(1-\tau_o'')] = \frac{\lambda b}{A} \tag{22'}$$

Note that in this case the growth rate of the economy is given by $\alpha^F-\rho$.

The relative size of the informal sector in this case is greater than that in the case of sufficiently low entry cost rates, which in turn is greater than that when there are no entry costs. Consequently, the steady-state growth rate is highest when there are no entry costs to formality and lowest when the entry cost rate is sufficiently large.

IV. THE BEHAVIOR OF GOVERNMENT

Welfare

Let us define social welfare (W) as the sum of individual utilities. Then,

$$W = \int f_t(k)\frac{1}{\rho}\log(\rho k)dk + \mu_t B^F + (1-\mu_t)B^I \tag{23}$$

Given that the one time cost to become formal represents a pure waste of resources, the optimal policy will have $\delta=0$. If $\delta=0$, formal and informal capital are interchangeable. This implies that the first term in the r.h.s. of equation (23), which is a function of the current distribution of capital, is independent of changes in policy parameters. Therefore, maximizing welfare with respect to the policy parameters is equivalent to maximizing the last two terms in equation (23).[14]

In equilibrium, if the informal sector exists ($\beta^*>0$), individual utility obtained in the formal sector is equal to that in the informal sector; therefore, $B^I=B^F$. If the informal sector does not exist ($\beta^*=0$), obviously every individual's utility depends on B^F. In either case, maximizing welfare amounts to maximizing B^F.

From the expression for optimal individual utility in the formal sector (equation (7)), we see that B^F is a positive function of α^F. Therefore, maximizing welfare is equivalent to maximizing α^F.

As was shown in the section on aggregate growth, the growth rate is for all practical purposes equal to α^F-ρ, and, thus, it is optimized by maximizing α^F. Therefore, maximizing welfare is approximately equivalent to maximizing growth. From now on, when analyzing

[14]Note that since the optimal choice of parameters does not depend on the current distribution or level of capital, the optimal solution is time consistent.

optimal welfare and growth, we concentrate on the maximization of α^F.

There are a number of parameters in the model. We are going to assume that four of them are policy parameters. They are the tax rate (τ), the penalty rate (b), the fraction of public services used by informals (ϵ), and the registration-cost rate (δ). They seem to be the parameters that most realistically would be under government control.[15] Note, however, that assuming that these four are the only policy parameters does not mean that we are restricted to suboptimal outcomes; in fact, as we show shortly, using these four parameters appropriately allows us to attain the optimal outcome.

From the perspective of social welfare, it is clear that δ must be set equal to zero. What about τ, b, and ϵ?

Consider the relationship between α^F and τ for given b and ϵ. This is represented in Figures 3A and 3B. We see that α^F reaches a maximum at τ_0 when $\tau_0<\tau^{'}$, and at τ^{*} when $\tau_0>\tau^{'}$. In both cases $\beta^{*}=0$. That is, in order for welfare, growth, and α^F to be maximized, it is necessary that the informal sector vanishes.

The maximum at $\tau^{'}$ is superior to the maximum at τ_o. As we know, a maximum at τ_o occurs when τ_o is relatively low; from (17), we learn that τ_o is low when the economy is exogenously very productive (high A), public services do not contribute much to production (low α), participation of public services by informals is significant (high ϵ), and the penalties are not very severe (low b). Therefore, by increasing the penalty rate and decreasing the fraction of public services used by informals, τ_0 can be raised until it is at least as big as $\tau^{'}$. In this way, α_F

[15]We keep the assumption that the probability of detection (λ) is exogenously given. In reality, this probability may be controlled by both government and economic agents, the former by determining the amount of resources dedicated to policing the informal sector, and the latter by using appropriate "hiding" strategies. We keep λ exogenous to simplify the analysis.

would reach a maximum at τ^*.

Hence, when the policy variables can be changed with no cost, the optimal policy is $\tau=\tau_0=\tau^*$. The fact that the optimal outcome is achieved with a proportional tax rate is explained by the congestion externality. As Barro and Sala-i-Martin (1992) show, τ^* can be thought of as the user fee which effectively internalizes the congestion effect.

We have assumed that there is no cost associated with maintaining the penalty rate at a certain level and preventing informals from using some public services. More realistically, if a more severe policy towards informals involves a higher implementation cost, the optimal policy will consist of having the actual tax rate τ equal to τ_0, and having b and ϵ such that τ_0 is less than but close to τ^*; to be precise, optimal b and ϵ occur when the marginal cost of adjusting b and ϵ (cost of policing the informal sector) is equal to its marginal benefit (which comes from having the tax rate, $\tau=\tau_0$, closer to τ^*). This analysis has the implication that optimal policies may seem to undertax the economy, for the optimal tax rate in this case falls short of τ^*. Raising the tax rate to undertake what appears to be profitable public projects hurts the economy, for it invites the formation of an informal sector.

Finally, although the vanishing of the informal sector is necessary to optimize social welfare, it is not a sufficient condition. Notice that if the penalty rate (b) is high enough or the fraction of public services used by informals (ϵ) is low enough, no agent will choose to operate in the informal sector. Nevertheless, the tax rate may not be at its optimal value.

Let us summarize and provide some economic interpretation. For given parameter values, if the tax rate is below a certain threshold level, there is no informal sector in the economy. This is because the costs of being informal (penalties and less usage of public services) are bigger than its benefits (avoiding taxes). In fact, as the tax rate increases from low

levels, productivity and welfare rise for everyone because the distortionary effect of taxes is more than compensated for by the beneficial effect of public services (which, of course, are tax financed). Government would want to raise the tax rate up to the point where productivity of public services is maximized. However, this optimal rate must be below the threshold rate; otherwise, the presence of the informal sector would add to the distortionary effect of taxes and this rate would no longer be optimal. To ensure that the threshold rate is at least as high as the optimal tax rate, government can increase penalties and prevent informals from using public services, thus making informality less profitable.

Bureaucracy and Informality

From the analysis in the previous section we learn that, for given parameters, an appropriate reduction of the tax rate and a sufficient severity towards the informal sector eliminate the incentives for economic agents to become informal. If everyone is better off without an informal sector, why may government not pursue a policy to eliminate it?

We have treated government as an impersonal entity. In reality government is managed by a bureaucracy. This bureaucracy has the power to collect taxes and penalties and to administer the use of public services.

The bureaucracy collects penalties from informal agents. We have assumed that these penalties are not used to produce public services. If in fact the bureaucracy appropriates at least some of the penalty revenues, it has the incentive to promote the formation and growth of the informal sector. If the informal sector were to disappear, bureaucrats would lose their special rents.

The behavior of the bureaucracy depends on the degree of cohesion and coordination

among its members, the extent of its power to dictate policy, and its planning horizon.

Shleifer and Vishny (1993) compare the case of a bureaucracy which behaves as a single monopolist with that composed of a number of independent monopolists. They show that the latter type of bureaucracy leads to more corruption and economic distortions than the first one. They also point out that a well coordinated bureaucracy is more profitable to its members.

The behavior of the bureaucracy is also determined by its power to control different policy instruments such as tax and penalty rates, entry costs to formality, and usage of public services. When the bureaucracy is more accountable to the public, through an effective use of the political mechanisms of democracy, the powers to legislate in its own behalf diminish. The bureaucracy may have limited power over some policy instruments and vast powers over others. For instance, a bureaucracy with small legislative powers may have little control over the determination of tax rates but a large control over penalty rates and registration costs to formality. The characteristics and strength of bureaucracy's power change considerably from country to country. Related to the extent and qualifications of its power is the time horizon the bureaucracy considers in taking policy decisions. The analysis presented so far in the paper helps us understand this decision-taking process.

Policy decisions affect the relative size of the informal sector at any point in time (β^*) and its growth rate (γ^I). As it was shown in previous sections, a relative expansion of the informal sector produces higher congestion of public services and, consequently, lower growth. Therefore, there tends to be a trade-off between a larger size of the informal sector (and, thus, a larger base from which to collect penalties) now and in the future. If the bureaucracy's planning horizon is rather short (may be because it follows the cycle of popular elections), it will sacrifice growth for a larger informal sector now. Depending on its power to control policy instruments,

the short-sighted bureaucracy will dictate high tax rates and rather low penalty rates, will make more public services available to informals, and will restrict the access to formality. A bureaucracy that enjoys a large planning horizon will take into account growth considerations more seriously, understanding the negative effect of the congestion of public services on growth. This bureaucracy will in fact be interested in a healthy formal sector, for it provides the resources to produce public services, which in turn determine the productivity of the informal sector. Relative to the short-sighted bureaucracy, this will impose lower tax rates, higher penalty rates, less access to public services by informals, and fewer restrictions to formality. The far-sighted bureaucracy behaves similarly to those which are accountable to the public, in so far as the importance paid to growth is concerned.

The presence and traits of the informal sector in different countries is very much related to the characteristics of their bureaucracy.

V. PRODUCTION UNCERTAINTY AND CAPITAL MARKETS

In this section we extend the simple model by introducing production uncertainty and capital markets. As it was pointed out in the introduction, one of the most important characteristics of informality is the inability to use capital markets. That is, informal firms have restricted access to credit, and their ability to participate of joint ventures and insurance markets is limited. In order to model this feature, we need to introduce some kind of uncertainty; we have chosen to introduce uncertainty in the production function.

We keep the same features as in the simple model presented in previous sections, not considering entry costs.

The net-of-tax flow of production for individual firms in the formal sector is given by

$$y_i^F = \alpha^F \omega_i k_i dt + \sigma' \omega_i k_i dz_i \tag{24}$$

where,

$$\alpha^F = A(1-\tau)\left(\frac{g}{y}\right)^{\alpha}$$

Each agent chooses the fraction w_i of her capital, k_i, that she wishes to use for production. The net-of-tax expected return or flow of production per unit of capital is given by $\alpha^F dt$. The variable z_i follows a standard Brownian Motion or Wiener process[16]. The processes z_i and z_j are independent for i different from j. The parameter σ^2 is the variance of return. Then, the variance of net-of-tax return is given by $\sigma'^2 dt$, where $\sigma'=\sigma(1-\tau)$, and τ is the tax rate. We assume σ to be constant.

The flow of production for individual firms in the informal sector is

$$y_i^I = \alpha^I \omega_i k_i dt + \sigma \omega_i k_i dz_i \tag{25}$$

where,

$$\alpha^I = A\left(\epsilon\frac{g}{y}\right)^{\alpha} \qquad 0<\epsilon<1$$

The expected production flows α^F and α^I are the same as in previous sections.

We assume that formals can use the capital market for lending, borrowing, and diversifying risks. Informal producers cannot use the capital markets, for they have no legal claim to their capital stock.

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[16]That is, $z_i(t)$ has stationary, independent increments, continuous sample paths, and is normally distributed with mean zero and variance t.

The Formal Sector

The formal sector is formed by a large (infinite) number of agents. There is also a large number of intermediaries in the capital market. These intermediaries borrow assets from formal agents and invest them in any of the individual technologies. Suppose a given intermediary with total assets equal to a invests in N different technologies, using a/N units of capital in each of them. The total return is given by

$$R = a(\alpha^F dt + \frac{1}{N}\sum_{i=1}^{N} \sigma' dz_i)$$

Since the z_i processes are independent, when N goes to infinity the stochastic part of the return converges to 0. Hence, using this strategy the intermediary obtains $R = a\alpha^F dt$. It is clear that this strategy is the best one available to the intermediary: any other produces the same expected return but a higher variance. The large number of intermediaries precludes the possibility of any of them taking into account the congestion externality. We assume that capital markets are competitive and that there are no administrative costs to intermediaries. Then, given that the production technology is constant returns to scale, intermediaries will borrow and lend at the same interest rate α^F. In summary, agents in the formal sector will always choose to operate through the capital market, for that allows them to diversify away their production risk.

The ability to use capital markets allows formal agents to ignore the production-related uncertainty in their optimal decision making. Formal agents now face the same problem as in the case with no uncertainty in production. Therefore, the solution for optimal consumption and growth rate in the formal sector is the same as in section I.

The Informal Sector

Informal agents cannot use the capital markets so that each producer operates her own technology. Consequently, they cannot diversify away the risk inherent in production. The underlying assumption is that informals will not choose to form coalitions since they cannot enforce contracts. As we said above, informal agents cannot enforce contracts because they have no legal claim to their capital stock and do not enjoy the protection of courts of law.

The budget constraint for informal agent i is

$$dk_i = \alpha^I \omega_i k_i dt + \sigma \omega_i k_i dz_i - c_i dt - bk_i dq_i \tag{26}$$

Equation (26) is the short-hand expression for the stochastic integral of $k_i(t)$. Note that, as opposed to z_i, q_i is continuous in time but not in the state space.

Note that α^I can be interpreted as the effective borrowing rate for informal producers. Production in the informal sector is carried out by family firms. In this sense the size of each informal firm is very small (it is actually negligible in our model). On the other hand, in the formal sector, firms work jointly to diversify away their production uncertainty. In this sense, formal firms are much larger than informal family firms.

Informals maximize U subject to (26). Let $V^I(k_i)$ be the maximized current value of total expected utility U, starting in state k_i. The Bellman equation for V^I is

$$\begin{aligned} \rho V^I(k_i) = \underset{c_i, \omega_i}{MAX} \{ & \log(c_i) + V_k^I(k_i)(\alpha^I \omega_i k_i - c_i) + \frac{1}{2} V_{kk}^I(k_i) \omega_i^2 k_i^2 \sigma^2 \\ & + \lambda [V^I(k_i(1-b)) - V^I(k_i)] \} \end{aligned} \tag{27}$$

The first part of the expected change in total utility corresponds to the continuous variation in capital given by production and consumption. The second part is the standard infinite variation correction for Ito processes. The last part is the discontinuous change in utility

caused by expected penalties.

The F.O.C.s for maximization are given by

$$\frac{1}{c_i} - V_k^I(k_i) = 0$$
$$\alpha^I V_k^I(k_i)k_i + V_{kk}^I(k_i)\omega_i k_i^2 \sigma^2 = 0 \tag{28}$$

We obviously require that w_i be greater than 0 and smaller than 1. We choose not to impose this constraint directly; instead, we constrain the parameters of the model (as explained below) so that the condition obtains. The two equations in (28) are independent, and the second one is linear in the optimal fraction of capital used (w_i); therefore, we can solve for w_i as follows:

$$\omega_i = \frac{\alpha^I}{\left(\frac{-V_{kk}(k_i)k_i}{V_k(k_i)}\right)\sigma^2}$$

The optimal fraction of capital used in production (w_i) is increasing in the expected return and decreasing in the variance. The term in parenthesis in the denominator is the Arrow-Pratt measure of relative risk aversion.

Substituting (28) into (27), we get a differential equation for V^I with boundary condition

$$\lim_{t\to\infty} V^I(k_i(t))e^{-\rho t} = 0$$

The solution for V^I is given by

$$V^I(k_i) = \frac{1}{\rho}\log(\rho k_i) + B^I \tag{29}$$

where,

$$B^I = \frac{1}{\rho}\left[\frac{1}{2\rho}\frac{\alpha^{I^2}}{\sigma^2} + \frac{\lambda}{\rho}\log(1-b) - 1\right]$$

The consumption function and optimal rate of utilization are given by

$$c_i = \rho k_i$$
$$\omega_i = \frac{\alpha^I}{\sigma^2} \tag{30}$$

We ensure that the utilization rate belongs to [0,1] by assuming $\alpha^I < \sigma^2$.

Given optimal consumption and utilization rates, capital evolves according to

$$dk_i = \left(\frac{\alpha^{I^2}}{\sigma^2} - \rho\right)k_i dt - bk_i dq_i + \frac{\alpha^I}{\sigma}k_i dz_i \tag{31}$$

Now, aggregate informal capital is

$$k^I = (1-\mu_p)E(k_i/i\in I)$$

To get the evolution of aggregate informal capital (k^I), we take expected values (over agents) in (31). Since the z_i processes are independent, $E(k_i dz_i/i\in I) = 0$. Hence, the growth rate γ^I of the informal sector is given by

$$\gamma^I = \frac{\alpha^{I^2}}{\sigma^2} - \lambda b - \rho \tag{32}$$

Steady State

In steady state informal agents want to switch to the formal sector whenever

$$V^I(k_i) \le V^F(k_i)$$

or,

$$g(\beta) \leq P \tag{33}$$

where,

$$g(\beta) = \frac{1}{2}\frac{\alpha^{I^2}}{\sigma^2} - \alpha^F$$

$$P = -\lambda\log(1-b)$$

Formals, in turn, want to move to the informal economy in the steady state when the inequality in (33) is reversed. Hence the rest of the analysis is the same as in the case of no uncertainty. The steady state (β^*) obtains when equation (33) is given with equality. As before, the key element that ensures the existence and stability of the steady state is the negative slope of $g(\beta)$ (Figure 1 also applies to this case). The new element here is that higher congestion also reduces the rate of capital utilization in the informal sector: When α^I decreases because of a higher β, uncertainty becomes relatively more important, thus lowering utility in the informal sector.

Using Figure 1, we note that when the production uncertainty increases (σ^2 rises), the curve $g(\beta)$ shifts to the left, thus decreasing β^*. More uncertainty hurts the informal sector thus decreasing its relative size in steady state.

From equation (33) with equality, we can get an expression for β^*, when $\beta^*>0$,

$$(1+\epsilon\beta^*)^\alpha = \frac{A\tau^\alpha}{2P}\left[-(1-\tau) + \left\{(1-\tau)^2 + 2P\frac{\epsilon^{2\alpha}}{\sigma^2}\right\}^{\frac{1}{2}}\right] \tag{34}$$

Note that τ_o is implicitly given by equation (34) when $\beta^*=0$; and as before, if $\tau<\tau_o$ then $\beta^*=0$.

The growth rate is given by the same expression as in the case of no uncertainty (equation 19), although the switching term is slightly different. The qualitative implication for growth and

welfare are similar to those of the simpler model.

VI. CONCLUDING REMARKS

This paper studies the emergence of informal sectors and their impact on growth and welfare. We argue that the rise of informal sectors is a natural consequence of the restrictions imposed by governments on optimizing agents. An informal status entails many disadvantages; namely, inability to use the capital and insurance markets, lack of access to important public services, and propensity to suffer penalties and expropriations. Nevertheless, despite those disadvantages, some economic agents choose to become informal because the restrictions government imposes on them, by way of taxes and regulations, are overwhelming.

Economies with larger informal sectors are more inefficient because of the disadvantages inherent to informality and because the loss of tax revenues hurts the provision of public goods and services. In this paper, we show that such inefficiency is reflected in low rates of return to all investment, stagnant growth, and suboptimal social welfare.

What explains government's socially inefficient behavior? It has been argued that such behavior can be explained by the inertia of bad laws, designed to meet the social needs of other times and places. However, this explanation begs the question: what explains such inertia? We believe that bad laws, far from being removed, are put forward because they benefit groups in power. In this paper, we have identified such groups with government bureaucracy, which controls public services and has the power to expropriate capital from informal agents. It thus follows that bureaucrats, having a vested interest in a large and growing informal sector, create the incentives for informality.

In reality, the bureaucracy is not the only interest group in society. Many groups would

like government to legislate regulations on their behalf. As those special regulations are implemented, informal sectors, trying to avoid them, arise. With widespread informality, society at large suffers.

REFERENCES

Allingham, M. G. and A. Sandmo (1972), "Income Tax Evasion: A Theoretical Analysis," *Journal of Public Economics*, November.

Alm, J., G. McClelland, and W. Schulze (1992), "Why Do People Pay Taxes?," *Journal of Public Economics*, June.

Banerji, A. (1991), "Tax Evasion, Enforcement, and Intertemporal Choice," *Proceedings*, 1991 National Tax Association Conference, Williamsburg, pp. 90-100.

Barro, R. (1990), "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, October, supplement.

Barro, R. and X. Sala-i-Martin (1992), "Public Finance in Models of Economic Growth," *The Review of Economic Studies*, October.

Becker, G. (1968), "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, Vol. 76, No. 2.

Chaudhury, T. (1989), "A Theoretical Analysis of the Informal Sector," *World Development*, March.

Chickering, A. and M. Salahdine (1991), "Introduction," in *The Silent Revolution*, ed. A. Chickering and M. Salahdine, International Center for Economic Growth, San Francisco.

Cowell, F. (1990), *Cheating the Government: The Economics of Evasion*, MIT Press, Cambridge.

De Soto, H. (1989), *The Other Path*, Harper & Row, New York.

Gupta, M. (1993), "Rural-Urban Migration, Informal Sector, and Development Policies: A Theoretical Analysis," *The Journal of Development Economics*, June.

Loayza, N. (1993a), "A Brief Introduction to Informal Economies," mimeo, Harvard University, November.

Loayza, N. (1993b), "Labor Regulations and the Informal Sector," mimeo, Harvard University, November.

Lucas, R. (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics*, July.

Rauch, J. (1991), "Modelling the Informal Sector Formally," *The Journal of Development Economics*, January.

Rebelo, S. (1991), "Long-Run Policy Analysis and Long-Run Growth," *Journal of Political Economy*, June.

Romer, P. (1986), "Increasing Returns and Long-Run Growth," *Journal of Political Economy*, October.

Shleifer, A. and R. Vishny (1993), "Corruption," *The Quarterly Journal of Economics*, August.

Tanzi, V. and P. Shome (1993), "A Primer on Tax Evasion," International Monetary Fund, Working Paper No. 93/21, March.

FIGURE 1

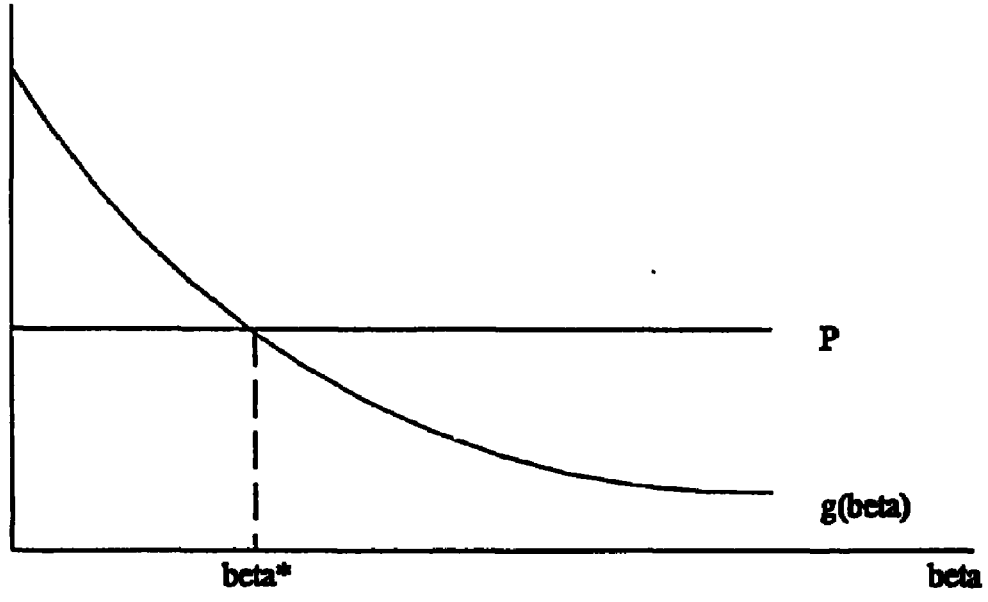


FIGURE 2

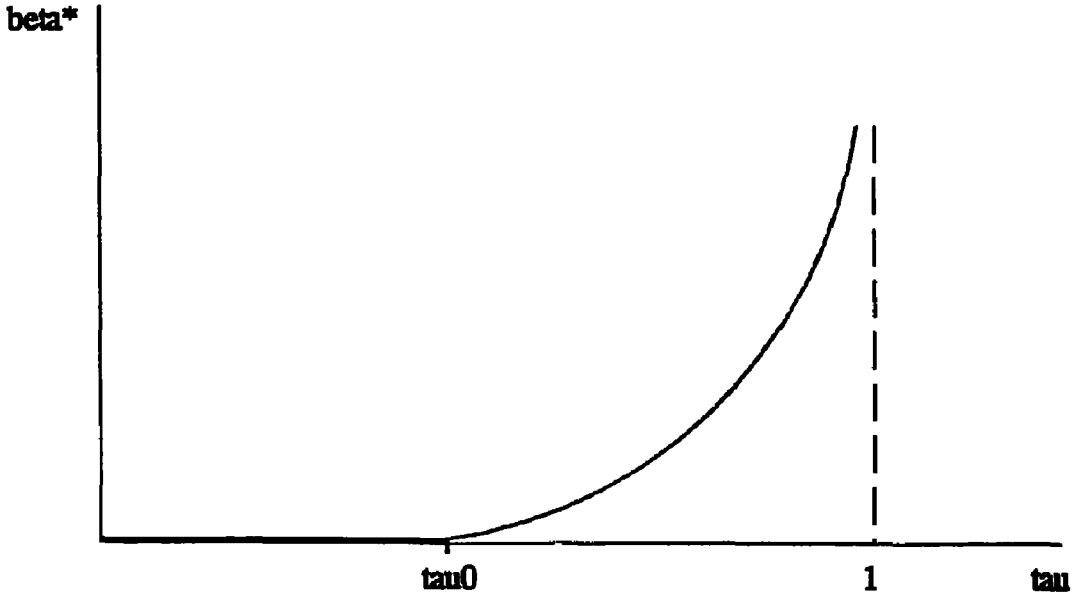


FIGURE 3A

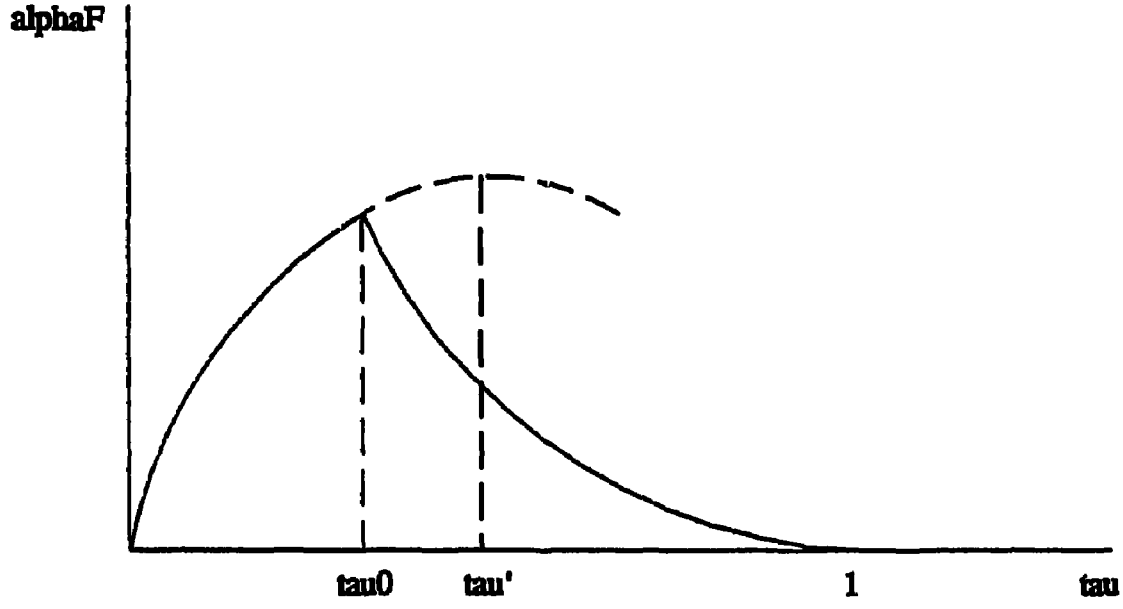


FIGURE 3B

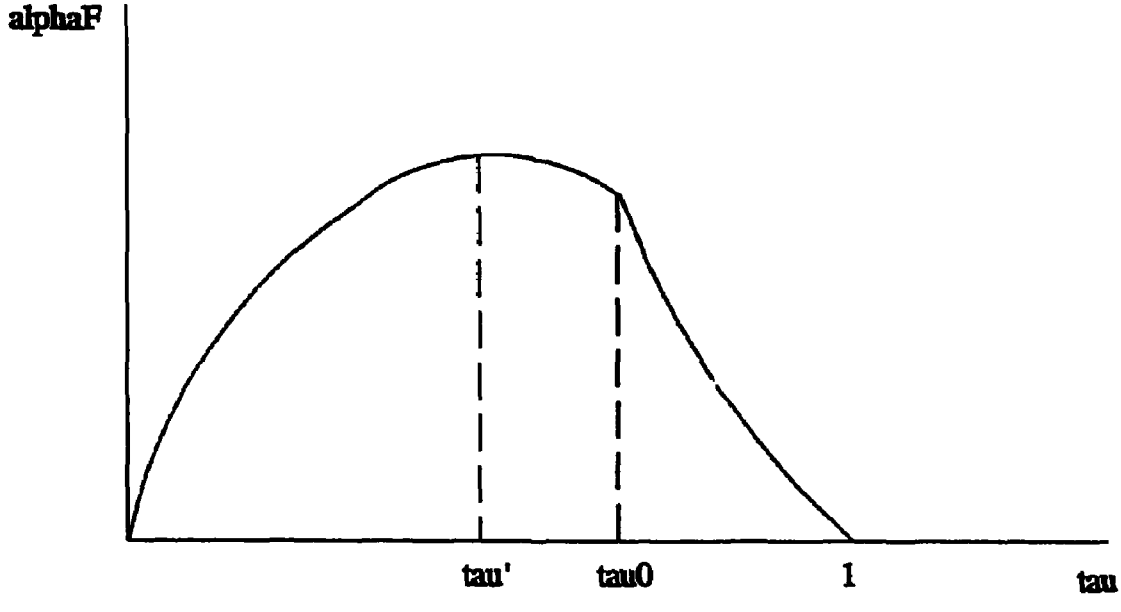


FIGURE 4A

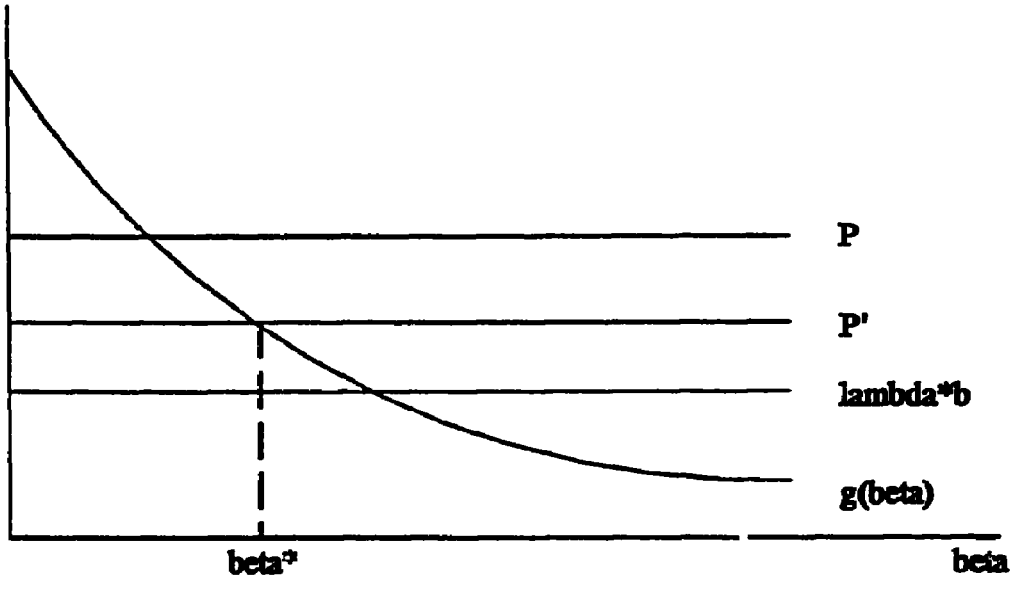
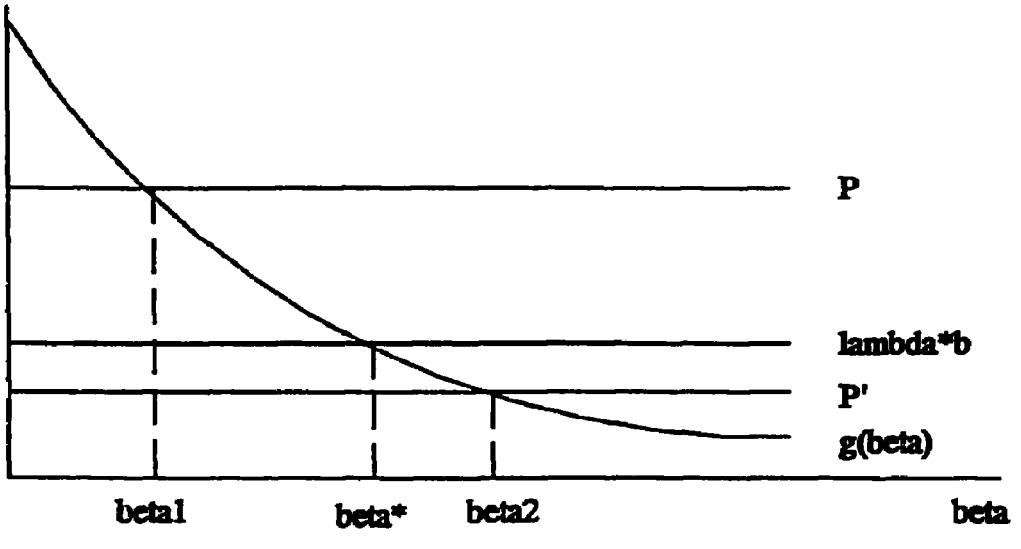


FIGURE 4B



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