A THEORY OF THE INFORMAL SECTOR

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ABSTRACT

In many countries, especially poor countries, a heavy burden of taxes, bribes, and bureaucratic hassles drives many producers into the informal sector. Is this situation explicable only as a consequence of either the ignorance or the ineptitude of the state authorities? On the contrary this paper shows that we can attribute the existence of a large informal sector to the fact that, because productive endowments contain important unobservable components, the state cannot adjust the amounts that it extracts from producers in the formal sector according to each producer's endowment. Given this fact we find that, if either the distribution of endowments is sufficiently inegalitarian or the production of private substitutes for public services is sufficiently easy, then the state would extract a large enough amount from producers in the formal sector that poorly endowed producers would choose to work in the informal sector. This result obtains both for a proprietary state, which maximizes its own net revenue, and for a hypothetical benevolent state, which would maximize the total net income of producers. But, we also find that a proprietary state would create an informal sector for a larger set of combinations of parameter values than would a hypothetical benevolent state.

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Many authors, Hernando De Soto (1989) being a prominent example, have pointed out that in many countries, especially poor countries, a heavy burden of taxes, bribes, and bureaucratic hassles drives many producers into an informal sector.[1] Producers in the informal sector avoid much of this burden, but they must produce with less assistance from public services than is available to producers in the formal sector. These public services include the protection of property rights by the police and the courts as well as public utilities, such as roads, electric service, potable water, and sewage disposal.

Why does the state impose such a heavy burden that many producers choose to work in the informal sector? Is it just an unfortunate fact explicable only as a consequence of either the ignorance or the ineptitude of the state authorities? The present paper suggests a different answer. We show that, because productive endowments contain important unobservable components, with the result that the state cannot adjust the amounts that it extracts from producers in the formal sector according to each producer's endowment, then the state might decide to extract a large enough amount from producers in the formal sector that poorly endowed producers choose to work in the informal sector.

We obtain this result in two radically different models of the state. One model assumes that the state is proprietary, which means that the state maximizes its net revenue.[2] This

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[1] Using data from Latin American countries in the early 1990s, Norman Loayza (1996) finds the size of the informal sector is positively correlated with tax burdens, as well as labor market restrictions and inefficient government institutions, and negatively correlated with real per capita GDP. Using data from 69 countries Eric Friedman, Simon Johnson, Daniel Kaufmann, and Pablo Zoido-Lobaton (2000) find that costs of bureaucracy and corruption, rather than official taxes, are the key factor for an existence of the informal sector.

[2] Herschel Grossman(2000) characterizes a proprietary state as the instrument of a ruling elite, which is a generic name for whatever group appropriates the net revenues of the state. Membership in the ruling elite can include a monarch and his court, the military, the professional politicians, and the bureaucrats. The present paper is not concerned with how the members of the ruling elite divide the net revenue of the state among themselves.

net revenue consists of taxes and bribes minus expenditure on public services.[3] The other model considers a hypothetical benevolent state that would maximize the total net incomes of producers.

We begin the analysis of a proprietary state by showing that, if the state were able to observe productive endowments, then a proprietary state would extract from each producer the maximum amount consistent with each and every producer choosing to be in the formal sector.[4] Next, we assume, more realistically, that productive endowments include important components that are not directly observable. These unobservable components can include attributes like knowledge and ability as well as intangible resources like reputation, connections, financial backing, and market power. In addition, although productive endowments are correlated with incomes, we assume that, as seems to be a common characteristic of poor countries, the state is not able to monitor incomes with any precision, at least not without incurring prohibitively large costs. Under these assumptions the state cannot adjust the amounts that it extracts from producers in the formal sector according to each producer's endowment.

Given this constraint we show that, if either the distribution of endowments is sufficiently inegalitarian or the production of private substitutes for public services is sufficiently easy, then the proprietary state would choose to extract a large enough amount from producers in the formal sector that poorly endowed producers would choose to work in the informal sector. Under these conditions the state would lose net revenue if it were to decrease the amount that it extracts from producers in the formal sector in order to induce poorly endowed producers to work in the formal sector.

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[3]Bureaucratic hassles do not directly produce revenue but make it possible to extract bribes. Thus, taxes, bribes, and bureaucratic hassles combine to generate revenue for the state.

[4]Our analysis assumes that goods produced in the informal sector and in the formal sector are perfect substitutes. Douglas Marcouiller and Leslie Young (1995) consider a related model that assumes less than perfect substitutability between goods produced in the formal and informal sectors.

We also analyze the behavior of a hypothetical benevolent state with unobservable endowments. A benevolent state's first-best solution would be to provide the amount of public services that would maximize total net output with all producers working in the formal sector. But, this first-best solution would be feasible if and only if the state could collect enough taxes from producers in the formal sector to pay for this amount of public services.

Otherwise, the benevolent state would look for the second-best solution, under which it would provide a smaller amount of public services than in the first-best solution. In one possible second-best solution the benevolent state would set taxes as high as possible consistent with all producers choosing to work in the formal sector. In another possible second-best solution the benevolent state would set taxes even higher, with the result that poorly endowed producers would choose to work in the informal sector.

Although either a proprietary state or a hypothetical benevolent state could create an informal sector, this analysis does not imply that the state's objective does not matter for the existence of an informal sector. We find that, if the parameters are such that a proprietary state were indifferent between having and not having an informal sector, then the benevolent state would set taxes low enough to induce all producers to work in the formal sector. Thus, we obtain the important result that a proprietary state would create an informal sector for a larger set of combinations of parameter values than would a hypothetical benevolent state.

Production in the Formal Sector and in the Informal Sector

Assume that each of N well endowed producers has an endowment of K units of productive resources, whereas each of n poorly endowed producers has an endowment of k units of productive resources, where K is larger than k.[5] Normalize the unit for measuring population such that $N + n = 1$. Let T and t denote the number of units of output that

[5]The assumption that producers are either well endowed or poorly endowed focuses the analysis on the conditions under which an informal sector exists. In this setup, if an informal sector exists, then it consists of the n poorly endowed producers. An extended model in which distribution of endowments had more than two realizations would yield additional implications about the size of the informal sector. Such an

the state extracts in the form of either taxes or bribes from, respectively, each well endowed producer and each poorly endowed producer in the formal sector. If the state could observe the endowment of each producer, then it could choose different values for T and t.

Let G denote the number of units of output that the state provides to producers in the formal sector in the form of public services.[6] These public services serve as intermediate goods in production. Producers in the formal sector can access these public services freely, but the state costlessly prohibits access to producers in the informal sector.

Let Ω denote the average endowment of productive resources, where $\Omega \equiv NK + nk$. Also, let Ω_f denote the amount of productive resources employed in the formal sector, where $\Omega_f \equiv MK + mk$, and where M and m, $0 \leq M \leq N$, $0 \leq m \leq n$, are, respectively, the fractions of well endowed producers and poorly endowed producers who choose to work in the formal sector.

Let Z_f denote net output in the formal sector — that is, gross output less the amount of output used to provide public services. Assume that producers in the formal sector combine their endowments of productive resources with public services according to an aggregate Cobb-Douglas technology. Thus, we have

$$ (1) \qquad\qquad Z_f = \Omega_f^{\alpha}\, G^{1-\alpha} -\ G, \quad 0 < \alpha < 1. $$

For simplicity this formulation implicitly assumes that public services are strictly rival.

Let Y_f and y_f denote, respectively, the net incomes of well endowed and poorly endowed producers in the formal sector. Gross production per unit of productive resources

extended model also would allow analysis of the decision to participate in production. The present analysis implicitly assumes that k is large enough that all producers choose work, either in the formal sector or in the informal sector, over the alternative of not participating in production.

[6]For simplicity the analysis abstracts from infrastructure. Although the main implications of our analysis would be unchanged if the provision of public services required infrastructure, as well as current output, allowing for infrastructure would involve a dynamic analysis.

in the formal sector equals gross production in the formal sector, $\Omega_f^\alpha \, G^{1-\alpha}$, divided by the amount of productive resources employed in the formal sector, Ω_f. To calculate the gross income of each producer in the formal sector, we multiply gross production per unit of productive resources by the endowment of each producer in the formal sector, either K or k. Accordingly, allowing for taxes and bribes, we have

(2) $$Y_f = (G/\Omega_f)^{1-\alpha} K \; - \; T \quad \text{and} \quad y_f = (G/\Omega_f)^{1-\alpha} k \; - \; t.$$

Any producer who chooses to work in the informal sector does not pay taxes or bribes, but also does not receive any public services. Let S and s denote the number of units of output that each well endowed and poorly endowed producer in the informal sector, respectively, would allocate to the provision of substitutes for public services.[7] Assume that this allocation yields the equivalent of μS or μs units of public services, $1 > \mu > 0$, where μ measures the cost of producing private substitutes for public services. For example, if it costs the state one unit of output per producer to provide producers in the formal sector with a unit of a public service, then it would cost each producer in the informal sector a larger amount, $1/\mu$ units of output, to provide a private substitute for a unit of this public service.

Let Y_i and y_i denote, respectively, the net incomes of any well endowed and poorly endowed producers who choose to work in the informal sector. Assume that each producer in the informal sector would combine his substitutes for public services with his endowment of productive resources according to the same Cobb-Douglas technology that producers use in the formal sector. Thus, allowing for output allocated to the provision of private substitutes for public services, we have

(3) $$Y_i = K^\alpha (\mu S)^{1-\alpha} - S \quad \text{and} \quad y_i = k^\alpha (\mu s)^{1-\alpha} - s.$$

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[7]De Soto (1989) tells an isomorphic story in which each producer in the informal sector pays bribes to obtain access to public services. See Grossman (1995) for another story in which the mafia provides public services to the informal sector.

Assume that any well endowed producer in the informal sector would choose S to maximize Y_i. Similarly, any poorly endowed producer in the informal sector would choose s to maximize y_i. The solutions to these choice problems are

(4) $$S = (1 - \alpha)^{\frac{1}{\alpha}} \, \mu^{\frac{1-\alpha}{\alpha}} \, K \quad \text{and} \quad s = (1 - \alpha)^{\frac{1}{\alpha}} \, \mu^{\frac{1-\alpha}{\alpha}} \, k.$$

Substituting equations (4) into equations (3), these solutions imply that

(5) $$Y_i = \alpha[(1 - \alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, K \quad \text{and} \quad y_i = \alpha[(1 - \alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, k.$$

Let Z_i denote net output in the informal sector. From equations (5) we have

(6) $$Z_i = (N - M)Y_i + (n - m)y_i = \alpha[(1 - \alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, (\Omega - \Omega_f).$$

Let Z denote total net output, where $Z = Z_f + Z_i$.

Finally, assume that each producer would choose to work in the formal sector if and only if he would not have a larger net income in the informal sector. Thus, each of the well endowed producers would choose to work in the formal sector if and only if $Y_f \geq Y_i$. Similarly, each of the poorly endowed producers would choose to work in the formal sector if and only if $y_f \geq y_i$. Equations (2) and (5) imply that these conditions are equivalent to

(7)
$$(G/\Omega_f)^{1-\alpha}K \; - \; T \; \geq \; \alpha \, [(1 - \alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, K \quad \text{and}$$

$$(G/\Omega_f)^{1-\alpha}k \; - \; t \; \geq \; \alpha \, [(1 - \alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, k.$$

Equations (7) tell us that, given a producer's endowment of productive resources and the total amount of productive resources employed in the formal sector, a producer would choose to work in the informal sector either if the state would extract a large enough amount from him if he were to work in the formal sector, or if the state provides a small enough amount of public services to producers in the formal sector, or if producing private substitutes for public services is sufficiently easy.

A Proprietary State with Observable Endowments

Let R denote the net revenue of the state, where

$$(8) \qquad\qquad R = MT + mt - G.$$

Equation (8) says that the net revenue of the state equals the total number of units of output that the state extracts in the form of either taxes or bribes from producers in the formal sector minus the number of units of output that the state provides to producers in the formal sector in the form of public services. Assume for now that the state can easily observe the endowment of each producer. Accordingly, the state can choose different values for T and t.

To maximize R, the proprietary state would choose T, t, and G such that $Y_f = Y_i$, $y_f = y_i$, and $dR/dG = 0$. These conditions say the following: After observing endowments, the proprietary state would set t and T such that each producer earns the same net income in the formal sector as he would earn in the informal sector. In other words, the proprietary state would extract from each producer the maximum amount consistent with all of the producers choosing to work in the formal sector. Also, the proprietary state would provide the amount of public services such that, given that all producers choose to work in the formal sector, the state's net revenue is maximized.

These choices imply that with a proprietary state and observable endowments we would have $M = N$, $m = n$, and, hence, $\Omega_f = \Omega$, as well as $G = G^*$, $T = T^*$, and $t = t^*$, where

$$G^* = (1 - \alpha)^{\frac{1}{\alpha}} \, \Omega,$$

$$(9) \qquad\qquad T^* = (1 - \alpha)^{\frac{1-\alpha}{\alpha}} \left(1 - \alpha \mu^{\frac{1-\alpha}{\alpha}}\right) K, \quad \text{and}$$

$$t^* = (1 - \alpha)^{\frac{1-\alpha}{\alpha}} \left(1 - \alpha \mu^{\frac{1-\alpha}{\alpha}}\right) k.$$

Let R^* denote the net revenue of a proprietary state with observable endowments. Substituting $M = N$, $m = n$, $T = T^*$, $t = t^*$, and $G = G^*$ into equation (8), and recalling that $\Omega \equiv NK + nk$, we have

$$(10) \qquad\qquad R^* = \alpha \, (1 - \alpha)^{\frac{1-\alpha}{\alpha}} \, (1 - \mu^{\frac{1-\alpha}{\alpha}}) \, \Omega.$$

Let Z^* denote total net output with a proprietary state and observable endowments. Substituting $\Omega_f = \Omega$ and $G = G^*$ into equations (1) and (6) and summing, we have

$$(11) \qquad\qquad Z^* \;=\; \Omega^\alpha \, (G^*)^{1-\alpha} - G^* \;=\; \alpha \, (1 - \alpha)^{\frac{1-\alpha}{\alpha}} \, \Omega.$$

A Proprietary State with Unobservable Endowments

Now assume that, although from a combination of observation and experience the state knows the distribution of endowments, the state can neither observe nor infer the endowment of each producer. In the present setup these assumptions mean that the state knows the possible endowments, K and k, and the numbers of well endowed and poorly endowed producers, N and n, but that the state does not know who has K and who has k. As a result the state cannot choose different values for T and t. Instead the state sets both T and t equal to a common value, denoted by X.

With the state extracting the same amount from both well endowed producers and poorly endowed producers, the net incomes of each well endowed producer and each poorly endowed producer in the formal sector are

$$(12) \qquad\qquad Y_f = (G/\Omega_f)^{1-\alpha} \, K - X \quad \text{and} \quad y_f = (G/\Omega_f)^{1-\alpha} \, k - X.$$

Equations (5) still give the net incomes that well endowed producers and poorly endowed producers would have in the informal sector.

Again, assume that each well endowed producer would choose to be in the formal sector if and only if $Y_f \geq Y_i$, and each poorly endowed producer would choose to be in the formal

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sector if and only if $y_f \geq y_i$. These conditions are now equivalent to

$$(G/\Omega_f)^{1-\alpha} K - X \geq \alpha \left[(1-\alpha)\mu\right]^{\frac{1-\alpha}{\alpha}} K \quad \text{and}$$

(13)

$$(G/\Omega_f)^{1-\alpha} k - X \geq \alpha \left[(1-\alpha)\mu\right]^{\frac{1-\alpha}{\alpha}} k.$$

With unobservable endowments the net revenue of the state is given by

(14)
$$R = (m + M)X - G.$$

To maximize R, the proprietary state chooses X such that this choice results in either[8]

(15)
$$Y_f > Y_i \quad \text{and} \quad y_f = y_i$$

or

(16)
$$Y_f = Y_i \quad \text{and} \quad y_f < y_i.$$

The proprietary state also chooses G such that $dR/dG = 0$.

If the state chooses X to satisfy conditions (15), then the amount that it extracts from each producer in the formal sector is such that well endowed producers have a larger net income in the formal sector than they would have in the informal sector, whereas poorly endowed producers have the same net income in the formal sector as they would have in the informal sector. In this case all producers choose to work in the formal sector. If, instead, the state chooses X to satisfy conditions (16), then it extracts so much from each producer in the formal sector that well endowed producers have the same net income in the formal sector as they would have in the informal sector, whereas poorly endowed producers have a

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[8]This analysis implicitly assumes that the state announces, either by word or deed, and irrevocably commits itself to its choice of X before producers choose whether to work in the formal sector or the informal sector. See Grossman and Noh (1990, 1994) for an analysis that focuses on the time consistency of the tax policy of a proprietary state.

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larger net income in the informal sector than they would have in the formal sector. In this case well endowed producers choose to work in the formal sector, whereas poorly endowed producers choose to work in the informal sector.

Suppose that the proprietary state chooses X to satisfy conditions (15). From equations (5) and (12) the equality, $y_f = y_i$, implies that to satisfy conditions (15) the state sets X such that

(17)
$$X = (G/\Omega)^{1-\alpha} k \ - \ \alpha \left[(1-\alpha)\mu\right]^{\frac{1-\alpha}{\alpha}} k.$$

Equation (17) together with the condition $dR/dG = 0$ implies that $M = N$, $m = n$, and hence, $\Omega_f = \Omega$, as well as $G = G|_{m=n}$ and $X = X|_{m=n}$, where

$$G|_{m=n} = \left[(1-\alpha)k/\Omega\right]^{\frac{1}{\alpha}} \Omega \quad \text{and}$$

(18)

$$X|_{m=n} = (1-\alpha)^{\frac{1-\alpha}{\alpha}} \left[(k/\Omega)^{\frac{1-\alpha}{\alpha}} - \alpha\mu^{\frac{1-\alpha}{\alpha}}\right] k > 0.$$

Let $R|_{m=n}$ denote the net revenue of a proprietary state with unobservable endowments and with all producers in the formal sector. Substituting $M = N$, $m = n$, $G = G|_{m=n}$, and $X = X|_{m=n}$ into equation (14), and recalling that $\Omega \equiv NK + nk$, we have[9]

(19)
$$R|_{m=n} = \alpha \ (1-\alpha)^{\frac{1-\alpha}{\alpha}} \left[(k/\Omega)^{\frac{1-\alpha}{\alpha}} - \mu^{\frac{1-\alpha}{\alpha}}\right] k \geq 0.$$

Let $Z|_{m=n}$ denote total net output with a proprietary state, unobservable endowments, and all producers in the formal sector. Substituting $\Omega_f = \Omega$ and $G = G|_{m=n}$ into equations (1) and (6) and summing, we have

(20)
$$Z|_{m=n} \ = \ \Omega^\alpha \ (G|_{m=n})^{1-\alpha} - G|_{m=n} \ = \ \left[(1-\alpha) \ k/\Omega\right]^{\frac{1-\alpha}{\alpha}} \ \left[\Omega - (1-\alpha) \ k\right].$$

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[9] For $R|_{m=n}$, as given by equation (19), to be positive, μ must be smaller than k/Ω, which is smaller than one. If μ were not smaller than k/Ω, then the proprietary state would not consider choosing X to satisfy conditions (15).

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Suppose, instead, that the proprietary state chooses X to satisfy conditions (16). From equations (5) and (12) the equality, $Y_f = Y_i$, implies that to satisfy conditions (16) the state sets X such that

(21) $$X = [G/(NK)]^{1-\alpha}K - \alpha [(1-\alpha)\mu]^{\frac{1-\alpha}{\alpha}} K.$$

Equation (21) together with the condition $dR/dG = 0$ implies that $M = N$ and $m = 0$, as well as $G = G|_{m=0}$ and $X = X|_{m=0}$, where

$$G|_{m=0} = (1-\alpha)^{\frac{1}{\alpha}} NK \quad \text{and}$$

(22)

$$X|_{m=0} = (1-\alpha)^{\frac{1-\alpha}{\alpha}} (1 - \alpha\mu^{\frac{1-\alpha}{\alpha}}) K.$$

Let $R|_{m=0}$ denote the net revenue of a proprietary state with unobservable endowments and with only well-endowed producers in the formal sector. Substituting $M = N$, $m = 0$, $G = G|_{m=0}$, and $X = X|_{m=0}$ into equation (14) we have

(23) $$R|_{m=0} = \alpha (1-\alpha)^{\frac{1-\alpha}{\alpha}} (1 - \mu^{\frac{1-\alpha}{\alpha}}) (\Omega - nk).$$

Let $Z|_{m=0}$ denote total net output with a proprietary state, unobservable endowments, and only well endowed producers in the formal sector. Substituting $M = N$, $m = 0$, and $G = G|_{m=0}$ into equations (1) and (6) and summing, we have

(24) $$Z|_{m=0} = (NK)^{\alpha}(G|_{m=0})^{1-\alpha} - G|_{m=0} + \alpha [(1-\alpha)\mu]^{\frac{1-\alpha}{\alpha}} (\Omega - NK)$$

$$= \alpha (1-\alpha)^{\frac{1-\alpha}{\alpha}} [\Omega - (1 - \mu^{\frac{1-\alpha}{\alpha}}) nk].$$

An Informal Sector or Not?

To decide whether to choose X to satisfy conditions (15) or conditions (16), the proprietary state compares $R|_{m=n}$, as given by equation (19), with $R|_{m=0}$, as given by equation (23). From these equations we see that $R|_{m=0}$ is larger than $R|_{m=n}$ if and only if

(25) $$\frac{(k/\Omega)^{\frac{1-\alpha}{\alpha}} - \mu^{\frac{1-\alpha}{\alpha}}}{1 - \mu^{\frac{1-\alpha}{\alpha}}} < \frac{1 - nk/\Omega}{k/\Omega}.$$

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Condition (25) implies that, either if k/Ω is sufficiently small or if μ is sufficiently large, then choosing X to satisfy conditions (16) results in larger net revenue for the state than would choosing X small enough to satisfy condition (15).

Here we have a central result of our analysis:

> *If the proprietary state cannot observe the endowment of each producer, and if either the distribution of endowments is sufficiently inegalitarian or the production of private substitutes for public services is sufficiently easy, then to maximize its net revenue the proprietary state extracts from producers in the formal sector a large enough amount that poorly endowed producers choose to work in the informal sector.*

This result is consistent with the observation that in poor countries, which commonly have large informal sectors, the distribution of endowments typically is relatively inegalitarian, and the quality of public services typically is poor.

Figures 1 and 2 illustrate this result by depicting alternative Laffer curves, with the net revenue of the state, R, on the vertical axis and the amount that the state extracts from each producer in the formal sector, X, on the horizontal axis. As these figures show, the proprietary state faces a trade-off in that either it can extract as much as $X|_{m=n}$ from every producer or it can extract as much as $X|_{m=0}$ from well endowed producers, but collect nothing from poorly endowed producers. If condition (25) is not satisfied, then Figure 1 is relevant. In this case, the amount of the decrease in R at the point at which X exceeds $X|_{m=n}$ is large enough that the state's net revenue is larger without an informal sector. Alternatively, if condition (25) is satisfied, then Figure 2 is relevant. In this case, the amount of the decrease in R at the point at which X exceeds $X|_{m=n}$ is small enough that the additional revenue that the state collects from well endowed producers by increasing X to $X|_{m=0}$ is larger than the revenue that the state foregoes by causing poorly endowed producers to work in the informal sector.
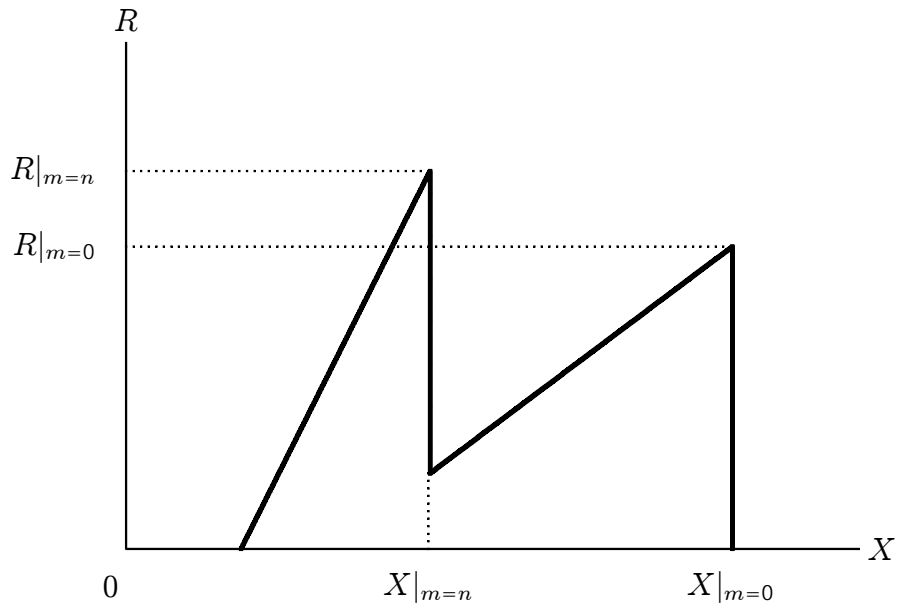
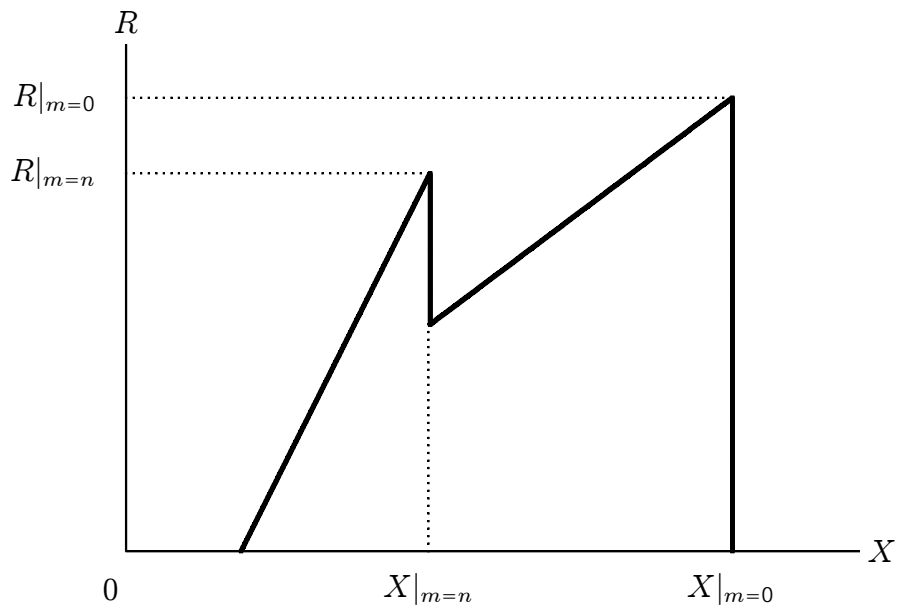Figure 1: Proprietary State without an Informal Sector

Figure 2: Proprietary State with an Informal Sector

Comparing $G|_{m=n}$ and $G|_{m=0}$, as given by equations (18) and (22), with G^*, as given by equations (9), we also see that, whether or not the proprietary state chooses to have an informal sector, it would not provide as much public services as it would provide if endowments were observable. If the state chooses to satisfy conditions (15), then the value of G that maximizes R is smaller with the state extracting X from all producers than with the state extracting T from well endowed producers. Alternatively, if the state chooses to satisfy conditions (16), then the value of G that maximizes R is smaller with only the well endowed producers in the formal sector. Furthermore, comparing equations (20) and (24) with equation (11) we also can easily confirm that, whether or not the proprietary state chooses to have an informal sector, net total output is smaller than it would be if endowments were observable.

A Hypothetical Benevolent State with Unobservable Endowments

A hypothetical benevolent state would choose G and X to maximize the total net income of producers subject to the fiscal budget constraint, $R = (M + m)X - G \geq 0$. In making these choices a hypothetical benevolent state would take as given that well endowed producers and poorly endowed producers would choose to work in the formal sector if and only if G and X satisfy conditions (13).

The first-best solution to this problem would involve choosing G to maximize total net output, $Z = Z_f + Z_i$, with all producers working in the formal sector and with the fiscal budget constraint satisfied as an equality. Summing equations (1) and (6) for Z_f and Z_i, and setting G and X to satisfy $dZ/dG = 0$, conditions (13), and $R = 0$, this solution would imply $m = n$, $M = N$, and, hence, $\Omega_f = \Omega$, with $G = \tilde{G}$ and $X = \tilde{X}$, where

$$(\tilde{G}/\Omega)^{1-\alpha}k \; - \; \tilde{X} \; \geq \; \alpha\,[(1-\alpha)\mu]^{\frac{1-\alpha}{\alpha}}\,k \quad \text{and}$$

(26)

$$\tilde{X} = \tilde{G} = (1-\alpha)^{\frac{1}{\alpha}}\,\Omega.$$

Let $\tilde{Z}$ denote total net output under the first-best solution of a benevolent state.

Substituting $\Omega_f = \Omega$ and $G = \tilde{G}$ into equations (1) and (6) and summing, we have

$$(27) \qquad \tilde{Z} \;=\; \Omega^\alpha \, (\tilde{G})^{1-\alpha} - \tilde{G} \;=\; \alpha \, (1-\alpha)^{\frac{1-\alpha}{\alpha}} \, \Omega.$$

From equations (9) and (26) we see that $\tilde{G}$ is equal to G^*. Thus, in the first-best solution a hypothetical benevolent state, in addition to choosing to have all producers work in the formal sector, also would provide the same amount of public services as would a proprietary state if endowments were observable. Furthermore, as we see from equations (11) and (27), total net output would be the same under the first-best solution of a hypothetical benevolent state as it would be with a proprietary state and observable endowments. The first-best policy of a hypothetical benevolent state, however, would differ from the policy of a proprietary state in that with unobservable endowments a hypothetical benevolent state would collect the same amount of taxes from each producer, but would collect only enough taxes to finance the provision of public services.

The first-best solution given by conditions (26) would be feasible if and only if these three conditions in G and X are mutually consistent. Furthermore, mutual consistency obtains if and only if the parameters satisfy

$$(28) \qquad \frac{1}{1-\alpha} \frac{k}{\Omega} - 1 \geq \frac{\alpha}{1-\alpha} \, \mu^{\frac{1-\alpha}{\alpha}} \frac{k}{\Omega}.$$

Condition (28) implies that, if and only if μ is not too large and k/Ω is not too small, then the hypothetical benevolent state can collect enough taxes from producers in the formal sector for the first-best policy to be feasible.

If the parameters μ and k/Ω fail to satisfy condition (28), then the hypothetical benevolent state would look for the second-best solution. In one possible second-best solution a benevolent state would provide the maximum amount of public services that it can finance with all producers working in the formal sector. In this solution the benevolent state would set X such that y_f equals y_i and would set G equal to X. This solution would imply

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$m = n$, $M = N$, and, hence, $\Omega_f = \Omega$, with $G = \tilde{G}|_{m=n}$ and $X = \tilde{X}|_{m=n}$, where

$$\tilde{X}|_{m=n} = (\tilde{G}|_{m=n}/\Omega)^{1-\alpha} \, k \; - \; \alpha \, [(1-\alpha)\mu]^{\frac{1-\alpha}{\alpha}} \, k \quad \text{and}$$

(29)

$$\tilde{X}|_{m=n} = \tilde{G}|_{m=n}.$$

Equations (29) imply that in this possible second-best solution, although taxes would be low enough that all producers would choose to work in the formal sector, the amount of public services would be smaller than it would in the first-best solution.

Let $\tilde{Z}|_{m=n}$ denote total net income in this possible second-best solution. Substituting $\Omega_f = \Omega$ and $G = \tilde{G}|_{m=n}$ into equations (1) and (6) and summing, we have

(30)
$$\tilde{Z}|_{m=n} = \Omega^\alpha \, (\tilde{G}|_{m=n})^{1-\alpha} - \; \tilde{G}|_{m=n}.$$

The other possible second-best solution would be to choose G such that $dZ/dG = 0$ with only well-endowed producers working in the formal sector. This solution would imply $m = 0$ and $M = N$, with $G = \tilde{G}|_{m=0}$ and $X = \tilde{X}|_{m=0}$, where

$$\tilde{G}|_{m=0} = (1 - \alpha)^{\frac{1}{\alpha}} \, NK \quad \text{and}$$

(31)

$$N \, \tilde{X}|_{m=0} = \tilde{G}|_{m=0}.$$

Equations (31) imply that in this possible second-best solution taxes would be high enough that poorly endowed people would choose to work in the informal sector. Also, because only well endowed people would work in the formal sector, the amount of public services in this possible second-best solution would be smaller than it would in the first-best solution.

Let $\tilde{Z}|_{m=0}$ denote total net income in this possible second-best policy. Substituting $M = N$, $m = 0$, and $G = \tilde{G}|_{m=0}$ into equations (1) and (6) and summing, we have

(32)
$$\tilde{Z}|_{m=0} = \alpha \, (1 - \alpha)^{\frac{1-\alpha}{\alpha}} \, [\Omega - (1 - \mu^{\frac{1-\alpha}{\alpha}})nk].$$

From equations (22) and (31) we see that with only well endowed producers working in the formal sector a hypothetical benevolent state and a proprietary state would provide the

same amount of public services. Thus, as we see from equations (24) and (32), with only well endowed producers working in the formal sector total net output would be the same with a hypothetical benevolent state as with a proprietary state. A hypothetical benevolent state, however, would collect only enough taxes to finance the provision of public services.

If the parameters do not satisfy condition (28), then a benevolent state would choose between these two possible second-best solutions by comparing $\tilde{Z}|_{m=n}$, as given by equation (30), with $\tilde{Z}|_{m=0}$, as given by equation (32). This comparison reveals that, if either k/Ω were sufficiently small or μ were sufficiently large, then $\tilde{Z}|_{m=0}$ would be larger than $\tilde{Z}|_{m=n}$. In this case a hypothetical benevolent state would choose to collect enough taxes from each producer in the formal sector that poorly endowed producers would choose to work in the informal sector. The state would make this choice because, with either k/Ω being sufficiently small or μ being sufficiently large, if the state were to set taxes on producers in the formal sector low enough to induce the poorly endowed producers to work in the formal sector, then it would be able to provide only a small amount of public services.

Comparison of a Proprietary State and a Hypothetical Benevolent State

Does this analysis imply that only the observability of productive endowments is important for the existence of an informal sector? Does not the state's objective also matter? In this section we compare the set of combinations of parameter values that would cause a proprietary state to create an informal sector with the set of combinations of parameter values that would cause a hypothetical benevolent state to create an informal sector.

To facilitate this comparison consider values of the parameters such that $R|_{m=n}$, as given by equation (19), is positive and either equal to or larger than $R|_{m=0}$, as given by equation (23). Under these conditions a proprietary state either would be indifferent between choosing G and X to have or not to have an informal sector or would prefer to choose G and X not to have an informal sector. From equation (19) we see that $R|_{m=n} > 0$ implies

$$(33) \qquad (k/\Omega)^{\frac{1-\alpha}{\alpha}} - \alpha\mu^{\frac{1-\alpha}{\alpha}} > 0.$$

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In addition, from equations (19) and (23) we see that $R|_{m=n} \geq R|_{m=0}$ implies

$$(34) \qquad [(k/\Omega)^{\frac{1-\alpha}{\alpha}} - \mu^{\frac{1-\alpha}{\alpha}}] \, k/\Omega \geq (1 - \mu^{\frac{1-\alpha}{\alpha}}) \, (1 - nk/\Omega).$$

Conditions (33) and (34) do not imply either that condition (28) is satisfied or that condition (28) is not satisfied. As we have seen, if condition (28) is satisfied, then a hypothetical benevolent state would choose the first-best solution in which all producers work in the formal sector. Alternatively, if condition (28) is not satisfied, then a hypothetical benevolent state would choose the second-best solution in which poorly endowed producers work in the informal sector if and only if $\tilde{Z}|_{m=0}$ would be larger than $\tilde{Z}|_{m=n}$.

How do conditions (33) and (34) relate to the relation between $\tilde{Z}|_{m=0}$ and $\tilde{Z}|_{m=n}$? To answer this question, begin by comparing $Z|_{m=n}$, as given by equation (20), with $Z|_{m=0}$, as given by equation (24). Using equations (20) and (24) we see that conditions (33) and (34) together imply

$$(35) \qquad Z|_{m=n} > Z|_{m=0}.$$

This result says that, if the values of the parameters were such that a proprietary state either would be indifferent between having poorly endowed producers work in the formal sector or in an informal sector or would prefer having poorly endowed producers work in the formal sector, then total net output would be larger if G and X were chosen to induce poorly endowed producers to work in the formal sector.

Next, recall that $\tilde{Z}|_{m=0}$, as given by equation (32), is identical to $Z|_{m=0}$, as given by equation (24). Hence, using inequality (35), we see that inequality (33) and equation (34) together imply

$$(36) \qquad Z|_{m=n} > \tilde{Z}|_{m=0}.$$

Also, recall that $\tilde{G}$ is the value of G that would satisfy $dZ/dG = 0$. Thus, because d^2Z/dG^2 is negative, we know that, for any value of G smaller than $\tilde{G}$, dZ/dG would be positive.

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Comparing equations (18) and (26) we see that $G|_{m=n}$ is smaller than $\tilde{G}$. Moreover, although we do not have an explicit expression for $\tilde{G}|_{m=n}$, we can infer that, for any given combination of values for the parameters, $G|_{m=n}$ would be smaller than $\tilde{G}|_{m=n}$. This inference follows from the observation that, either with a proprietary state setting G equal to $G|_{m=n}$ or with a hypothetical benevolent state setting G equal to $\tilde{G}|_{m=n}$, the state's gross revenue, either $X|_{m=n}$ or $\tilde{X}|_{m=n}$, would be the maximum consistent with all producers working in the formal sector. But, a proprietary state would spend only a fraction of $X|_{m=n}$ on the provision of public services, whereas a hypothetical benevolent state would spend all of $\tilde{X}|_{m=n}$ on the provision of public services. In addition, $\tilde{X}|_{m=n}$ would be larger than $X|_{m=n}$ because the provision of more public services would make it more attractive for producers to work in the formal sector.

Because $G|_{m=n}$ is smaller than $\tilde{G}|_{m=n}$, and because, over this range of values of G, dZ/dG is positive, we also infer that, for any given combination of values for the parameters, $\tilde{Z}|_{m=n}$ would be larger than $Z|_{m=n}$. Hence, using inequality (36), we see that conditions (33) and (34) together imply

(37) $$\tilde{Z}|_{m=n} > \tilde{Z}|_{m=0}.$$

Inequality (37) tells us that, whether or not condition (28) is satisfied, if the values of the parameters were such that a proprietary state either would be indifferent between choosing G and X to have or not to have an informal sector or would prefer to choose G and X not to have an informal sector, then a hypothetical benevolent state would choose G and X such that all producers would work in the formal sector.

Here we have another central result of our analysis:

The set of combinations of parameter values for which a proprietary state would choose not to have an informal sector is a subset of the set of combinations of parameter values for which a hypothetical benevolent state would choose not to have an informal sector.

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Summary

This paper has shown that a heavy burden of taxes, bribes, and bureaucratic hassles that, especially in poor countries, drives many producers into the informal sector does not imply that the state authorities are either ignorant or inept. On the contrary this paper has shown that we can attribute the existence of a large informal sector to the fact that, because productive endowments contain important unobservable components, the state cannot adjust the amounts that it extracts from producers in the formal sector according to each producer's endowment. Given this fact we found that, if either the distribution of endowments is sufficiently inegalitarian or the production of private substitutes for public services is sufficiently easy, then the state would extract a large enough amount from producers in the formal sector that poorly endowed producers would choose to work in the informal sector. This result is consistent with the observation that in poor countries, which commonly have large informal sectors, the distribution of endowments typically is relatively inegalitarian, and the quality of public services typically is poor. Moreover, this result obtains both for a proprietary state, which maximizes its own net revenue, and for a hypothetical benevolent state, which would maximize the total net income of producers. But, we also found that a proprietary state would create an informal sector for a larger set of combinations of parameter values than would a hypothetical benevolent state.

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