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Rent-Seeking Bureaucracies and Oversight in a Simple Growth Model*†

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Abstract

Following recent cross-country empirical work, research on public policy and growth has come to examine the impact of inefficient or corrupt bureaucracies. Most of this work has emphasized the interactions between bureaucracies and private markets. By contrast, this paper focuses on the relationship between rent-seeking bureaucracies and their political authority. We emphasize two main points. First, when oversight is relatively costly, the political authority exercises little monitoring of its agencies which reduces the effectiveness of productive government spending. Second, when the technology used to provide public services is poor, as in many developing economies, bureaus better succeed in requesting overly large budgets before triggering any monitoring. Both of these characteristics contribute to reducing the growth rate of already poor economies.

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†The views expressed in this paper are solely those of the author and do not necessarily represent those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

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1 Introduction

With the advent of endogenous growth theory, a substantial body of work has been devoted to understanding the impact of public policy on economic growth[1]. Following recent cross-country empirical work by Mauro (1995), and Keefer and Knack (1995), this body of work has expanded to include the analysis of various distortions introduced by inefficient or corrupt bureaucracies. Along with other case studies such as De Soto (1989), cross-country regressions generally suggest that rent-seeking and dishonest bureaucracies tend to have an adverse effect on a country's growth performance. Almost without exceptions, the theoretical literature on bureaucratic quality and development has focused on the drawbacks that arise from the interactions of an inefficient bureaucracy with private markets. As stated by Hall and Jones (1997), "a corrupt bureaucracy acts as a tax on the productive activities of the economy. Investors must spend some of their time and resources bribing officials in order to obtain permits and licenses necessary for the conduct of business."

While these arguments are no doubt significant, there exists another important avenue through which bureaucratic quality affects economic growth. In particular, this paper suggests that the empirical results cited above stem, at least in part, from the political authority's interactions with its executive agencies. It is well known that in many developing economies, the central government is relatively weak and cannot effectively engage in bureau oversight. This directly suggests that the growth effects of government spending may be partially linked to an agency problem between the political authority and its bureaucracy. There exist two lines of ongoing research which, combined together, lend some natural support to this hypothesis. First, several authors, notably Barro (1990), and Glomm and Ravikumar (1994, 1997), have suggested that governments provide goods and services that raise the return to private investment. In this sense, the construction of highways or the provision of law enforcement, say, contributes directly to economic growth. Second, public goods and services do not originate from the central government directly, but rather from a variety of agencies under its control. These bureaus are typically better informed than the political authority concerning the technology they use to provide public services and, furthermore, generally act in their self interest. Niskanen (1971), and Migué and Bélanger (1974), were among the first to pioneer frameworks where bureaus act to maximize their discretionary budget. Put together, these two considerations imply that the efficiency of productive public expenditures is implicitly related to the need for some amount of bureau oversight. This paper, therefore, investigates this issue. In the US, it is precisely the need for bureau oversight which justifies the existence of the Office of Management and Budget and, to an extent, the

[1] See Easterly and Rebelo (1993) for instance.

General Accounting Office.

Figure (1a), depicts the relationship between an index of Bureaucratic Delays and the Quality of Communication Infrastructures in a sample of 41 countries. These indices are obtained from Business Environmental Risk Intelligence (BERI), a private investment risk service. Since the Quality index is meant to capture "facilities for and ease of communication" as well as the "quality of transportation" within the country, we may interpret it as a proxy for the oversight technology available to the political authority. Under this interpretation, bureaus tend to exhibit lesser delays as the oversight technology improves. One possible motivation for this relationship is that greater bureau oversight takes place the better the oversight technology.

[Insert Figure 1 Here]

On a related note, Figure (1b) suggests that economies with greater bureaucratic delays grow at slower rates[2]. This paper formalizes two potential explanations for this relationship. First, and consistent with Figure (1a), we show that as the oversight technology deteriorates, less monitoring of executive agencies occurs which reduces the effectiveness of productive government spending. The second explanation relies on the idea that bureaucracies may inherently differ along technological considerations. In particular, the provision of public services is likely to be carried out more efficiently in advanced economies relative to poorer countries. Under this alternative interpretation, we show that when the technology used to provide public services is poor, bureaus better succeed in acquiring excessively large budgets before triggering any monitoring. We also show that such economies are generally associated with lower growth rates.

To shed light on the above issues, we adopt a conventional linear neoclassical growth framework in which productive government spending is financed through distortionary taxation. This framework is, therefore, similar in nature to that of Barro (1990), or Glomm and Ravikumar (1994, 1997). Contrary to these papers, however, the provision of public intermediate inputs occurs through a variety of government bureaus that seek to maximize their discretionary budget. That is, the difference between the budget they request and the cost of producing the output required by the political authority. In the analysis below, the allocation of budget emerges as the outcome of a static optimal contract between a government oversight agency and each of the bureaus. Since bureaus privately observe their cost of providing public services, this seems a natural approach. More importantly, this particular

[2] Although Figure 1 depicts unconditional correlations, Keefer and Knack (1995) show that the BERI variables are significantly correlated with economic growth, even when included in more fully specified cross-country growth regressions.

modelling strategy allows us to focus on the difficulty of overseeing bureaucratic activity as a crucial aspect of the environment.

This paper is organized as follows. Section 2 presents a brief outline of the economic environment. Section 3 describes production and the bureaucratic provision of public goods. In section 4, we examine the long-run growth properties of the model as well as the equilibrium degree of oversight that characterizes the bureaucracy. Section 5 addresses the issue of optimal tax policy. Finally, some concluding remarks are offered in section 6.

2 Structure of the environment

Figure 2 briefly describes the organizational structure of the environment. The economy is populated by a continuum of households uniformly distributed on the unit interval. Households directly operate the technology for final goods and are subject to taxation. The proceeds from taxation can be used in one of two ways. First, tax revenue can be used to finance a variety of bureaus in the production of public goods and services that are redistributed back to households via distortionary transfers. Second, tax proceeds can also be used in the supervision of the bureaucracy through an oversight agency. Bureaus possess private information with respect to a randomly drawn technology used to produce public services. Since they also act to maximize their discretionary budget, the monitoring of bureaus serves to economize on total government outlays. To the degree that the allocation of budgets allows for informational rents to be earned by the bureaucracy, we assume that those rents are rebated back to households as a lump sum transfer[3].

[Insert Figure 2 Here]

Given some choice of fiscal policy, and thus tax revenue, our discussion focuses on how to efficiently allocate public expenditures across bureaus. To keep this latter issue separate from that of how to set fiscal policy, the budget allocation process is assumed to occur through an oversight agency which takes policy as given. In the US, the task of bureau oversight, including budget review and allocation, is largely carried out by the Office of Management and Budget. As such, the Office of Management and Budget does not decide on policy per se, which is typically decided in Congress, but rather helps the executive branch of government

[3]This aspect of the environment builds on Niskanen (1991), who suggests that "neither the members of the sponsor group nor the senior bureaucrats have a pecuniary share in any surplus generated by the bureau. The effect of this condition is that the surplus will be spent in ways that indirectly serve the interests of the sponsor and the bureau, but not as direct compensation."

with respect to managing public expenditures. According to its mission statement, the role of the Office of Management and Budget (OMB) is as follows:

> "OMB's predominant mission is to assist the President in overseeing the preparation of the Federal budget and to supervise its administration in Executive Branch agencies. In helping to formulate the President's spending plans, OMB evaluates the effectiveness of agency programs, policies, and procedures, assesses competing funding demands among agencies, and sets funding priorities."

For simplicity, we abstract from labor services in this paper. This allows us to focus exclusively on the growth distortions introduced by informational asymmetries between the political authority and its bureaucracy[4]. However, in the model below, we may think of capital as incorporating a human component as first suggested in Jones and Manuelli (1990), and Rebelo (1991).

3 Production and the provision of public goods

Consider a closed economy in which at each date, t, there exists a continuum of intermediate public inputs indexed by i, $x(t,i)$, uniformly distributed on $[0,N]$. Following Barro (1990), and Alesina and Rodrik (1994), a single final good, $y(t)$, is produced by combining capital with government services according to

$$y(t) = Ak(t)^{\alpha} \int_0^N x(t,i)^{1-\alpha} di, \; 0 < \alpha < 1. \tag{1}$$

In this framework, intermediate public inputs are meant to encompass a range of both public goods and services. (These may include highways, law enforcement, urban development, etc...) The variable $k(t)$ stands for capital services. We now examine the environment in which both the political authority and its bureaucracy interact. To keep the model relatively simple, the description of the informational framework which follows is assumed identical in every period.

Let us suppose that each bureau is required to produce a common level of public good or service, that is $x(t,i) = x(t)$ for each i, and requests a corresponding budget from a government oversight agency. In other words, we confine the analysis to that of a symmetric equilibrium. In this equilibrium, the particular value of $x(t)$ and the requested budget are

[4]That is, we leave aside the issue of possible scale effects typically associated with labor supply in endogenous growth models.

endogenous. In addition, we further assume that the supply of each public input is associated with a particular bureau. This is in keeping with Niskanen (1991), who sees the relationship between a bureau and its sponsor as "one of bilateral monopoly which involves the exchange of a promised output for a budget, rather than the sale of its output at a per-unit price." The exact form of the budget making mechanism remains to be described. To do this, however, first requires us to specify the technology underlying the provision of public goods.

We assume that the provision of $x(t)$ units of public goods by any bureau requires $\theta x(t)$ units of output, measured in terms of forgone consumption[5]. Here, θ is a random variable with support $(0, 1]$ which is distributed according to the continuously differentiable probability density function $f(\theta; \omega)$. Put another way, the average cost associated with the provision of government services is itself random. Let $F(\theta; \omega)$ *denote the corresponding cumulative* distribution function, where the parameter ω orders distributions by first-order stochastic dominance. Formally,

$$\frac{\partial F(\theta; \omega)}{\partial \omega} < 0, \text{ for } 0 < \theta \leq 1. \tag{2}$$

An increase in ω, therefore, generally renders the per-unit provision of government services more costly by shifting the distribution in a first-order sense. While the distribution $F(\theta; \omega)$ is publicly known, the realization of θ is costlessly observable only to the individual bureau. This feature of the model serves to capture an essential aspect of bureau theory. Specifically, Niskanen (1991) writes that the "bureau's primary advantage is that it has much better information about the costs of supplying the service than does the sponsor." Furthermore, Blais and Dion (1991) suggest that since bureaus "know much more about the production process than sponsors, it is easier for them to exploit the situation as monopoly suppliers than it is for sponsors to exploit it as monopoly buyers."

Nevertheless, there exists evidence, notably by Aucoin (1991), which indicates that even if bureaus do tend to press for larger budgets, they do not always obtain them. Consequently, we assume that a monitoring technology is available to the government whereby $\lambda x(t), \lambda \in (0, 1]$, units of final output can be used to observe a bureau's realization of θ when the bureau's output is $x(t)$. As mentioned earlier, a central government's ability to oversee its bureaucracy can vary significantly across economies. In poorer countries, bureaus tend to be geographically dispersed while means of communication remain elementary. One, therefore, expects developing economies to be associated with relatively high values of λ. Observe that a potential endogeneity problem exists in that persistently lower growth may itself prevent the adoption of effective oversight technologies. That is to say, slow growing economies

[5] In this sense, the use of output as intermediate goods relies on the assumptions of the one-sector production model.

cannot typically afford the infrastructure necessary for a competently run bureaucracy. For simplicity, we do not address this reverse causation issue here. Nevertheless, it is shown below that by reducing the effectiveness of productive government spending, the inability to adequately monitor bureaus can contribute to reducing the growth rate of already struggling economies.

Since each bureau is required to produce a common level of public good, $x(t)$, it follows that

$$N\overline{\theta}(\omega)x(t) = \int_0^1 \theta x(t) N dF(\theta;\omega),\ \overline{\theta}(\omega) \leq 1, \tag{3}$$

is the total quantity of resources required, measured in units of output, in the production of public goods across all bureaus. The fact that there exists a continuum of intermediate public inputs, or alternatively a continuum of bureaus, implies that this measure is known with certainty.

At this stage, it should be clear that the informational environment that we have thus far described is one of costly state verification as in Townsend (1979), or Williamson (1987). Before turning our attention to the determination of budgets, however, we need to be more specific as to the assumptions underlying the behavior of bureaus. In contrast to earlier work, we have abstracted from the fact that bureaus often interact with firms in awarding contracts or business and trade licenses. These types of interaction can often lead to economic distortions that severely hinder growth when bureaus are left unchecked.[6] In this paper, our concern is with the growth effects that emerge when distortionary public transfers occur through a rent-seeking bureaucracy. As suggested by Migué and Bélanger (1974), public bureaus are therefore interpreted as impersonal entities that seek to maximize their discretionary budget. In other words, the difference between total budget and the cost of producing the output required by the political sponsor[7].

Having postulated that bureaus privately observe the quantity of final goods they use to produce a given level of public input, $x(t)$, we model the budget allocation process as a static optimal contract, between each bureau and an oversight agency, which serves to economize on public expenditures. Since our bureaus are interpreted as surplus maximizing entities, this contract should allow for monitoring to take place in some states of the world. Indeed, in a world where monitoring never takes place, bureaus will always announce $\theta = 1$ and request the maximum budget allowed, $x(t)$ units of output. We then define the optimal budget allocation mechanism as one which minimizes total government expenditures while ensuring

[6] See De Soto (1989), or Shleifer and Vishny (1993), for example.

[7] In adopting this interpretation of bureaus, we also follow Peacock (1978) who points out that "the essence of the Niskanen/Tullock approach is that there is a close analogy between the theory of the firm and the theory of bureaucratic operation."

that the budget allocated to bureaus at least covers their cost of production. In addition, we require that each bureau's budget request correspond to its true realization of θ. In other words, the contract must satisfy incentive compatibility. As already noted, the oversight agency we have in mind for the US corresponds to the Office of Management and Budget. However, the General Accounting Office also plays a significant role in oversight activities. For the purposes of this model, we can conceptually think of combining these two agencies into a single institution taking $x(t)$ as given. Under the above conditions, it is optimal for this government monitoring institution to allocate to each bureau $\eta x(t)$, measured in units of output, if $\theta < \eta$ is reported, and $\theta x(t)$, if $\theta \geq \eta$ is reported, where $\eta \in (0, 1]$ satisfies

$$\min_{\eta} \int_{\eta}^{1} [\theta x(t) + \lambda x(t)] N dF(\theta; \omega) + \eta x(t) N F(\eta; \omega). \tag{4}$$

Here, the threshold η minimizes total government spending while ensuring that bureaus obtain a budget which at least covers their cost of production. Moreover, the contract is such that bureaus report the truth[8]. Bureaus reporting a high cost of production, that is $\theta \geq \eta$, obtain a relatively large budget in the amount $\theta x(t)$. However, these bureaus are also subject to oversight by the political sponsor. Bureaus reporting a relatively low value of θ, that is $\theta < \eta$, are not monitored and allocated a flat budget, $\eta x(t)$, in excess of the true cost they incur, $\theta x(t)$. As shown in Figure 3, this difference in the amount of $(\eta - \theta) x(t)$ constitutes a discretionary surplus resulting from informational asymmetries between bureaus and the oversight agency.

[Insert Figure 3 Here]

Since only bureaus which report $\theta \geq \eta$ are subject to oversight, the measure of monitored bureaus is $N[1 - F(\eta; \omega)]$. This directly implies that the quantity of resources used in monitoring activities is $N\lambda x(t)[1 - F(\eta; \omega)]$ units of output, which implicitly enters in equation (4). In particular, observe that the objective function in equation (4) can also be written as

$$N\bar{\theta}(\omega)x(t) + N\lambda x(t)\left[1 - F(\eta; \omega)\right] + N x(t) \int_{0}^{\eta} (\eta - \theta) dF(\theta; \omega). \tag{5}$$

Thus, in this last equation, the first two terms denote the quantity of final goods used in the production of public services and monitoring respectively. Similarly, the last term represents total discretionary surplus accruing to bureaus, measured in units of output. Using Leibniz's rule, we can differentiate equation (5) with respect to η which yields

[8]The form of this contract is stated without proof since this is a well known result for the case of verification in pure strategies in this environment. See Townsend (1979), or Williamson (1987).

$$Nx(t)F(\eta;\omega) - N\lambda x(t)f(\eta;\omega). \tag{6}$$

Therefore, as the monitoring threshold η rises, two opposing forces are in effect. On the one hand, a higher value of η indicates that a smaller fraction of the bureaucracy will be monitored. This leads to a decline in the quantity of final output used in the oversight of bureaus. On the other hand, a higher monitoring threshold also means that bureaus' discretionary budgets from possessing private information will rise. For simplicity, we therefore assume in this paper that equation (5) is strictly convex in η. Specifically,

$$Nx(t)\left\{f(\eta;\omega) - \lambda\frac{\partial f(\eta;\omega)}{\partial\eta}\right\} > 0, \text{ for } 0 < \eta \leq 1. \tag{7}$$

It directly follows that the solution to the minimization problem in (4), denoted η^*, solves

$$F(\eta^*;\omega) - \lambda f(\eta^*;\omega) = 0. \tag{8}$$

This result is quite intuitive in the sense that the oversight agency will monitor the bureaucracy up to the point where the marginal gain from decreasing bureaus' informational rents exactly offset the additional increase in the resources needed in bureau oversight. In this case, the solution will generally depend on both the monitoring technology, as summarized by λ, and the distribution which characterizes the cost of providing government services, as summarized by ω.

In order to proceed with the model, and in particular the analysis of growth effects introduced by the agency problem specified above, we now need to describe the make up of tax revenue. To this end, we assume that all household income is taxed at a constant rate $\tau \in (0,1)$. Tax revenue, denoted $T(t)$, is therefore given by

$$T(t) = \tau\left[y(t) + s(t)\right], \tag{9}$$

where $s(t) = Nx(t)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)$ is the measure of total bureaucratic surplus, evaluated at η^*, and rebated to households as a lump sum transfer. In equilibrium, total government expenditures in equation (5) must equal tax revenue. Hence, we have

$$\begin{aligned} & Nx(t)\bar{\theta}(\omega) + N\lambda x(t)[1 - F(\eta^*;\omega)] + Nx(t)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega) \\ = \; & \tau\left\{Ak(t)^\alpha Nx(t)^{1-\alpha} + Nx(t)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)\right\}, \end{aligned} \tag{10}$$

or alternatively,

$$\overline{\theta}(\omega)+\lambda[1-F(\eta^*;\omega)]+(1-\tau)\int_0^{\eta^*}(\eta^*-\theta)dF(\theta;\omega)=\tau A\left[\frac{x(t)}{k(t)}\right]^{-\alpha}. \quad (11)$$

As first suggested by Barro (1990), and Glomm and Ravikumar (1994, 1997), the ratio of government services to private capital, therefore, naturally depends on the state of fiscal policy. However, in this economy this ratio also depends on the cost distribution characterizing the production of public goods and the technology available to monitor a rent-seeking bureaucracy. It is this latter feature of the model that will allow us to investigate the nature of the relationships depicted in Figure 1.

Having described the nature of production as well as the provision of public goods, we can now turn our attention to the demand side of the model and the determination of the growth rate. In doing so, we explore the growth implications associated with countries in which there exist substantial difficulties in oversight. Moreover, we also analyze the growth effects that are present in countries whose public sector cannot provide public goods and services very effectively. As pointed out earlier, both of these cases generally apply to developing economies.

4 Determination of the growth rate

To close the model, we assume that the representative household maximizes its lifetime utility over an infinite horizon and solves

$$\max \mathcal{U}=\int_0^{\infty}e^{-\rho t}\frac{c(t)^{1-\sigma}}{1-\sigma}dt \text{ with } \sigma>0,\ \rho>0, \quad \text{(P1)}$$

$$\text{subject to} \quad c(t)+\dot{k}(t)+\delta k(t)=(1-\tau)\left[Ak(t)^{\alpha}\int_0^N x(t,i)^{1-\alpha}di+s(t)\right], \quad (12)$$

$$c(t)\geq 0,\ k(t)\geq 0,\ k(0)=k_0>0 \text{ given,}$$

where δ is the capital depreciation rate and $\dot{k}(t)$ is the time derivative. The right-hand side of equation (12) is simply disposable income. Using equation (10) and the household's budget constraint, it can easily be shown that the goods market clears. Formally, we have $c(t)+i(t)=y(t)-g(t)$ where $i(t)$ denotes gross investment, and $g(t)=N\overline{\theta}(\omega)x(t)+N\lambda x(t)[1-F(\eta^*;\omega)]$ are the resources actually used in the production of government services and monitoring respectively. In equilibrium, the solution to this dynamic optimization problem yields the familiar formula for the growth rate of consumption,

$$\gamma_c = \frac{(1-\tau)AN\alpha[x(t)/k(t)]^{1-\alpha} - (\delta+\rho)}{\sigma}. \tag{13}$$

As in more conventional linear growth models with productive government spending, a higher ratio of public infrastructures to private capital increases the return to capital and, therefore, contributes positively to economic growth. This ratio, however, depends on a variety of parameters that are intrinsic to the agency problem linking the political authority and its bureaucracy. As a result, it is not necessarily surprising that the institutional quality of government spending emerges as a significant factor in cross-country growth regressions. In particular, and by using equation (11), the growth rate in equation (13) ultimately reduces to

$$\begin{aligned} \gamma_c \;=\; & [B(1-\tau)\tau^{\frac{1-\alpha}{\alpha}} \times \\ & \left\{\overline{\theta}(\omega) + \lambda\left[1 - F(\eta^*;\omega)\right] + (1-\tau)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)\right\}^{\frac{\alpha-1}{\alpha}} - (\delta+\rho)]/\sigma \end{aligned} \tag{14}$$

where $B = \alpha N A^{\frac{1}{\alpha}}$. Therefore, in addition to fiscal policy, the distribution of costs associated with the provision of government services, the monitoring technology available in oversight, and the degree of oversight that actually takes place all affect economic growth.

For notational convenience, let us define the function

$$h(\eta^*;\lambda,\omega) = \overline{\theta}(\omega) + \lambda\left[1 - F(\eta^*;\omega)\right] + (1-\tau)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega), \tag{15}$$

and note that the growth rate in equation (14) is strictly decreasing in $h(\eta^*;\lambda,\omega)$. This implies that as a first approximation, the presence of bureaucratic rents in per-unit terms[9], as captured by $\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)$, lowers the rate of growth in this environment. The mechanism underlying this finding is clear in the sense that an increase in informational rents artificially raises the amount of resources required in the production of public services. Given unchanged fiscal policy, this distortion reduces the ratio of public infrastructures to private capital.

Using the resource constraint for the economy as a whole, equation (14) also depicts the growth rate of all variables including that of output. In the remainder of the paper, we let the growth rate of the economy be denoted by γ. Observe that since total bureaucratic rents are given by $s(t) = Nx(t)\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)$, with $x(t)$ being linear in $k(t)$ in equation (11), this quantity also grows at rate γ in this model. Finally, this framework does not allow for transitional dynamics. We are now ready to address the issues first set out in the introduction.

[9] Recall that the total quantity of public intermediate inputs is given by $Nx(t)$.

4.1 Economic growth and bureau oversight when monitoring is relatively costly

As suggested by Keefer and Knack (1995), and Ayal and Karras (1996), the institutional make up of government bureaus differ widely across countries. In some countries more than others, bureaucracies may be better able to generate bureaucratic rents while being seldom subject to any monitoring. Moreover, these country characteristics are often associated with lower rates of growth. We now explore the possibility that these observations may endogenously emerge in countries where the political authority finds it difficult to oversee its bureaucracy. As pointed out earlier, we do not address the potential problem of reverse causation in this paper. However, we do make it clear that inadequate oversight capabilities can reduce the effectiveness of productive government spending, and thereby adversely affect the growth rate of already poor economies.

To determine what a less effective monitoring technology implies for economic growth, we must first derive its impact on the equilibrium oversight threshold η^*. Using equation (8), the effect of a poorer monitoring technology on the equilibrium threshold report η^* can be obtained as

$$\frac{\partial\eta^*}{\partial\lambda} = \frac{f(\eta^*;\omega)}{f(\eta^*;\omega) - \lambda(\partial f(\eta^*;\omega)/\partial\lambda)} > 0 \tag{16}$$

since, by equation (7), the denominator is strictly positive. An upwards shift in the monitoring cost function, therefore, naturally leads to less oversight. Formally, the decline in the measure of monitored bureaus is given by $-Nf(\eta^*;\omega)\frac{\partial\eta^*}{\partial\lambda} < 0$. Note that this result is, in fact, consistent with Figure (1a). In addition, and since $\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)$ is strictly increasing in η^*, a less effective monitoring technology directly leads to a rise in the total quantity of discretionary surplus accruing to the bureaucracy, relative to the total production of public goods. With these results in hand, we can now trace out the effects of an increase in λ on economic growth.

Since γ is decreasing in $h(\eta^*;\lambda,\omega)$, it follows that $\frac{d\gamma}{d\lambda} \leq (>)\ 0 \Leftrightarrow \frac{dh(\eta^*;\lambda,\omega)}{d\lambda} \geq (<)\ 0$. Differentiating $h(\eta^*;\lambda,\omega)$ with respect to λ yields

$$\begin{aligned}\frac{dh(\eta^*;\lambda,\omega)}{d\lambda} &= \frac{\partial h(\eta^*;\lambda,\omega)}{\partial\eta^*}\frac{\partial\eta^*}{\partial\lambda} + \frac{\partial h(\eta^*;\lambda,\omega)}{\partial\lambda} \\ &= \left[-\lambda f(\eta^*;\lambda,\omega) + (1-\tau)F(\eta^*;\lambda,\omega)\right]\frac{\partial\eta^*}{\partial\lambda} + \left[1 - F(\eta^*;\lambda,\omega)\right], \end{aligned} \tag{17}$$

where $\frac{\partial\eta^*}{\partial\lambda} > 0$ is given by equation (16). It follows that

$$\frac{dh(\eta^*;\lambda,\omega)}{d\lambda} \geq (<)\, 0 \tag{18}$$
$$\Leftrightarrow\ (1-\tau)F(\eta^*;\lambda,\omega)\frac{\partial\eta^*}{\partial\lambda} + [1-F(\eta^*;\lambda,\omega)] \geq (<)\ \lambda f(\eta^*;\lambda,\omega)\frac{\partial\eta^*}{\partial\lambda}.$$

As we have just alluded to, an increase in λ reduces oversight and therefore allows bureaus to earn greater informational rents in per-unit terms. This distortion shows up as $(1-\tau)F(\eta^*;\lambda,\omega)\frac{\partial\eta^*}{\partial\lambda} > 0$ in equation (17) and contributes to lowering the rate of growth. The second term in equation (17), $[1-F(\eta^*;\lambda,\omega)] > 0$, captures the increase in monitoring costs that occurs as a direct result of the rise in λ. Since the tax rate is held fixed in this experiment, this increase in the amount of final output required to oversee the bureaucracy lowers the ratio of public goods and services to capital and, consequently, economic growth. However, since a smaller fraction of the bureaucracy is subject to oversight following the rise in λ, there also exists an offsetting decrease in monitoring costs. This latter effect, as illustrated by the term $-\lambda f(\eta^*;\lambda,\omega)\frac{\partial\eta^*}{\partial\lambda} < 0$ in (17), helps raise the rate of growth.

In general, one might expect the first two distortions in equation (18) to outweigh the decrease in monitoring costs resulting from the fall in bureau oversight. In this case, a higher value of λ would be associated with lower growth [i.e. $\frac{\partial\gamma}{\partial\lambda} < 0$]. Since a higher value of λ is also associated with less oversight, the end result is a relationship that is consistent with Figure (1b).

It remains that a poor monitoring technology and little bureau oversight do not necessarily lead to lower growth in this framework. Note in equation (18) that the higher the tax rate, the smaller the effect of the distortion induced by per-unit bureaucratic rents, and hence the more likely it will be that $\frac{\partial\gamma}{\partial\lambda} > 0$. This result, which may at first appear counter-intuitive, in fact directly derives from the simple notion that the interaction of two distortions can actually help offset each other. In this case, the presence of informational rents accruing to the bureaucracy is naturally detrimental to economic growth. However, the effect of this distortion may be partially reduced by the fact that those rents are ultimately rebated back to households and, therefore, subject to taxation.

At this point, we find it useful to introduce a simple example in order to make matters more concrete. In addition, this example will also serve us in the next subsection where the model loses some degree of analytical tractability. Suppose that the distribution $F(\theta;\omega) = \theta^\omega$, $\omega \in (0,1]$.[10] As required, the parameter ω orders distributions by first-order stochastic dominance since

[10] The restriction on ω ensures that the convexity assumption in equation (7) actually holds.

$$\frac{\partial F(\theta;\omega)}{\partial\omega} = \theta^{\omega}\ln\theta < 0, \text{ for } 0 < \theta \leq 1. \tag{19}$$

Moreover, note that the mean of the corresponding probability distribution, which we have denoted $\overline{\theta}(\omega)$, is simply $\frac{\omega}{\omega+1}$ which indeed increases with ω. Given this functional form for $F(\theta;\omega)$, it follows that

$$\eta^* = \lambda\omega \tag{20}$$

and, moreover, that

$$\frac{dh(\eta^*;\lambda,\omega)}{d\lambda} = 1 - (\lambda\omega)^{\omega}(1+\tau\omega). \tag{21}$$

It is then apparent that with this particular distribution function, $\frac{dh(\eta^*;\lambda,\omega)}{d\lambda} \geq 0$ $(<)$ 0, and therefore $\frac{d\gamma}{d\lambda} \leq 0$ $(>)$ 0, whenever $\tau \leq$ $(>)$ $\frac{(\lambda\omega)^{-1}-1}{\omega}$. In other words, an increase in the difficulty associated with bureau oversight generally leads to lower growth except in instances where the tax rate exceeds some upper bound. Furthermore, depending on the underlying technology parameters, it may never be feasible for fiscal policy to undo the adverse growth effects implied by more costly monitoring and, consequently, greater per-unit bureaucratic rents. For example, in the special case where $\lambda \leq \frac{1}{\omega^2}\overline{\theta}(\omega)$, a rise in λ unambiguously reduces economic growth since $\frac{(\lambda\omega)^{-1}-1}{\omega} \geq 1$ and $\tau < 1$.

The results we have just described are generally consistent with the fact that economies where a weak central government cannot effectively monitor its bureaucracy often simultaneously display little bureau oversight and lower rates of economic growth. That is not to say that other channels aren't important. Shleifer and Vishny (1993) argue that it is precisely in those economies that the interactions of rent-seeking bureaucracies with private markets may be most harmful to growth. According to these authors, "in feudal Europe, in post-Communist Russia, and in many African countries, the central government is so weak that it cannot fire or penalize officials in the provinces ... for running their own corruption rackets." Nevertheless, our framework does point out that these latter interactions are not the only sources of distortion one needs to consider.

More importantly, in a world where bureaus operate a technology that cannot be fully observed by the political authority, our framework puts a strong emphasis on the necessity for effective oversight. One could argue that in the US, the Office of Management and Budget represents an effective way to keep a variety of bureaus, ranging from the Internal Revenue Service to Customs, under supervision. In the UK, the equivalent organization, known as the Government Efficiency Unit, is perhaps just as proficient. Unfortunately, in many developing economies, simply ensuring that bureaucracies are faithfully carrying out their required agenda may be quite burdensome. As shown in this paper, this ultimately reduces the effectiveness of public policy in fostering economic growth.

4.2 Economic growth and oversight when bureaucracies differ in the technology used to provide public services

Although the findings that have thus far emerged provide one explanation for the data in Figure 1, panels (a) and (b), part of this explanation implicitly relies on the assumption that the index of Bureaucratic Delays can be interpreted as a sensible proxy for the degree of oversight. One would indeed expect to observe greater delays under less stringent oversight. However, this particular interpretation may be far from complete. Indeed, the delays' index could just as well be capturing the fact that bureaucracies inherently differ across economies as a result of technological considerations. In developing countries especially, the technology available for the provision of government services may be substantially worse than in more advanced economies. In post-Communist Russia for example, the material equipment available to the public sector is notoriously outdated. In this section, we show that this characteristic enhances the difficulty of achieving higher growth rates for these poorer economies.

We can capture the idea of an inferior public goods technology by examining an appropriate shift in $F(\theta;\omega)$ through an increase in ω. As in the previous subsection, we first derive the implications of a first-order shift in $F(\theta;\omega)$ for the degree of oversight. Focusing on the simple example introduced earlier where $\eta^* = \lambda\omega$, it directly follows that

$$\frac{\partial \eta^*}{\partial \omega} = \lambda > 0. \tag{22}$$

While this result does not necessarily generalize to all possible underlying distribution functions, it does have some intuitive appeal. Recall that the oversight threshold in this model equates the marginal gain from decreasing bureaucratic rents to the marginal increase in the resources needed for oversight. As shown in Figure (4a), an increase in ω leads to a shift in the average cost distribution associated with the production of government services towards the higher end of its support. Since a greater fraction of bureaus consequently report higher values of θ, a higher monitoring threshold η^* is generally needed to trigger oversight by the political authority. In other words, as the technology for providing public infrastructures deteriorates, bureaus get away with reporting substantially large production costs, in per-unit terms, before any monitoring takes place.

[Insert Figure 4 Here]

It should be pointed out, however, that the implications for the overall degree of bureau oversight are not unambiguous. To see this, note that a change in ω affects the number of bureaus subject to oversight, $N[1 - F(\eta^*; \omega)]$, both directly, through ω, and indirectly, through η^*. Figure (4b) provides a numerical example to illustrate this last point. The parameter values used in this exercise are given in the following table:

Exogenous Parameters:	α	σ	τ	δ	ρ	λ
Values:	.65	2	.25	.05	.02	.75

Observe that for low values of ω, the fraction of the bureaucracy subject to oversight actually increases with ω. As shown in Figure (4a), this is because in cases where the public goods' technology is initially effective, a slight increase in ω is sufficient to cause a relatively large shift in the average cost distribution towards high values of θ. The fraction of bureaus with relatively poor technology, therefore, increases rapidly with ω for low values of ω. It follows that in spite of the increase in the monitoring threshold η^*, the measure of bureaus that are monitored at first increases. The opposite, of course, is true for high values of ω. Hence, when the average cost of providing public services already tends to be high, an increase in ω leads to less oversight. These findings imply that in countries where the technology available to produce public services is of low quality, not only are particularly large budget requests necessary before any monitoring occurs, but the fraction of the bureaucracy that is monitored is likely to be small as well. Clearly, these result are consistent with one might generally expect of less developed economies. It therefore remains to see, at least with the particular distribution function adopted in this example, if high values of ω are also associated with lower growth.

Figure (4c) shows that the quantity of per-unit bureaucratic rents increases with ω. This result is mainly driven by the fact that $\frac{\partial \eta^*}{\partial \omega} > 0$ while $\int_0^{\eta^*} (\eta^* - \theta) dF(\theta)$ itself increases with η^*. In addition, the mean of the average cost distribution, $\frac{\omega}{\omega+1}$, also increases with ω as pointed out earlier. Since both an increase in per-unit rents and an increase in the average cost of public goods production lower the fraction of government services to private capital in equilibrium [i.e. recall equation (11)], the growth rate tends to fall with ω. This is shown in Figure (4d). It follows that for high values of ω, this framework not only suggests that little oversight occurs, and only when bureaus show themselves to be especially inefficient, but also that lower growth indeed prevails. In addition, if we interpret the index of Bureaucratic Delays as indicating the degree to which bureaucracies differ across countries on technological grounds, Figure (4c) stands as the model analogue to Figure (1b). Figure 5, panels (a) through (d), show that the relationships we have just described are robust across different values of both λ and τ.

[Insert Figure 5 Here]

4.3 Economic growth under full information

In this subsection, we briefly relate the analysis above to previous work on the issue of productive government expenditures and economic growth. More precisely, we show that the full information case yields the standard expected results. In a full information environment, the political authority can observe each bureau's technology for transforming final output into public services or, alternatively, each bureau's draw of θ. As a result, there is no need for monitoring and the government can provide each bureau with a budget precisely equal to the cost associated with the production of public intermediate inputs. Alternatively, we can think of the full information scenario as one where oversight is costless so that $\lambda = 0$. Then, in the above example, the optimal monitoring threshold satisfies $\eta^* = \lambda\omega = 0$ by equation (20), and all bureaus are monitored since $N[1 - F(0;\omega)] = N$. Moreover, when $\eta^* = 0$, $\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega) = 0$ and there are no informational rents accruing to the bureaucracy. Analogously to equation (11), it follows that the government budget constraint yields

$$\overline{\theta}(\omega) = \tau A[\frac{x(t)}{k(t)}]^{-\alpha}. \tag{23}$$

By solving the representative household's problem in (P1), the resulting rate of economic growth is still given by equation (13) which, in this case, reduces to

$$\gamma = \frac{\alpha N A^{\frac{1}{\alpha}}(1-\tau)\tau^{\frac{1-\alpha}{\alpha}}\overline{\theta}(\omega)^{\frac{\alpha-1}{\alpha}} - (\delta+\rho)}{\sigma}. \tag{24}$$

Under full information, one loses the distortions associated with the fact that bureaucracies often act as rent-seekers. Evidently, since monitoring is no longer necessary while bureaucratic rents are reduced to zero, the growth rate in equation (24) exceeds that of equation (14). However, note that the quality of the technology used in the provision of public services may still affect economic growth since γ is decreasing in $\overline{\theta}(\omega)$. This result differs from that of Barro (1990). In Barro's earlier framework, it is implicitly assumed that final output directly translates into productive government transfers at the rate of one for one.

5 Growth and welfare maximizing tax policies

At this stage of the analysis, one may find it interesting to address the issue of optimal tax policy in the set-up we have described. First, note that in terms of maximizing growth, Barro's (1990) efficiency condition still holds under full information since the tax rate that maximizes (24) is given by

$$\tau_{\gamma}^{f} = 1 - \alpha. \tag{25}$$

This condition balances the adverse impact of distortionary taxation against the fact that higher taxes raise the ratio of government services to private capital since, from equation (23), $\frac{x(t)}{k(t)} = (\tau A)^{\frac{1}{\alpha}} \overline{\theta}(\omega)^{\frac{-1}{\alpha}}$. In the private information case, however, the ratio of public intermediate inputs to private capital is given by

$$\frac{x(t)}{k(t)} = (\tau A)^{\frac{1}{\alpha}} \left[\overline{\theta}(\omega) + \lambda[1 - F(\eta^*;\omega)] + (1-\tau)\int_0^{\eta^*} (\eta^* - \theta)dF(\theta;\omega)\right]^{\frac{-1}{\alpha}} \tag{26}$$

from equation (11). Thus, taxes play an additional role that contributes to raising growth. Specifically, they help reduce the distortion associated with per unit bureaucratic rents. Observe that growth is strictly concave in the tax rate under both full and private information while the expression in square brackets in (26) monotonically decreases with τ. Letting τ_{γ}^{p} denote the tax rate which maximizes growth in equation (14), (i.e. the case where bureaus possess private information) it follows that

$$\gamma_{\gamma}^{p} \geq \tau_{\gamma}^{f}. \tag{27}$$

In other words, and as shown in Figure (6a), one might expect countries where bureaucratic operations lack transparency to adopt more stringent tax policies to make up for the resulting rent distortions. Let us go one step further and ask whether this result still holds when the political authority is concerned, not with maximizing economic growth, but with maximizing welfare. We may, for instance, imagine a benevolent central government whose aim is to maximize households' utility, taking as given the decentralized choices of households and bureaus. Since our model under full information collapses to that of Barro (1990), it immediately follows that

[Insert Figure 6 Here]

$$\tau_{\mathcal{U}}^{f} = \tau_{\gamma}^{f} = (1 - \alpha). \tag{28}$$

where $\tau_{\mathcal{U}}^{f}$ denotes the welfare maximizing tax rate under full information. When oversight is costly, however, the benevolent political authority solves

$$\max \mathcal{U} = \int_0^{\infty} e^{-\rho t} \frac{c(t)^{1-\sigma}}{1-\sigma} dt \text{ with } \sigma > 0,\ \rho > 0, \tag{P2}$$

$$\text{subject to } c(t) + \gamma k(t) = (1-\tau)[ANk(t)^{1-\alpha}x(t)^{1-\alpha} + s(t)], \tag{29}$$

$$c(t) \geq 0,\ k(t) \geq 0,\ k(0) = k_0 > 0 \text{ given,}$$

where γ is given by equation (14). We can re-write (P2) as

$$\mathcal{U} = \frac{c(0)^{1-\sigma}}{(1-\sigma)(\rho - \gamma(1-\sigma))} \tag{P2'}$$

and note that

$$c(t) = \left\{(1-\tau)AN[\frac{x(t)}{k(t)}]^{1-\alpha} - \gamma\right\} k(t) + (1-\tau)[\frac{x(t)}{k(t)}]\left\{N\int_0^{\eta^*}(\eta^* - \theta)dF(\theta;\omega)\right\} k(t), \tag{30}$$

where the ratio $\frac{x(t)}{k(t)}$ is constant and given by (26). This problem is rather difficult to solve analytically since both γ and $\frac{x(t)}{k(t)}$ are functions of τ. Nevertheless, and letting $\tau^p_{\mathcal{U}}$ denote the welfare maximizing tax rate under private information, a simulation using the parameter values introduced in the previous section suggest that

$$\tau^p_{\mathcal{U}} > \tau^p_{\gamma} > \tau^f_{\mathcal{U}} = \tau^f_{\gamma}, \tag{31}$$

as shown in Figure (6b). Therefore, when oversight is relatively costly, a government concerned about households' welfare rather than growth chooses an even more stringent tax policy. To see why this result emerges, note that bureaucratic rents in equation (30), when expressed in units of capital services, depend on the ratio of government services to capital which itself increases with τ. Thus, the fact that $\tau^p_{\mathcal{U}} > \tau^p_{\gamma}$ derives mainly from the idea that when maximizing welfare, one must take into account initial consumption effects in addition to growth effects. Finally, Figure (6b) suggests that irrespective of whether one's concerns lie with growth or welfare, the less effective the oversight technology, the higher the optimal tax rate.

6 Concluding remarks

Following the empirical work of Mauro (1995), and Keefer and Knack (1995), the notion that the quality of bureaucratic activity may significantly influence economic growth has recently received considerable attention. However, most of the theoretical research in this area has focused on the interactions of bureaucracies with private markets. By contrast, the purpose of this paper has been to point out that the interactions of rent-seeking bureaucracies with their political authority may be equally significant.

The reasoning behind this observation relied on two strands of ongoing research. First, as suggested by Barro (1990), as well as Glomm and Ravikumar (1994, 1997), productive government expenditures may play a significant role in the process of economic development. It is presumably this idea that underlies much of the effort exerted by the International Monetary Fund in lending funds to poorer governments. Second, the provision of public goods and services typically occurs through a variety of public agencies. As first suggested by Niskanen (1970), and Migué and Bélanger (1974), these bureaus possess private information with respect to their technology and often act in a self-interested fashion. When considered together, these two arguments directly suggest that the efficiency of government spending is implicitly linked to the need for some amount of bureau oversight. Thus, in addressing the issues first set out in the introduction, our framework provides the following observations.

In countries where the central authority cannot monitor its bureaucracy effectively, lower rates of economic growth tend to emerge along with little bureau oversight. In many African countries for instance, means of communication and transportation are rudimentary at best. Such conditions make it difficult for the relevant political authority to oversee its agencies in the provinces. Therefore the fact that little oversight takes place in equilibrium is to be expected. Moreover, as the monitoring of bureaus becomes more costly, the amount of public expenditures- including bureaucratic rents- that are necessary for the provision of public services typically increases. This effect directly results in a lower ratio of government services to private capital, and hence a lower rate of return to private investment. Economic growth, therefore, suffers in a way that is consistent with the general trend in Figure (1b).

The findings we have just described, however, do not necessarily hold in all possible cases. In particular, the fact that government expenditures are financed through distortionary taxation implies that under certain circumstances, the adverse growth effects of bureaucratic rents may be mitigated by fiscal policy. Under this scenario, it is possible for growth to increase as the monitoring technology worsens since the fall in oversight implies an offsetting decrease in monitoring costs.

Finally, we have also argued that in economies where bureaus are limited to inferior technologies in the provision public services, not only does little oversight occur, but bureaus generally succeed in requesting especially large budgets before triggering any monitoring. Furthermore, these findings directly implied high levels of bureaucratic rents, in per-unit terms, as well as lower growth. This is indeed what is suggested by Figure (1b), when the difference in Bureaucratic Delays across countries is primarily attributed to technological considerations as opposed to oversight.

Although we have tried to provide a reasonable analysis that is consistent with the data available on the quality of bureaucratic activity across economies, it is clear that the BERI indices are subject to many caveats. One of the more important caveats relates to the somewhat vague definition of the indices which, therefore, allows for multiple interpretations. We have outlined two such interpretations regarding the index of Bureaucratic Delays. Obtaining better estimates of the way in which bureaucracies differ along specific dimensions, such as the state of the technology they use or the amount of resources spent on oversight, would allow us to start sorting out which aspects of bureaucratic activity might matter most for economic growth. Thus, we hope that our analysis may prove a useful guide in future empirical work.

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Data Appendix:

Institutional Indicators are obtained from Business Environmental Risk Intelligence. The description of the variables can also be found in Keefer and Knack (1995). The plots in Figure 1 represent time series averages over the available sample.

Bureaucratic Delays: Measures the "speed and efficiency of the civil service including processing customs clearances, foreign exchange remittances and similar applications." Scored 0-4, with higher scores for greater efficiency.

Infrastructure Quality: Assesses "facilities for and ease of communication between headquarters and the operation, and within the country," as well as quality of transportation. Scored 0-4, with higher scores for superior quality

Per capita growth rates are averages over the period 1960-89 obtained from the World Bank tables.

Fig 1.

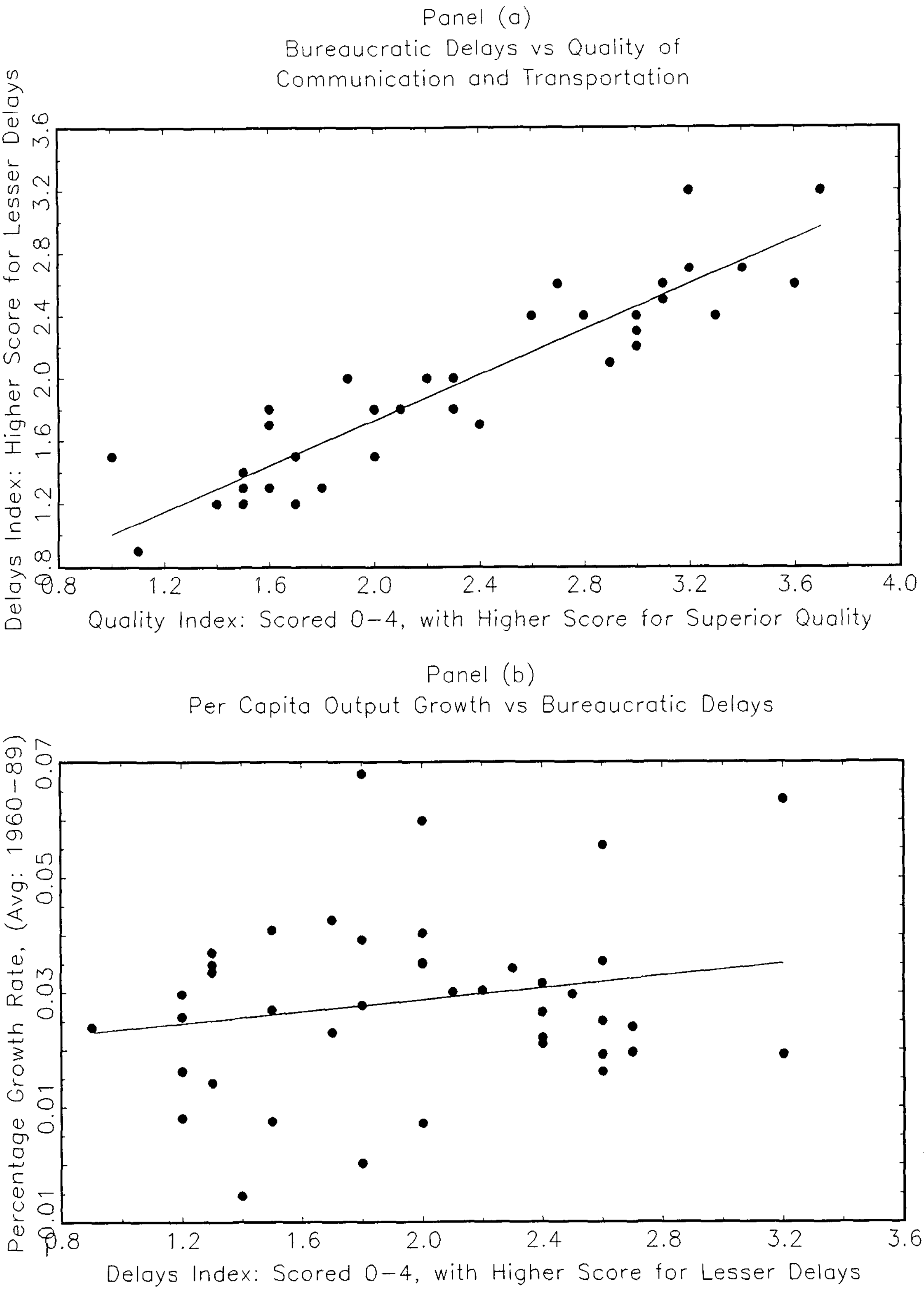

Panel (a)
Bureaucratic Delays vs Quality of Communication and Transportation
Delays Index: Higher Score for Lesser Delays
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
4.0
Quality Index: Scored 0–4, with Higher Score for Superior Quality
Panel (b)
Per Capita Output Growth vs Bureaucratic Delays
Percentage Growth Rate, (Avg: 1960–89)
-0.01
0.01
0.03
0.05
0.07
0.8
1.2
1.6
2.0
2.4
2.8
3.2
3.6
Delays Index: Scored 0–4, with Higher Score for Lesser Delays

Figure 2

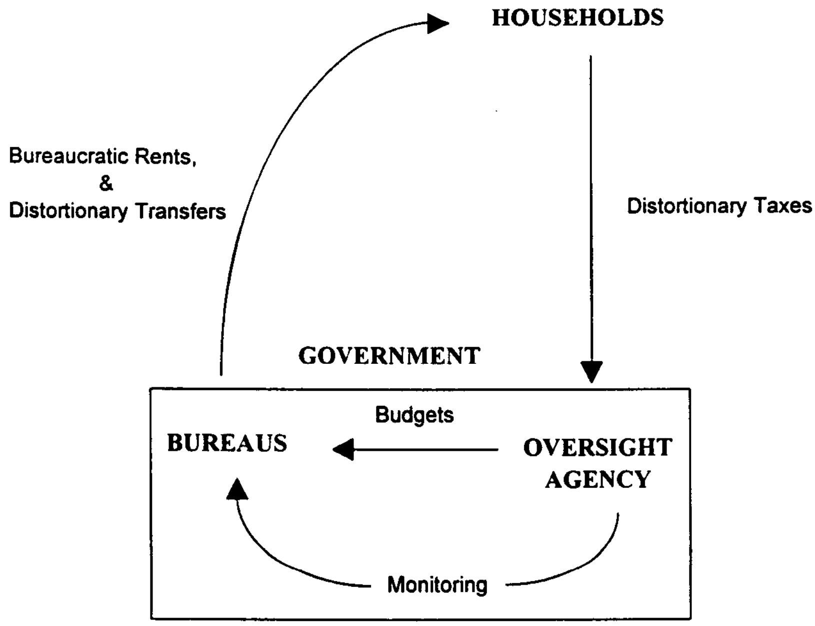

HOUSEHOLDS
Bureaucratic Rents,
&
Distortionary Transfers
Distortionary Taxes
GOVERNMENT
Budgets
BUREAUS
OVERSIGHT
AGENCY
Monitoring

Figure 3

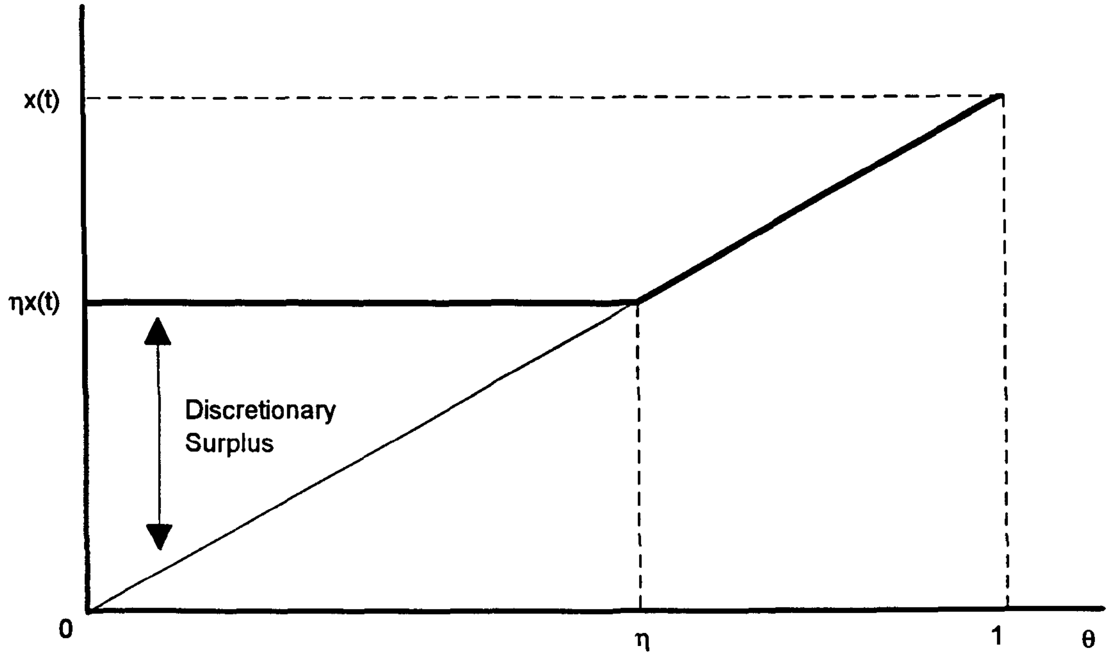


Fig 4

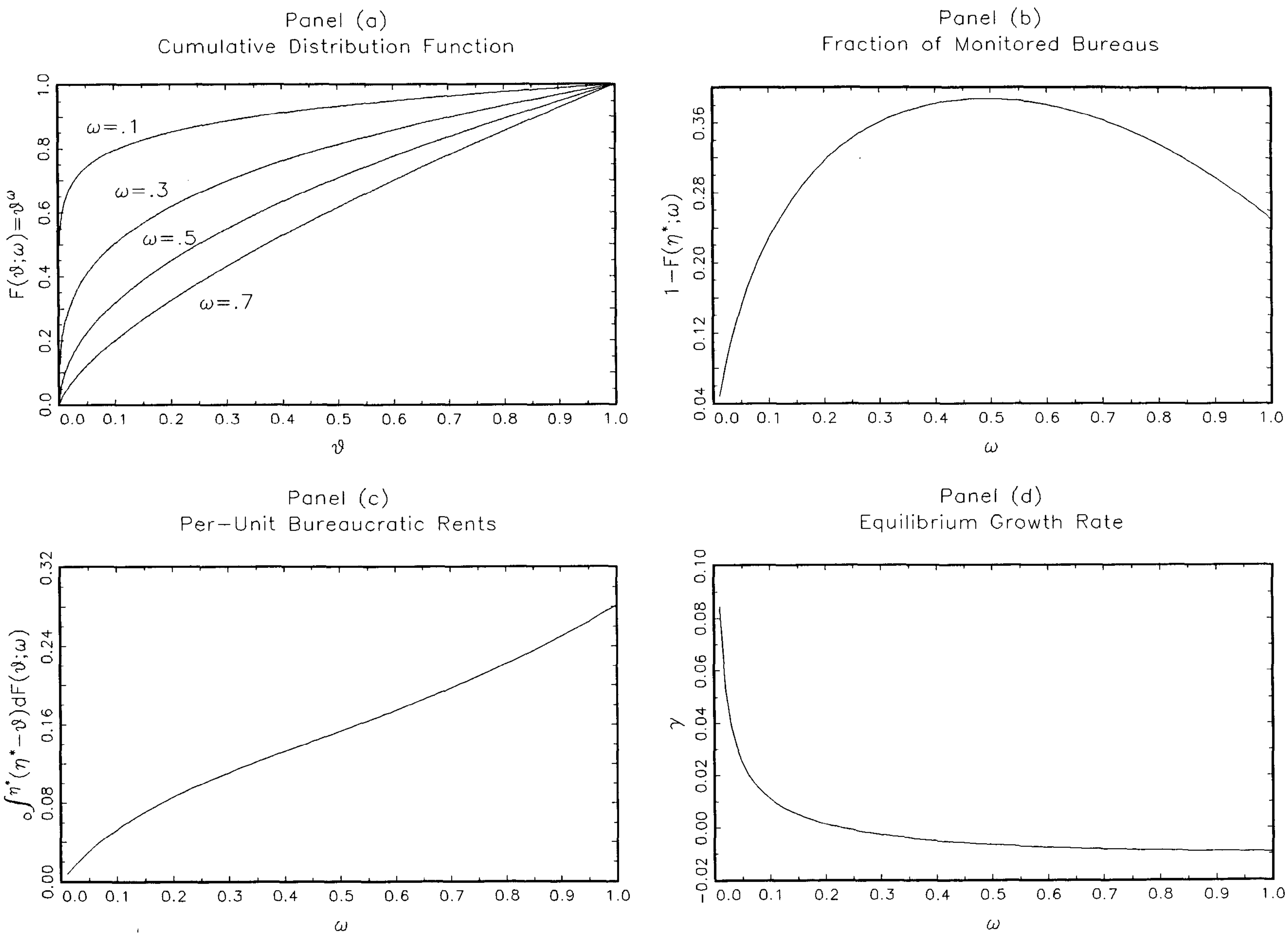
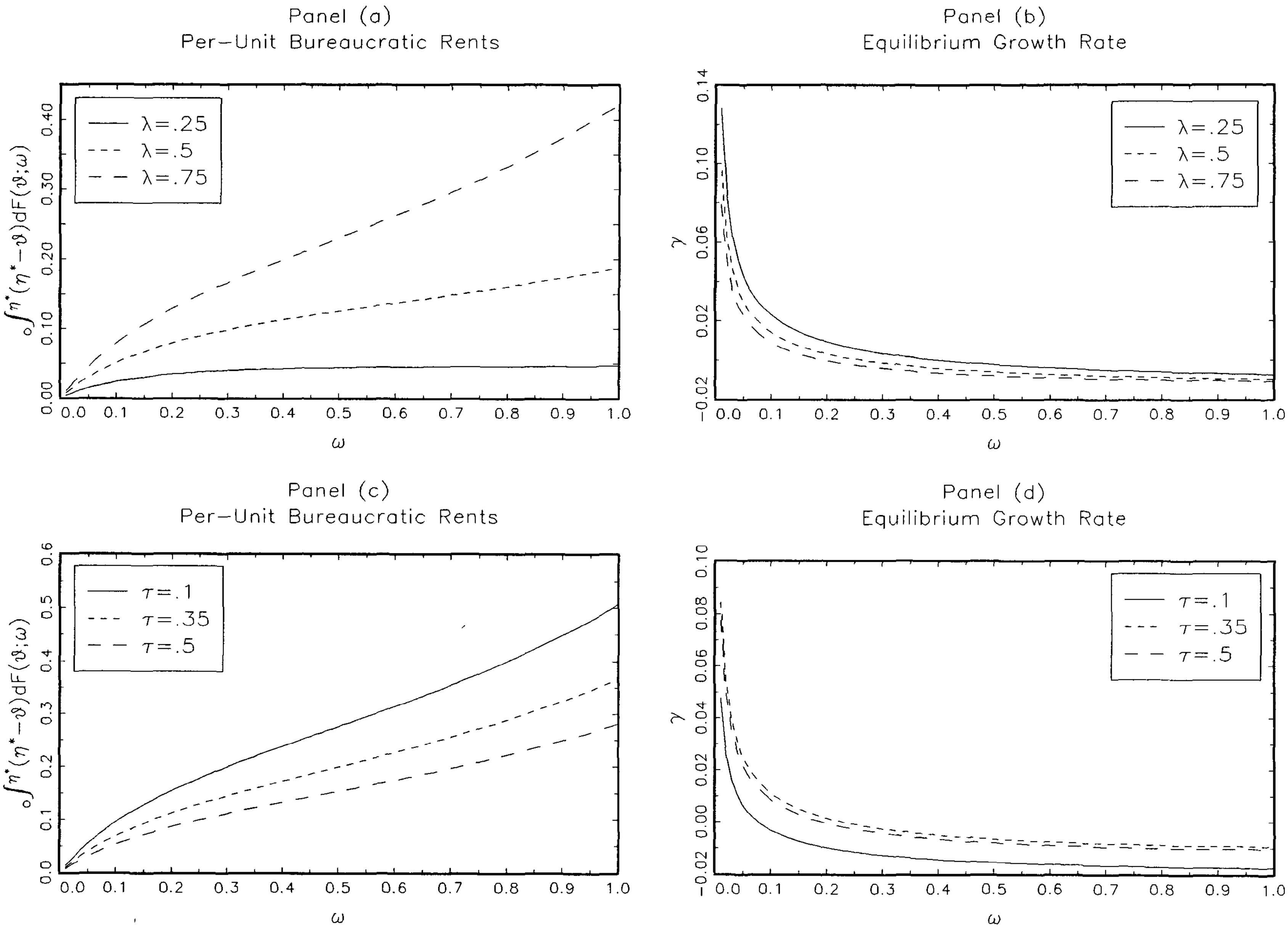

Panel (a)
Cumulative Distribution Function
F(ϑ;ω)=ϑ^ω
ω=.1
ω=.3
ω=.5
ω=.7
ϑ
Panel (b)
Fraction of Monitored Bureaus
1−F(η*;ω)
ω
Panel (c)
Per−Unit Bureaucratic Rents
∫₀^η* (η*−ϑ)dF(ϑ;ω)
ω
Panel (d)
Equilibrium Growth Rate
γ
ω

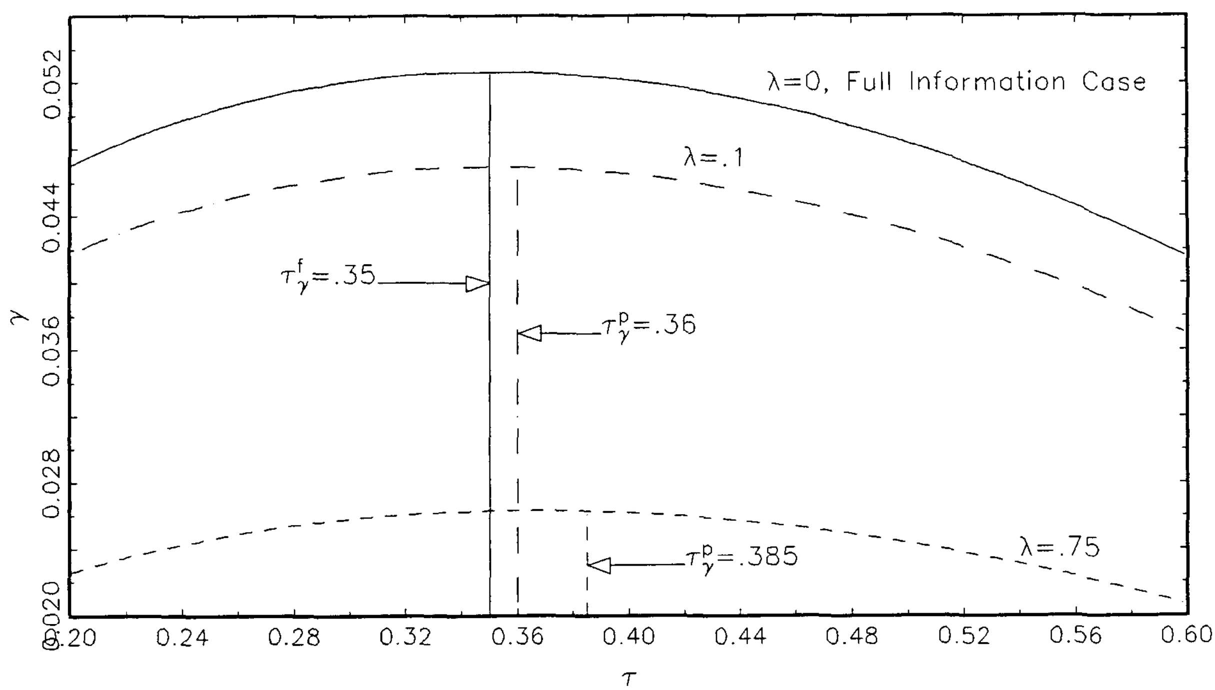
Fig 5.



Panel (a)
Per–Unit Bureaucratic Rents
λ=.25
λ=.5
λ=.75
0.00
0.10
0.20
0.30
0.40
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
ω
Panel (b)
Equilibrium Growth Rate
λ=.25
λ=.5
λ=.75
γ
−0.02
0.02
0.06
0.10
0.14
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
ω
Panel (c)
Per–Unit Bureaucratic Rents
τ=.1
τ=.35
τ=.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
ω
Panel (d)
Equilibrium Growth Rate
τ=.1
τ=.35
τ=.5
γ
−0.02
0.00
0.02
0.04
0.06
0.08
0.10
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
ω

Fig 6

Panel (a)
Growth Maximizing Tax Policies



Panel (b)
Welfare Maximizing Solutions