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# *The Economics of Rural Organization*

*Theory, Practice, and Policy*

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*Published for the World Bank  
Oxford University Press*

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*Oxford University Press*

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1818 H Street, N.W., Washington, D.C. 20433

Published by Oxford University Press, Inc.  
200 Madison Avenue, New York, N.Y. 10016

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Manufactured in the United States of America  
First printing April 1993

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***Library of Congress Cataloging-in Publication Data***

The Economics of rural organization : theory, practice, and policy /  
edited by Karla Hoff, Avishay Braverman, and Joseph E. Stiglitz.

p. cm.

Includes bibliographical references and index.

ISBN 0-19-520888-9

1. Rural development—Developing countries. 2. Rural credit—  
Developing countries. 3. Agriculture—Economic aspects—Developing  
countries. 4. Technological innovations—Developing countries.  
5. Land use, Rural—Developing countries. I. Hoff, Karla Ruth.  
II. Braverman, Avishay, 1948- . III. Stiglitz, Joseph E.

HN981.C6E3 1993

307.1'412'091724—dc20

93-18451

CIP

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## Targeting Taxes and Transfers: Administrative Costs and Policy Design in Developing Economies

Timothy Besley

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*It is often argued that administrative and compliance costs are responsible for the shape of tax and transfer systems in developing countries in significant ways. This chapter discusses what these costs are and how policies may be adapted to these constraints. It derives (a) a cost-benefit rule for the reform of commodity taxes in the presence of administrative costs, (b) the value of using indirect indicators of income as a basis for both tax and transfer programs, (c) precise conditions under which it is better to pay officials responsible for the collection of taxes an efficiency wage rather than their reservation wage, and (d) the value of rural works projects and public provision of private goods as self-targeted income redistribution measures.*

WHILE THE TAX AND TRANSFER SYSTEM in force in any particular developing country is in large part a product of that country's special social and economic structure, there are still some interesting things that many seem to have in common (Tanzi 1987). Of particular note is the heavy reliance on trade and commodity taxes. Compared to more developed countries, developing countries make little use of income taxes. On the transfer side, things are not as well documented and, in the wake of recent structural adjustment programs, there has been much change. Even a casual inspection of the evidence suggests that food subsidy schemes and public provision programs, especially for health and education, are important. In line with the relative unimportance of income taxes, income transfers are little used.

Such stylized facts are hardly surprising. For many sectors of developing countries, income-based tax or transfer programs are an unrealistic option. Not the least of the difficulties would be the task of measuring the incomes of millions of individuals who do not currently fall under the ambit of income-based tax or transfer programs. Some of the difficulties are conceptual: for example, how should the livestock depreciation of a small farmer be treated? But similar problems arise in developed countries in implementing anything closely approximating a tax on Haig-Simons or Hicksian income.<sup>1</sup> It is unlikely, therefore, that conceptual problems are a serious barrier to the operation of income-based tax or transfer programs in developing countries. Instead, the problems are intensely practical. The administrative costs of establishing an infrastructure to implement policies that require a detailed appraisal of all individuals' incomes would be immense.

Imperfect information plays a central role in the analysis of tax design. Indeed one of the main components involved in running a tax system is collecting and processing information. There are two aspects of imperfect information that are worth keeping distinct. First, there are problems of imperfect information that are *strategic*. These arise in situations where one agent has private information that the government would like to use for tax or transfer purposes. Such problems motivated the analysis of optimal income taxation pioneered by Mirrlees (1971). When such problems exist, taxes need to be made *incentive-compatible*: taxpayers need to have an incentive to reveal truthfully information that is relevant to the policymaker.

Not all problems of imperfect information are strategic. A second kind of uncertainty is about the environment in which policymaking takes place. Governments may be uncertain about key behavioral parameters, such as demand elasticities, or may not know the average per capita income in a region of the country. Imperfect information of this kind is also pervasive, especially in developing countries. The development of administrative capacity for tax purposes is in large measure the process of accumulating information about the environment and about individuals, the end being to enhance the sophistication of the policies that are possible. Particularly important is increasing the ambit of income-based taxes and transfers.

When the administrative infrastructure is weak and information poor, it may be worthwhile to implement policies that economize on information and play to the strengths of the existing administration. History may matter in important ways. For example, the long experience that India has had with rural public works projects may make such policies attractive even if implementing them in another country without that history is not.

One must be wary of ignoring administrative considerations in policy design. A policy that is unsophisticated yet well administered may be better than a more sophisticated policy administered incompetently. This possibility is considered in Stern (1982), who shows that an income tax may dominate a lump-sum tax if the latter is subject to errors in administration.

Administrative considerations might also help to explain the widespread use of trade taxes in developing countries. Ports provide a convenient location at which goods can be taxed. Chapter 19 showed that an export tax can dominate a land tax if the assessment of land quality is subject to error. Even trade taxes, however, may exceed a country's administrative capacity. In Ghana, for example, taxation of cocoa exported through official channels has led to smuggling to neighboring Togo and Côte d'Ivoire.<sup>2</sup>

The remainder of this chapter is organized as follows. In the next section, we consider the problem of building institutions to administer taxes. Most models of optimal taxation forsake consideration of such concerns.<sup>3</sup> The third section introduces administrative costs into a model of tax reform and examines some implications of this. In the fourth section, we consider using imperfect indicators of income for tax purposes. We illustrate the analogy between this and the use of random taxation. The fifth section considers transfer policies when incomes cannot be measured, while the sixth section considers corruption in tax collection and applies the efficiency wage model, developed in Calvo and Wellicz (1979) and Shapiro and Stiglitz (1984), to this issue.

## **Building Institutions to Administer Taxes and Transfers**

Most countries have had, and some retain, traditional methods for collection of agricultural taxes that are assessed locally. For example, India has a long history of agricultural taxation based upon fairly detailed evaluation of landholdings and output (Angrish 1972). The assessment of such taxes is vested primarily in localities and they are often levied in kind. Throughout rural Africa, agricultural taxes assessed and collected at the local level have also been important. Personal taxes that are variously described as poll, hut, or village taxes have been levied depending on a person's circumstances, very often as perceived by local chiefs (Bird 1974, chapter 2). Those assessing the taxes typically have good information about the local residents, their endowments and circumstances, so that the strategic information problems that we referred to above seem to have not been serious. The problem of tax compliance under such systems is also diminished because the benefits from tax revenues raised can often be directly perceived by the taxpayer. Personal taxes of the kind described here have provided significant tax revenues in some countries. In Nigeria, for example, they constituted 48 percent of tax revenues raised in 1960-61 (Bird 1974).

Such systems are effective, however, only when the social and economic structure permits. The process of economic development to some extent erodes the institutions by which taxes are locally levied. For example, populations become more mobile and kinship less important. The benefits of

taxes may also seem remote, perhaps concentrated in urban areas. This in turn increases the compliance problem. Consider, for example, the case of Zaire's *impôt indigène* (a long-standing system of taxation), which while responsible for 46 percent of government revenues in 1900, constituted only 3 percent by 1958 (Bird 1974). There also seems to be a widespread view that the level of corruption increases in the early stages of economic development (Huntington 1968). If correct, this makes the task of developing an adequate administrative capacity for taxation all the more difficult. Many developing countries therefore find themselves in a hiatus created by the breakdown of many traditional forms of tax collection, yet lacking the institutions to adopt the tax structures currently used in the developed world.

The policy problem is thus to build a tax administration that can tax the rural sector efficiently and fairly. To do this, the government must find out who the taxpayers are and how much they earn, and then enforce compliance with the tax code. One possibility is to exploit existing institutions for purposes of taxation: for example, levying taxes administered by village councils. The rich social and economic structure of village life is thus harnessed as a revenue-extracting tool. This is a familiar story in the colonial history of some countries. There are, however, limits to revenue extraction by such means. To the extent that it becomes a tool for funneling funds out of the village, it may tend to undermine the motivation underpinning the original institution, and it may induce populations to choose a more atomistic existence. The alternative is to build bureaucracies to administer taxes and to decentralize them in rural areas in order to build up local expertise among tax agencies. This pattern has been widely followed (Radian 1980). It has not, however, been without its problems.

Following Bird (1983), we will divide the tasks involved in levying taxes into three parts: to identify taxpayers, to assess the tax that they should pay, and to collect the tax. These may be thought of as the "three E's" of tax administration: enumerate, estimate, and enforce. There are many criticisms of the way in which developing countries have attempted to organize these activities. The main ones are:

- An excessive number of different taxes with different rate structures that dilutes the expertise of tax administrators, since a small staff typically has to administer all of the taxes.
- The confusing way that tax law is written and the absence of manuals to consult.
- The dearth of information available to the tax administration to check and cross-check taxpayers. Since populations are mobile, it may not be possible to trace many individual taxpayers. Since much trading is informal, there is often very little documentary evidence to provide a basis of investigations. In any case, tax inspectors have few weapons with which to investigate noncompliance.

- Poor training and pay of tax inspectors, resulting in low quality and corrupt administration. The legal sanctions to enforce punishments on either taxpayers or inspectors who do not comply with the law are typically rather weak.

Each of these factors increases the costs of raising a given tax and limits the array of taxes that can be profitably levied.

Behind all this lies a problem that a culture of tax compliance has not yet emerged. Traditional tax systems in rural areas have been sustained by a combination of commitment to other individuals in the community and the tangibility of benefits from taxation, although, as we noted above, this may diminish as more funds are funneled out of the community. Hence, neither of these motives may be so strong when taxes are levied by a central administration, which makes the task of extracting resources from rural areas to finance urban development more difficult. Thus, taxing agricultural commodities has been the *sine qua non* for the latter. Noncompliance with taxes may also have contagion effects, because some taxpayers regard it as unfair that they should have to pay taxes when others do not. Similarly, the dishonesty of tax inspectors may not be punished by cultural sanctions. Economic incentives may be used to induce honest behavior even though, as noted in Arrow (1970), one would rather that society developed an honor code to police the system.

Many of the problems that we have mentioned here apply equally to transfer programs. Ideally one would like to assess transfers based on a detailed evaluation of individuals' characteristics. Target populations are typically hard to identify and governments lack the administrative infrastructure necessary to make accurate assessments of who is needy.

## The Theory of Tax Reform with Administrative Costs

### *The Model*

This section develops the theory of tax reform in a model with administrative costs. While we shall not presume prior familiarity with the theory of tax reform, there is no attempt to be comprehensive. For a more detailed account, the reader is referred to Stern (1987b).

Consider a government that is implementing a set of tax reforms. In doing so, it is assumed to care about the well-being of its citizens as measured by their utility levels. In the initial equilibrium, it is taxing and subsidizing certain goods and has an administrative machinery that possesses certain types of information. Over time, there is scope for investing in tax infrastructure by collecting information pertinent to tax collection

and tax incidence. Indeed, such activities constitute an important part of tax reform procedures.

We begin by using the standard analytical framework. There are  $H$  households, each with an indirect utility function denoted by

$$(20-1) \quad v_h(q, m^h, \theta^h)$$

where  $q$  is the price vector of all goods produced and consumed by the household,  $m^h$  is lump-sum income, and  $\theta^h$  represents household characteristics. This indirect utility function summarizes both production and consumption decisions by the household. Hence, Roy's identity with respect to equation 20-1 would give the net demand or supply for each good. Any household-specific prices (such as wage rates) are part of the vector  $\theta^h$ . We shall allow the government to levy taxes only in the form of changes in the price vector  $q$ . Note that this already implies some restriction on the ability to tax; that is, the tax rate is independent of  $h$ . In principle, the government would like to implement a lump-sum tax that depended upon  $m^h$  and  $\theta^h$ . The conventional income tax system that is operated in developed countries is like a tax on an element of  $\theta^h$ , for example, the wage received, and it is enacted anonymously.

Assume that the government evaluates tax reforms according to social weights derived from the social welfare function:

$$(20-2) \quad W(V^1, \dots, V^H).$$

Letting  $t_i$  denote the per unit tax rate on good  $i$ , the government has revenues net of marginal subsidies of

$$(20-3) \quad \sum_h \sum_i t_i x_i(q, m^h, \theta^h)$$

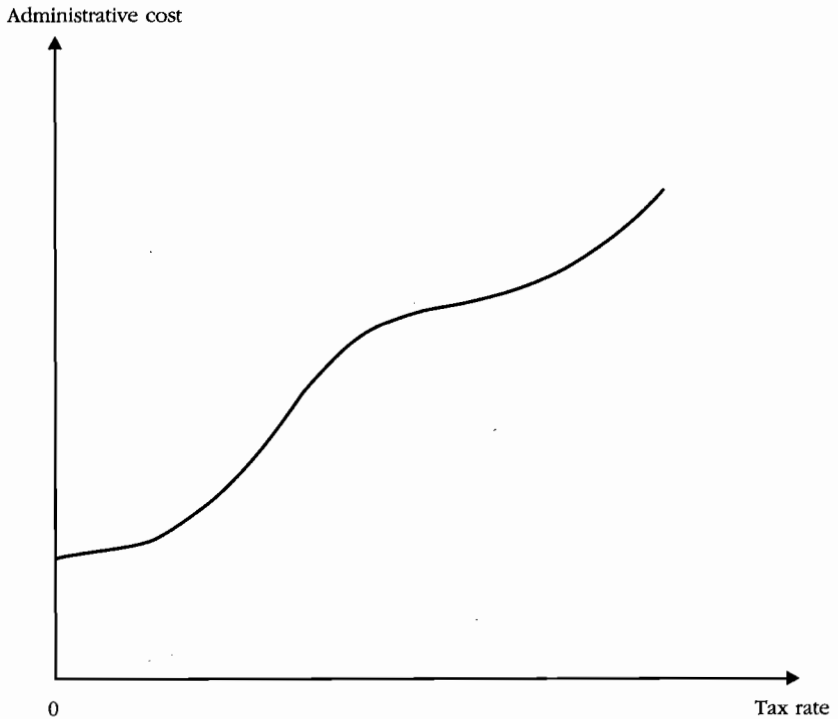
where  $x_i(\cdot)$  is the demand function for good  $i$ .

Taxation entails administrative costs, which we take to be a function of the tax rates levied and what we shall refer to as *tax capital*, denoted  $K$ . The latter can be thought of as the investments that the country has made in infrastructure to raise taxes. It includes both physical capital and the state of knowledge. For example, the costs of levying a tax on rice, when the government has no information about rice transactions, could be regarded as effectively infinite. The administrative costs of the tax vector  $t$  are thus:

$$(20-4) \quad F(t, K) + rK$$

where  $r$  is the user cost of tax capital. We assume that the function  $F(\cdot, \cdot)$  is increasing in  $|t|$ .<sup>4</sup> In practice, the shape of the function may be quite complicated. Figure 20-1 illustrates a typical case. There is an initial fixed cost associated with a tax and an increasing marginal cost, over some range. The function would become convex for high tax rates because of difficulties



Figure 20-1. *An Administrative Cost Curve*

involved in enforcing payment of such rates. There seems, however, to be very little evidence about the actual shape of administrative cost functions.

Putting together costs and revenues, we have the government's budget constraint:

$$(20-5) \quad \sum_h \sum_{i,t} x_i^h(q, m^h, \theta^h) - R - F(K,t) - rK = 0$$

where  $R$  is the revenue required for expenditure programs.<sup>5</sup> Note that we are pursuing the issues in a static model and that we have not allowed the vector  $K$  to affect household utility directly. These are quite strong assumptions. For example, households presumably care about how taxes are collected—how intrusive and time-consuming the process of complying with the tax rules is. We shall return to this below. We turn now to considering tax reform in this framework.

Tax reforms are of two kinds: reform of tax rates given an administrative infrastructure, and reform of the infrastructure (which corresponds in this model to the accumulation of tax capital). Most of the literature to date has concentrated on the former.<sup>6</sup> It is also important to note that our adminis-

trative costs are costs of implementing a tax system and *not* those of changing taxes.<sup>7</sup> Costs of changing a system may themselves be important and affect which parts of the tax system might be chosen for attention. These are likely, in practice, to depend on political considerations as much as anything else.

### Reform of Tax Rates

Consider first the reform of taxes in the absence of administrative costs. Total welfare,  $\Omega$ , can be written in the form of individuals' welfare plus government revenue valued at its shadow price, denoted here by  $\lambda$ , so that  $\Omega \equiv W + \lambda R$ . Differentiating  $\Omega$  with respect to the tax rate on good  $i$  yields

$$(20-6) \quad \Delta_i \equiv - \sum_h \beta_h x_i^h = \text{social cost of raising the tax on good } i$$

where  $\beta_i^h$  is the social marginal utility of income of individual  $i$ , and

$$(20-7) \quad \Lambda_i \equiv \sum_h x_i^h + \sum_h \sum_j \frac{\partial}{\partial q_i} t_j x_j^h = \text{revenue from raising the tax on good } i.$$

A change in the tax rate on good  $i$  will increase welfare if  $\Omega_i = \Delta_i + \lambda \Lambda_i > 0$ , where  $\Omega_i$  is the partial derivative of the welfare function with respect to the  $i$ th tax rate;  $\Omega_i > 0$  means that the reduction in the welfare of consumers of the good is offset by the increase in tax revenues valued at their shadow price. In this framework it is easily seen that if taxes are set optimally, then cost-benefit ratios should be equalized for all commodities at an optimum; that is,  $-\Delta_i/\Lambda_i = \lambda$  for all  $i$ . Hence, for a reform to be worthwhile, tax rates should be increased on goods for which the cost-benefit ratio is below  $\lambda$  and reduced in goods for which it is more.

The modification of this argument in the presence of administrative costs is fairly straightforward. All we require is that the benefit from raising a tax be measured *net of collection and enforcement costs*. This is seen most clearly if one defines  $\mu_i \equiv [\Lambda_i - F_i]/\Lambda_i$ , where  $F_i$  is the partial derivative of the administrative cost function with respect to the  $i$ th tax rate. Obviously,  $\mu_i < 1$  when there are administrative costs associated with a tax increase. It represents the proportion of any tax increase that actually augments revenues. The condition for a marginal tax reform on good  $i$  to be worthwhile is now that  $\Omega_i = \Delta_i + \lambda \mu_i \Lambda_i > 0$ . Even this simple extension of tax reform rules can have a significant impact. Tax increases that are worthwhile on the cost-benefit test ignoring administrative costs may not be so if the leakage to administrative costs is considered. The optimal tax rule would now be to set cost-benefit ratios equal to  $\lambda \mu_i$ . This term is the shadow price times the proportion of the tax that actually finds its way into government revenues. Other things being equal, one would be less likely to advocate a tax increase for goods where  $\mu_i$  is low.

So far, we have only considered local tax reforms. If costs are as in figure 20-1, then administrative costs may introduce nonconvexities into the analysis. In particular, there may be some goods for which  $t = 0$  is an optimum given  $K$ . One obvious case, for example, is where transactions in the commodity are unobservable. Such nonconvexities would also imply that the optimal tax rule to equalize cost-benefit ratios is invalid since taxes that satisfy the first-order conditions may not raise welfare enough to outweigh the fixed cost of administering the tax.

### Reforming Tax Capital

There are two reasons for being interested in the reform of tax capital. First, one might wish to reduce the cost of raising tax revenue for a given tax structure. A number of countries have recently computerized tax records to lower administrative costs without wishing to implement large-scale tax reforms. The second reason for accumulating tax capital is as an instrument for the reform of tax rates. The government may wish to expand its tax inspectorate in order to combat the increased evasion that might result from an increase in taxes. A tax capital reform has direct and indirect benefits. Direct benefits accrue when the costs of levying a given set of taxes are lowered. The indirect benefits arise from being able to implement taxes that were not previously possible.

To make these ideas precise, write welfare as  $W(t) + \lambda[R(t) - F(K,t) - rK]$ . Welfare is increasing in  $K$  if

$$(20-8) \quad \sum_j \Omega_j \frac{dt_j}{dK} - \lambda[F_K + r] > 0.$$

The first term represents the indirect welfare effect of the reform on optimal tax rates, while the second is the direct welfare effect on administrative costs.

This rule is even simpler in the case where taxes are set optimally in the initial state, given the country's administrative capacity, since this implies that  $\Omega_j = 0$  for all  $j$ . Hence a marginal reform of tax capital is desirable in this case *if and only if it lowers administrative costs*. The indirect effect of the change in tax capital on optimal tax rates can be ignored. This demonstrates the importance of understanding the initial tax equilibrium when putting forward rules for tax reform. One needs to consider the indirect effects due to changes in tax rates only if it is believed that there are reasons, other than a lack of tax capital, why taxes are not being set optimally in the first place.

Note that if tax capital were allowed to enter the taxpayers' utility functions, then the simplicity of this rule would be undermined somewhat. In this case, one would need to take the direct effect on taxpayer welfare into consideration, as well as the change in administrative costs, when formulat-

ing the cost-benefit rule. For example, the cost of introducing tax collection procedures that made the lives of taxpayers more difficult would have to be weighed against the reduction in administrative costs.

## Measuring Indicators for Tax Purposes

The above analysis is best thought of as a model for the reform of commodity taxation taking account of administrative costs. There has also been much discussion of extending the tax base by taxing goods or activities that serve as signals of high income. This role is partly served by commodity taxes. For example, air conditioners are consumed disproportionately by the rich, and so are a signal of having high income. Thinking about consumption patterns in this way serves as a useful focus for thinking of other ways of broadening the tax base to include those who are normally thought of as being hard to tax.

Consider, for example, the suggestion of Bird (1983, p. 11) to establish "a set of *standard assessment guidelines* for each major economic activity, on the basis of which the income of any individual taxpayer can be estimated in a relatively objective fashion." This is likely to be compatible with the administrative constraints that many developing countries face. It also suggests the following problem. Suppose that the government cannot observe agents' incomes, although it can observe, at some cost, other things that are correlated with it, such as the size of someone's house, what durables he owns, and so on. How should such information be used for tax purposes?

Let  $y$  denote income and let  $x$  denote another variable that can be observed at cost  $c(\rho)$ , where  $\rho$  is a measure of the *informativeness* of  $x$  about  $y$ , an idea that we will make precise below. Assume that  $c(\cdot)$  is increasing and convex for  $\rho \in [0, 1]$ ; that is, more informative signals cost more. To fix ideas, we consider an example in which  $x$  and  $y$  are jointly normally distributed and the utility function of an agent is of the form  $-\exp(-Ay)$ ; that is, absolute risk aversion is constant. Consider introducing a tax of  $\tau$  on good  $x$ , which is redistributed back to consumers in the form of a lump-sum subsidy denoted by  $\beta$ .<sup>8</sup> Given our assumptions about the utility function and the distribution of  $x$  and  $y$ , social welfare (measured here by the sum of utilities) is monotone in:

$$(20-9) \quad \mu_y - \mu_x \tau + \beta - \frac{1}{2} A[\sigma_x^2 \tau^2 + \sigma_y^2 - 2\rho \sigma_x \sigma_y \tau]$$

where  $\mu_i$  and  $\sigma_i$  are the mean and standard deviation of variable  $i$ .<sup>9</sup> The symbol  $\rho$  is the correlation coefficient between  $x$  and  $y$  and is a means of quantifying the informativeness of  $x$  about  $y$ . If  $\rho = 1$ , then observing  $x$  would be just as good as observing  $y$  for tax purposes, while with  $\rho = 0$ ,  $x$

provides no information. The government is assumed to be risk-neutral and to face the budget constraint:

$$(20-10) \quad \tau\mu_x - c(\rho) - \beta = R$$

where, as above,  $R$  is the revenue requirement, which we shall take to be zero hereafter. Solving 20-10 for  $\beta$ , substituting in 20-9, and setting the derivative of the resulting expression with respect to  $\tau$  equal to zero, yields:

$$(20-11) \quad \tau^* = \rho\sigma_y/\sigma_x.$$

Hence, in this simple setup that assumes that the tax imposes no deadweight loss, the optimal tax is just equal to the regression coefficient of  $y$  on  $x$ . It is clear from equation 20-11 that the optimal tax is increasing in  $\rho$ ; that is, more informative signals are taxed more highly. Since  $1/\sigma_x$  measures the precision of  $x$ , the tax is higher the more precise is the signal. It is, however, increasing in the variability of income. The value of redistributive taxation is greater, the greater is initial income inequality. Substituting equation 20-11 into equation 20-9 yields

$$(20-12) \quad V^* \equiv \mu_y - c(\rho) - \frac{1}{2} A\sigma_y^2 [1 - \rho^2]$$

as an expression for maximized social welfare.

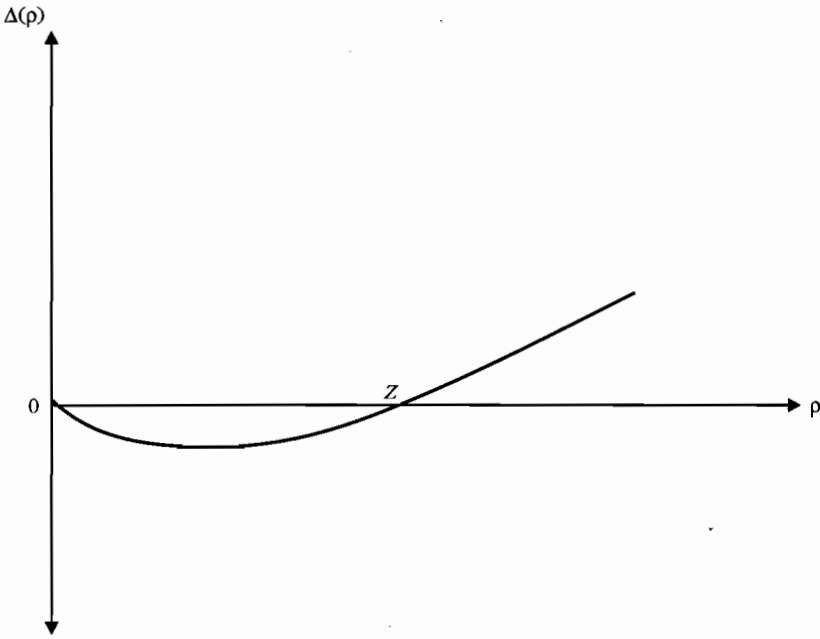
We wish to compare welfare under optimal taxation with welfare under no intervention. It is straightforward to check that the latter is just  $V \equiv \mu_y - 1/2 A\sigma_y^2$ . Hence, the difference between welfare in the two cases is given by

$$(20-13) \quad \Delta(\rho) \equiv V^* - V = \frac{1}{2} A\rho^2\sigma_y^2 - c(\rho).$$

The right-hand side of equation 20-13 has a convenient interpretation. The first term,  $[1/2]A\rho^2\sigma_y^2$ , can be thought of as the amount by which the tax reduces society's inequality premium, defined as the aggregate amount that society would be prepared to give up in order to equalize incomes.<sup>10</sup> Although equation 20-13 has been derived for special utility and density functions, it is valid as a second-order approximation to any case. The second term in equation 20-13 is just the cost of purchasing a signal of value  $\rho$ . Hence, in the absence of deadweight loss from the tax, whether taxing a signal of informativeness  $\rho$  is worthwhile depends on trading-off administrative costs against the reduction in inequality. The gain from levying the tax is greater the larger is  $A$ , a measure of the concavity of individual utility functions, and the larger is  $\sigma_y^2$ , the inequality in income. In more general models, incentive effects would have to be considered too.

Consider some properties of  $\Delta(\rho)$ . First we ask if, beginning with a situa-

Figure 20-2. *The Minimum Level of Informativeness at Which a Tax is Worthwhile (Point Z)*

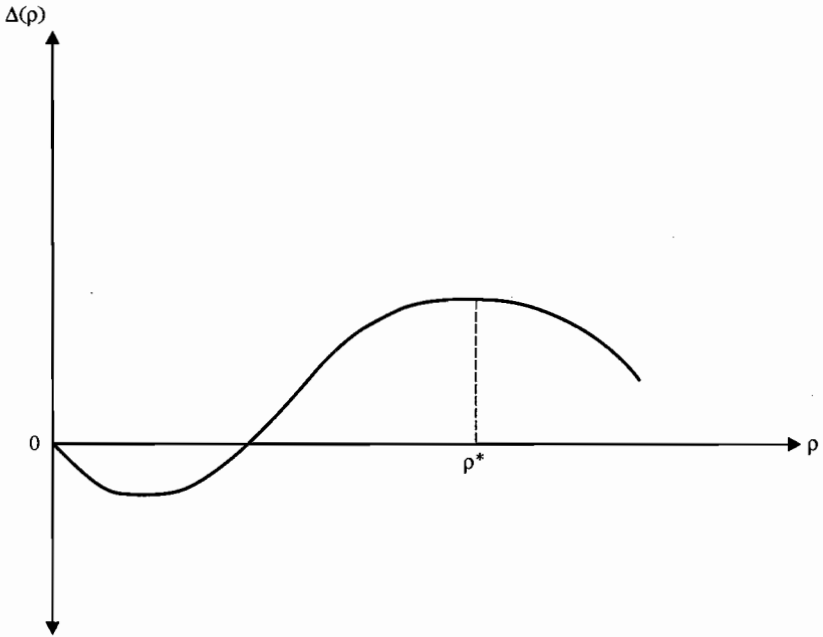


tion in which there is no tax, it would be worthwhile introducing one with  $\rho > 0$ . It is straightforward to check that

$$(20-14) \quad \Delta'(0) = -c'(0) < 0$$

Hence, introducing a tax on a barely informative signal is never worthwhile. This is just a manifestation of the nonconcavity in the value of information, first noted by Radner and Stiglitz (1981). It introduces some interesting complications into the present analysis.

Suppose, for example, that the cost function is of the form  $c(\rho) = a\rho + 1/2b\rho^2$ . Then we must have a corner solution, with either  $\rho = 0$  or  $\rho = 1$ . To see this, it is easiest to refer to figure 20-2 where we graph  $\Delta(\rho)$ . We require  $A\sigma_y^2 > b$  in order to have a turning point, which is in this case a global minimum. Whether we are at a corner with  $\rho = 0$  or  $\rho = 1$ , depends on whether point Z lies above or below  $\rho$ . A sufficient condition for  $\rho = 0$  to be optimal is that  $1/2[A\sigma_y^2 - b] - a < 0$ . In this example, taxation of an imperfect indicator of income is never a good idea. It is either worthwhile to measure the thing that we are directly interested in, that is, income (this is the corner solution with  $\rho = 1$ ) or do nothing at all (the corner solution with  $\rho = 0$ ).

Figure 20-3. *An Interior Solution*

In figure 20-3, we illustrate a case with an interior solution despite the nonconcavity that we have noted. Even with quite regular cost functions, we may have many points of inflection. This suggests the need to perform cost-benefit calculations rather carefully. This nonconcavity bounds the choice of  $\rho$  that would be made away from zero; that is, we will either choose zero or a  $\rho > 0$  that does not lie within a neighborhood of zero. This makes precise the idea that a signal is useful for tax purposes only if it is sufficiently informative; that is, if it satisfies  $[1/2]A\sigma_y^2 > c(\rho)/\rho^2$  (using equation 20-13).

This simple model can usefully be extended to the case of many indicators, that is,  $x$  can be a vector. The problem of choosing the best set of indicators from the point of informativeness about income is more difficult in this case since each signal has a  $\rho$  (a correlation coefficient with income) associated with it. It is more difficult to extend the model to allow for incentive effects and the excess burden that they give rise to. There are a number of possible cases. First,  $x$  could be manipulated in a way that does not affect income. Hence, if  $x$  is the number of square feet in one's house, then one could live in a smaller house and spend one's income on other things. Second,  $x$  could be manipulated with consequences for one's income. For example, if  $x$  is land, an individual would tend to reduce his land holdings and do more off-farm work since the latter is effectively untaxed.

It is also important to distinguish between cases where the tax rules are known versus those where they are not. In the first case, individuals reorganize their affairs anticipating correctly what taxes they will pay if they behave in particular ways. In the second, they have beliefs about the tax rules but there is some uncertainty. This is related to the question, discussed in Weiss (1976) and Stiglitz (1982), of whether random taxes are better than deterministic taxes. Not knowing the rules that are used for taxing indicators is like being uncertain about what tax rates one will face. This may actually mitigate the disincentive to work associated with a given tax.

## Transfers When Income Is Unobservable

As well as presenting a limitation on the type of tax system that can be implemented, income unobservability limits the ability of governments to implement transfer programs to reduce poverty. The purpose of this section, therefore, is to discuss three alternatives to income-based transfer programs: public works programs, public provision of private goods, and statistical targeting.<sup>11</sup>

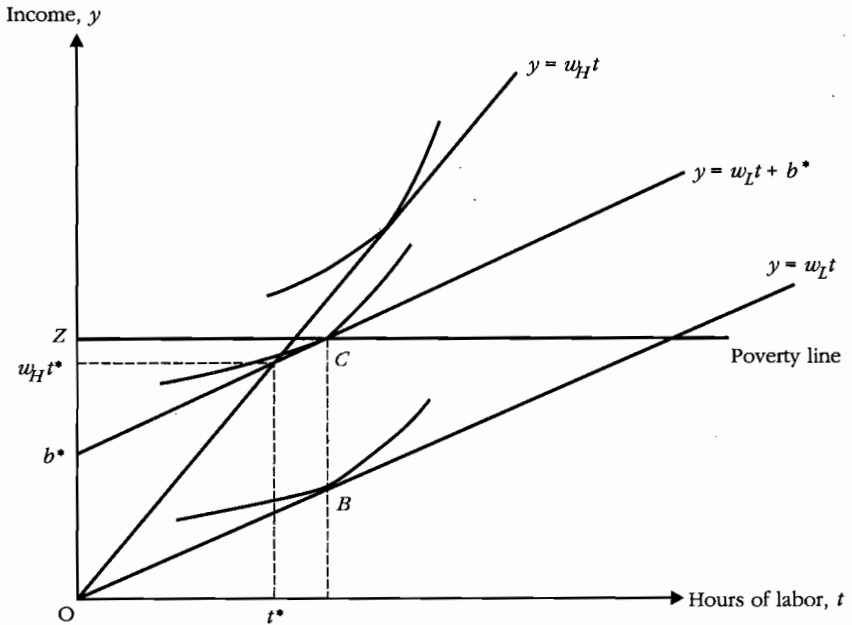
### *Self-Targeting Programs*

*Public works projects.* Even if income cannot be measured, it may be possible to design programs that, by targeting underlying differences between individuals, are able to direct transfers of cash to those whose needs are greatest. Among the most widely used tools in this respect are public works programs (pwp). They offer employment in exchange for an income that is large enough for individuals to sustain themselves. Suppose that the pwp offers a wage of  $\hat{w}$  for a working day of length  $t$ , so that all those with wages below  $\hat{w}$  and optimal labor supplies at  $\hat{w}$  that are more than or equal to  $t$  will choose to work on the government project. They may choose, in addition, to undertake some further work at whatever wage is available in the private labor market (which itself will be a function of  $t$  and  $\hat{w}$ ). By suitable choice of  $\hat{w}$ , the government may be able to design a scheme that attracts only those who cannot sustain themselves.

Such a case, taken from Besley and Coate (1992), is illustrated in figure 20-4. We have assumed that there are only two types of individuals who face exogenously given wage rates of  $w_H$  and  $w_L$ , and that the government wishes to get the poorer individuals up to the income level  $z$  (which can be thought of as a poverty line). The diagram neglects income effects on labor supply for simplicity. Initially individuals would be in equilibrium at points A and B, entailing consumption for the lower income individuals below  $z$ . If the government cannot observe the wage rates available to each individual, then



Figure 20-4. *The Optimal Public Works Program*



it cannot single out the low-wage individuals for selective treatment. Hence, if the amount  $b^*$ , which is required to get the low-wage individuals to income level  $z$ , were offered in a transfer program, there would be nothing to stop this transfer from being taken by the high-wage individuals as well. Consider, as an alternative, a PWP with  $\hat{w} = w_H$  and  $t = t^*$  in the diagram. Two things about this solution are clear. First, only low-income individuals would find it strictly worthwhile to join the program (attaining point C in the diagram). Second, this work program would get individuals to the target consumption level.

It is not clear, however, that this scheme would be better than a universal transfer program. One simple test is whether the government saves money by offering the package  $\{w_H, t^*\}$  rather than a blanket handout of  $b^*$ . Figure 20-4 helps to evaluate this. Suppose that the proportion of the population with low incomes is  $\gamma$ . The cost of the public works project is then  $\gamma[w_H - a]t^*$ , where  $a$  is the marginal product of labor in the public works project, which is assumed to be constant. Hence,  $w_H - a$  is the subsidy-tax granted to each individual per unit time in the public works project. By contrast, since all individuals claim the transfer when there is no work required in exchange, a pure transfer program costs  $b^*$ . Making use of figure 20-4, it is clear that  $b^* = [w_H - w_L]t^*$ . Putting these things together, we have deter-

mined that it is less costly to have a PWP to bring individuals up to the target income level  $z$  rather than a universal cash transfer if  $[1 - \gamma]w_H > w_L - \gamma a$ . This inequality behaves much as one might have expected. A PWP is preferred when  $a$  is high,  $w_L$  is low,  $w_H$  is high, and  $\gamma$  is low.

Projects where individual participation depends on self-selection and not on any administered test may play an especially crucial role in countries when income cannot be reliably measured, since the tests imposed are *self-acting*. Such programs may be valuable even when income is observable, since there may be incentive effects from pure income transfers on the decision to enter the labor force that PWPs may serve a role in mitigating.

It is debatable, however, whether PWPs are an administrative convenience. While, if properly designed, they do not require means tests, they still require some fairly detailed information about the distribution of individuals' types in the population, the fraction  $\gamma$  in our model. Just what administrative burdens would result from a scheme of the kind described here is an important issue for further investigation.

The example above was based on some restrictive assumptions. It is interesting to consider the consequences of relaxing some of them, as discussed below.

- The target income level may be affected by the terms of the PWP. If work done in PWPs is hard, then individuals may need to consume more calories. Individuals might also need to be compensated for the fact that PWPs are unpleasant in other ways. Either of these effects makes it less likely that a PWP would be preferred on the criterion given above.
- There may be general equilibrium effects on wages. If government demands laborers, then the wage earned by all may rise. Whether this improves or worsens the case for a PWP depends largely on what happens to the *relative* wages of the low- and high-wage individuals. A higher wage for the high-wage individuals would enable the government to pay a higher wage in the PWP without inducing the high-wage individuals to join the program. At a higher wage, the target income level can be met with fewer hours of work ( $t^*$  falls), and hence the foregone output under the PWP (equal to  $t^*[w_L - a]$ ) also falls. Higher wages for low-wage individuals means that the opportunity cost of their labor time in the PWP has risen. Since both sides of the inequality given above have increased, one cannot say a priori if it is more likely that a PWP will be preferred now than before. For empirical analysis relevant to this issue, see Ravallion (1989).
- So far we have assumed that human capital levels, which determine wage rates, are fixed; that is, we have not considered the consequences of allowing individuals to make investments that alter their wage rates. Besley and Coate (1992) investigate this issue in some detail. They find

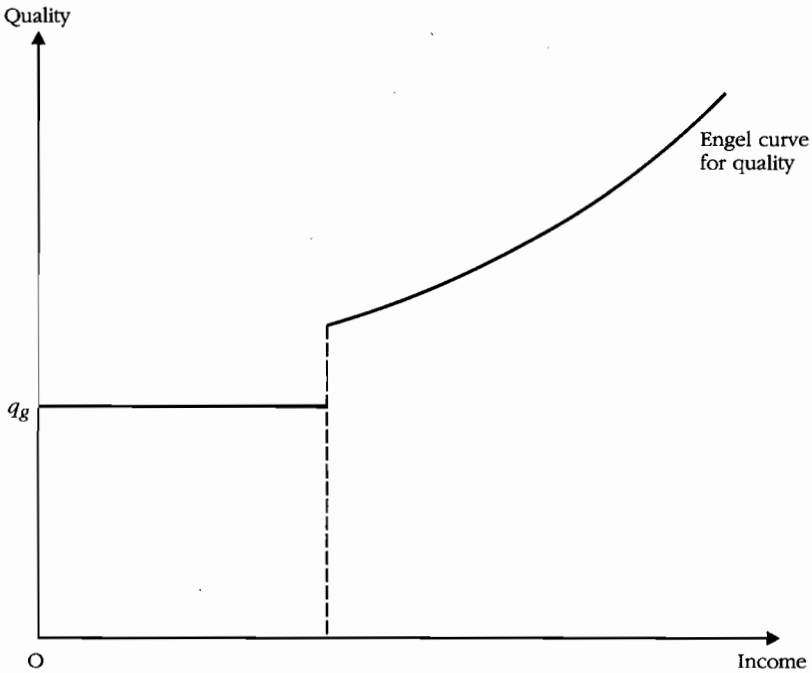
that instituting a work requirement in exchange for a transfer may increase human capital investment, although the objective adopted by the government is crucial to this conclusion. It relies on the government trying to give individuals a target income level as opposed to a target level of well-being.

*Public provision of private goods.* An alternative model for self-targeting redistribution schemes is public provision of goods rather than cash.<sup>12</sup> One model of this can be developed as follows. Many publicly provided goods are best thought of as being indivisible and hence being demanded discretely; that is, a consumer buys one or zero units. This is not to say, however, that all units are identical. While demanded discretely, such goods are typically available at different quality levels. For example, the same educational qualification is available at many different standards. Discreteness often implies that individuals are unable to consume these goods from two different sources simultaneously. For example, one cannot easily obtain medical care both from the public and private sectors for the same episode of an illness.

Moreover, a consumer who relies on public provision of the private good is stuck with consuming at the preset public-sector quality level. If the good concerned is normal and there is a private sector, then if the state provides a fixed quality level free of charge, one would find the population dividing into two classes—better-off consumers would use the private sector, leaving the public sector to the poor. This is illustrated in figure 20-5, where  $y^c$  denotes the critical income level below which individuals opt to consume in the public sector. We have assumed for simplicity that the private sector provides a continuum of possible quality levels. Note that there is a jump in the quality level demanded at  $y^c$ . Since public provision is free, an individual would turn to the private sector only if he had a demand for quality that exceeded that available in the private sector by a sufficient margin.

This argument for public provision rests squarely on an inability to make income transfers between individuals. The first-best solution, which we argued above may be administratively impossible, would always be direct income redistribution. This is because public provision of the kind that we have described entails a deadweight loss. Most individuals consuming in the public sector are not choosing to consume the quality level of the service that they would optimally choose to consume were they given the cash equivalent of the government transfer. Nonetheless, Besley and Coate (1991) show that there are conditions under which the deadweight loss is outweighed by the redistributive gain.

The idea that the government can redistribute by providing a basic quality level in the public sector bears a striking resemblance to some of the policies advocated in the literature on *basic needs policies* (Streeten 1981).

Figure 20-5. *The Effect of Providing Quality ( $q_g$ ) Universally*

However, the motivation described here differs quite markedly from that of most advocates of such programs. It comes from noting that policies that rely on income-contingent transfers are unlikely to be effective because of the costs of income measurement. We are interested in in-kind provision precisely because it may be a reasonably good substitute for transfers of cash. The advocates of basic needs policies, in contrast, seem to advocate policies based on the intrinsic value of the goods being transferred.

In recent years, there has been much discussion of the inadequacy of public provision programs in developing countries (Jimenez 1987). The fault with the model above is that quality was taken as something that could be straightforwardly fixed by the government. In practice, this has not been the case. Because of budgetary constraints, very often linked to import compression in the wake of indebtedness and other difficulties, quality has become an endogenous variable. For example, drugs in health facilities are unavailable for long periods. This often leads to richer individuals lobbying and bribing for the drugs and skews the benefits of public provision in favor of the rich. In the wake of this, user charges have come into vogue. A complete discussion of such charges lies beyond the scope of this chapter. Suffice it to

note that the view, often expressed, that the adverse effects of user charges on the poor can be undone by using other redistributive instruments, is blind to many of the constraints on such instruments. To say, for example, that income transfers could be used to undo the effects of user charges misunderstands one of the main arguments for wanting public provision in the first place.

### **Statistical Targeting**

Transfers under limited information about individual responses and incomes could also be made using *statistical targeting*. The object of such schemes is to target transfers based on easily observable characteristics, such as region of residence or age. Many of the issues considered above are also relevant here. Note that, in addition to the problem of the targeted characteristic being manipulable, there may be severe social constraints on the characteristics that can be used for such transfer schemes. For example, transfers based on ethnic origin may be socially unacceptable.

In practice, versions of such schemes are used primarily for regional targeting. Ration shops for food are one such example (Besley and Kanbur 1988, 1990). A certain amount of food is made available to everyone in a given region, at a particular store, at below-market price. If purchase and resale cannot be prevented, then this is equivalent to all patrons of a particular shop receiving the same addition to their incomes. Hence, if the consumers who use a particular store are on average socially deserving, such a scheme serves as a targeted income-transfer program. Locating ration shops in areas where the incidence of poverty is greatest will maximize the amount of needful assistance. Two things about this example are worthy of note. First, while food is normally the commodity used in such schemes, it seems inessential. At the same time, food is relatively fungible because unwanted ration shop allocations can easily be turned into cash. Second, food-based redistribution schemes tend to command greater political support than cash-based ones; they are a socially acceptable way of making transfers. Finally, it should be noted that such transfer schemes, while being able to target the poor in some measure, may not require an elaborate administrative machinery in order to be implemented. As discussed in chapter 23, it may be possible to reduce the extent of poverty in Indonesia through a set of region-specific income grants at a total cost equal to the current level of anti-poverty grants there.

### **Efficiency Wages and Tax Inspector Honesty**

A central difference between the policymaking environments in industrial and developing countries is the extent of administrative corruption.<sup>13</sup> This

may present problems for the development of effective administration for both tax and transfer programs. For example, administrators of transfer programs may misappropriate funds intended to assist the poor, or tax inspectors may accept bribes in lieu of tax payments. In this section, we shall give a concrete analysis of the second phenomenon. We shall focus on the problem of keeping administrators honest when collecting taxes. The prototype model developed here breaks with the "traditional" tax compliance model, which has focused exclusively on the decision of an individual taxpayer to pay taxes, without regard to corruption of inspectors.<sup>14</sup> In contrast, here we consider the consequences of having a number of tax inspectors who are prepared to accept bribes from taxpayers who wish to evade taxes.

We shall examine the argument that increasing payments to tax inspectors is a means of improving tax compliance. There are two reasons why this might be so.<sup>15</sup> First, there is a screening effect. Low wages mean that only those with low reservation wages will apply to become inspectors. For this argument to work it has to be true, however, that honesty and reservation wages are positively correlated. There are good reasons why this might be so. Dishonest individuals take account of the bribes that they will accept in the decision to become tax inspectors and hence are prepared to take the job at a lower wage than an honest individual. Hence, dishonest individuals may be the only people prepared to become tax inspectors at very low wages. This constitutes the *adverse selection effect* of low wages.

There is a second argument for paying higher wages that is based on considerations of *moral hazard*. A higher wage raises the present discounted value of remaining as a tax inspector relative to any outside possibilities and hence reduces the incentive to undertake activities, such as taking bribes, that increase the chance of being dismissed. This is essentially the efficiency wage argument of Calvo and Wellicz (1979) and Shapiro and Stiglitz (1984).

The aim of this section is to build a simple model to understand the tradeoffs involved in choosing between two wage strategies. The model is developed in greater detail in Besley and McLaren (1993). The first possibility is to pay the minimum wage at which honest individuals are prepared to become tax inspectors. This we call a *reservation wage strategy*. An alternative possibility is to pay the wage at which dishonest tax inspectors behave honestly, which we refer to as an *efficiency wage*. We compare these wage strategies in terms of the discounted stream of revenues, net of administrative costs, to which they give rise. Thus, we focus exclusively on the revenue-raising argument for levying taxes. Finally, we will discuss strategies involving tax farming—that is, privatizing tax collection.

### *The Model*

The model has  $M$  taxpayers and  $N$  tax inspectors. A fraction  $\gamma$  of the tax inspectors are dishonest, by which we mean that they are prepared to accept

bribes or pocket tax revenues if paid the reservation wage of the honest tax inspector  $\omega$ .<sup>16</sup> This reservation wage is also available to dishonest tax inspectors who are dismissed from public service. In each period, tax inspectors and taxpayers encounter each other. We assume that all taxpayers have identical incomes, each denoted by  $y$ . An honest tax inspector collects a tax of  $\tau y$ , while a dishonest one will offer to take a bribe denoted by  $b$ , which is assumed to be less than or equal to  $\tau y$ ; that is, no extortion is possible. The government audits tax inspectors randomly, and we denote the probability of taking a bribe without being caught by  $q$  per unit of time.<sup>17</sup> We take this to be exogenous in order to home in directly on the role of wage incentives.

Consider the case of an infinitely lived, risk-neutral, dishonest tax inspector.<sup>18</sup> In any encounter with a taxpayer, he faces the choice of whether or not to take a bribe. In doing so he will weigh the probability of being caught and dismissed. The outcome of this deliberation depends crucially on his wage. A dishonest tax inspector will behave honestly if and only if he is paid a wage such that

$$(20-15) \quad \omega \geq \frac{\delta q}{1 - q} b + \omega \equiv \hat{w}$$

where  $\delta$  is his discount rate.<sup>19</sup> Equality in 20-15 defines the efficiency wage. As long as there is some probability of not being caught, the efficiency wage exceeds the tax inspector's reservation wage. Note that, as one would expect, the efficiency wage increases with the size of the bribe, the discount rate, and the probability of not being caught.

We model the determination of the bribe as the solution to a bargaining problem between taxpayers and tax inspectors. We will adopt the generalized Nash bargaining approach (Roth 1979). Letting  $\alpha$  and  $\beta$  denote the bargaining strength parameters of the taxpayer and tax inspector, respectively, the bribe that solves the generalized Nash bargain satisfies

$$(20-16) \quad \text{Max}_b [\tau y - b]^\beta b^\alpha$$

assuming that the threat point for the two parties is one in which all taxes are paid honestly. It is straightforward to check that the optimal  $b$  satisfies

$$(20-17) \quad b^* = \frac{\alpha \tau y}{\alpha + \beta}$$

Thus, the tax inspector captures a share of the surplus  $\mu \equiv \alpha / [\alpha + \beta]$ . This fraction is increasing in  $\alpha$ ; that is, if the bargaining strength of the tax inspector increases, then he captures a greater share of the unpaid tax revenues. The limiting case of  $\mu = 1$  is that where the tax inspector can pocket the tax revenues that he has collected without colluding with a taxpayer.

## Tax Revenues and Tax Inspector Incentives

We consider determinants of the choice between paying reservation and efficiency wages on the criterion of revenues raised. We shall formulate the tradeoff between these two options by considering what tax revenues would be raised in either case, as a function of  $\gamma$ , the fraction of tax inspectors who are dishonest, and  $q$ .

The first step is to characterize the  $(\gamma, q)$  pairs that yield zero revenues, net of collection costs, for each case. In the case of reservation wages, the number of dishonest tax inspectors falls through time, since each period (defined here as the duration of one taxpayer encounter) a number of the dishonest tax inspectors are audited and dismissed. Since all inspectors behave honestly in an efficiency-wage regime, there is no such effect. This advantage of reservation wages has the important implication that it may be misleading to appraise the two wage strategies that we have identified with reference to tax revenues at a single point in time. The case for reservation wages improves through time because the composition of tax inspectors—that is, the balance between honest and dishonest ones—improves. It is straightforward to verify (see the appendix to this chapter for details) that the number of dishonest taxpayers at time  $t$ ,  $D_t$ , is given by

$$(20-18) \quad D_t = \gamma N [1 - [1 - \gamma][1 - q]]^t.$$

Notice that over an infinite time horizon, the number of dishonest inspectors falls to zero.<sup>20</sup>

At any point in time the government is able to secure tax revenues from the honest tax inspectors and from those dishonest tax inspectors who are audited. Using this fact, the total tax receipts at time  $t$  are

$$(20-19) \quad \tau \gamma N [1 - q \gamma [1 - (1 - \gamma)(1 - q)]]^t$$

where we have also used the fact that only  $N/M$  of taxpayers are visited in each time period. The total administrative costs are independent of time and equal to  $N\omega$ .

Assuming, for simplicity, that the government and tax inspectors use the same discount rate, the condition for the discounted present value of tax revenues to be zero is<sup>21</sup>

$$\frac{1 + \delta}{\delta} \left[ 1 - q\tau \cdot \frac{\delta}{\delta + [1 - \gamma][1 - q]} \right] \tau \gamma N - \frac{1 + \delta}{\delta} N\omega = 0$$

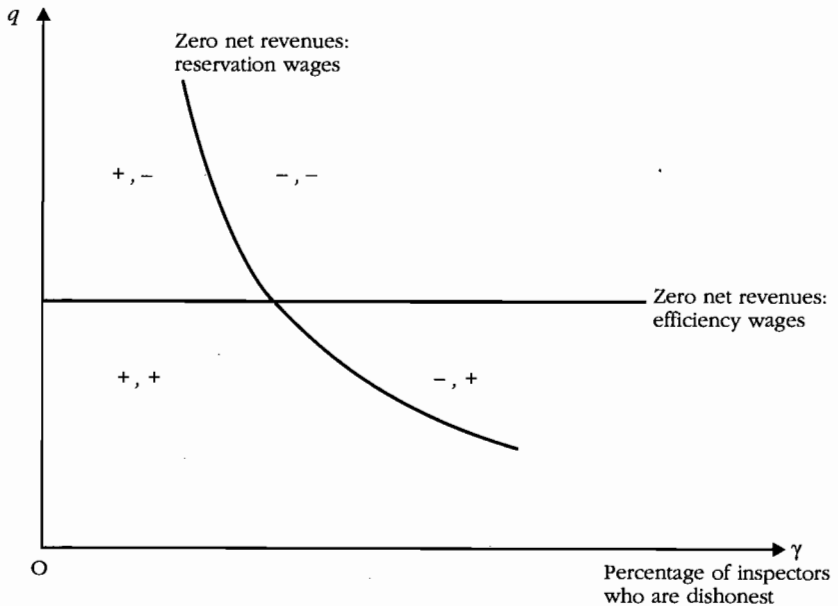
or

$$(20-20) \quad \frac{1 + \delta}{\delta} [C - 1] - C \left[ \frac{q\gamma [1 + \delta]}{\delta + [1 - \gamma][1 - q]} \right] = 0$$

where  $C \equiv \tau\gamma/\omega$  is the ratio of tax revenue to costs of collection when all tax



Figure 20-6. *Tax Revenues as a Function of the Auditing and the Honesty of Tax Inspectors*



Note: Whether a tax yields revenue in excess of the wage bill for tax inspectors depends on  $\gamma$ ,  $q$ , and the wage rate.  $(+, +)$  indicates the region of  $(\gamma, q)$  points for which net revenues are positive under either a reservation or efficiency wage;  $(+, -)$  indicates the locus of  $(\gamma, q)$  for which only the reservation wage yields positive net revenues.

inspectors behave honestly. We will assume that  $C > 1$ , otherwise levying the tax in question could never be worthwhile for revenue-raising purposes. Equation 20-20 has two main components. The first term represents the revenues that would be raised with a completely honest tax inspectorate. Hence, the second term can be thought of as the cost of administrative corruption. Figure 20-6 illustrates the relationship between  $q$  and  $\gamma$  given in equation 20-20. It is a rectangular hyperbola truncated at either end.<sup>22</sup> Any  $(\gamma, q)$  pair below this curve will yield positive revenues. It clarifies the idea that it is possible to raise tax revenue, if tax inspectors are paid their reservation wage, only if either tax inspectors are sufficiently honest ( $\gamma$  is low) or there is sufficient auditing of their behavior ( $q$  is low).

Consider next the case where tax inspectors receive an efficiency wage. Since the government is assumed to be unable to identify which tax inspectors are dishonest, the same wage is paid to all inspectors. Using equation 20-15, the zero net revenue locus for efficiency wages is defined by

$$(20-21) \quad \frac{1 + \delta}{\delta} [C - 1] - \frac{q\mu}{1 - q} C = 0$$

where  $\mu$  is the parameter reflecting bargaining strength that we introduced above. Since, from equation 20-17, the size of the bribe depends on the tax rate, the administrative costs of taxation depend positively on the tax rate. The second term in equation 20-21 is best thought of as the cost of corruption in an efficiency wage regime.

The zero net revenue locus is independent of  $\gamma$  (since if tax inspectors are paid their efficiency wage, none acts dishonestly). It is characterized by

$$(20-22) \quad q = \left[ \frac{1 + \delta}{\delta} [C - 1] \right] / \left[ \mu C + \frac{1 + \delta}{\delta} [C - 1] \right] < 1$$

using equation 20-21. It is clear from equation 20-22 that it is only possible to raise positive net revenues when paying efficiency wages if  $q$  is sufficiently small, since for low values of  $q$ , the efficiency wage rate becomes very large. If the probability of getting audited were too small, then the efficiency wage would have to be raised to a point where implementing the tax would not be profitable. Equation 20-22 is represented by the horizontal line in figure 20-6.

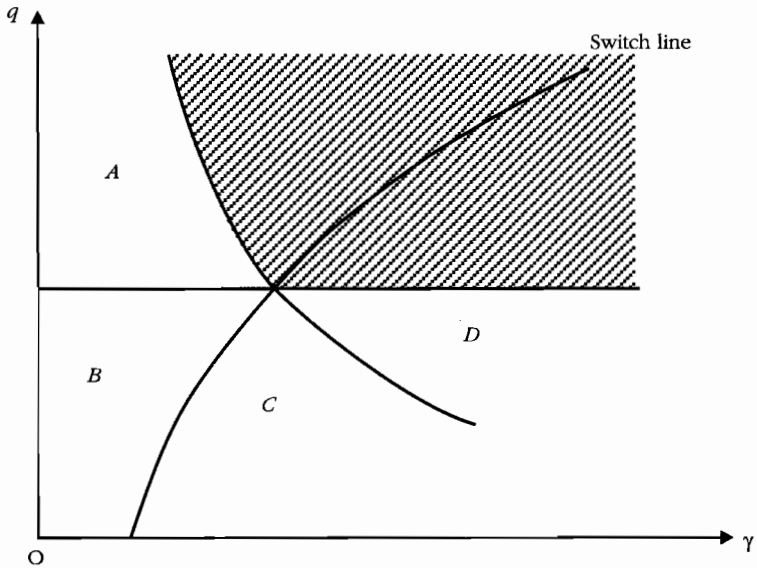
We consider next whether net revenues are highest when tax inspectors are paid efficiency or reservation wages. Comparing equations 20-21 and 20-22 yields the following condition determining whether efficiency wages raise more (or less) net revenues than reservation wages:

$$(20-23) \quad \frac{q\mu}{1 - q} < (>) \frac{q\gamma [1 + \delta]}{\delta + [1 - \tau][1 - q]}$$

Equality in 20-23 defines  $q$  as an increasing, concave function of  $\gamma$ , which is illustrated in figure 20-7 as the switch line. Below the switch line, the payment of efficiency wages yields greater net revenues than payments of reservation wages. A higher  $\delta$  or  $\mu$ , other things being equal, means that reservation wages are more likely to be preferred since the efficiency wage is increased. Payment of efficiency wages yields greater net revenues when  $\gamma$  is large—that is, when more tax inspectors are corrupt. This also makes intuitive sense.

Figure 20-7 illustrates the different regimes in which reservation or efficiency wages are preferred. There are five regimes. The shaded area represents values of  $q$  and  $\gamma$  for which no positive tax revenue solution exists. Note that the possibility of efficiency wages for tax inspectors reduces the size of this region by the area  $D$ , but does not eliminate it.

There are two cases in which the government prefers to pay reservation wages. First, the area labeled  $A$  constitutes a regime in which reservation wages raise more revenue and, furthermore, efficiency wages could not be used at all to raise revenue, since  $q$  is too high and dishonest tax inspectors could not be deterred from accepting bribes at low enough cost. The second case in which reservation wages are preferable is given by area  $B$ . Here, both payment schemes yield positive revenues, although a low  $\gamma$  implies that

Figure 20-7. *The Choice between Different Wage Regimes*

reservation wages are preferred to paying reservation wages. That is, there are too few dishonest tax inspectors to make an efficiency wage regime that eliminates one payoff to being corrupt.

Efficiency wages are preferred in areas C and D in figure 20-7. Region C is again a case when both strategies yield positive net revenues but the level of dishonesty is high enough to make efficiency wages worthwhile. The final case is for parameter values in the region labeled D. This is a case where only efficiency wages can be used to raise revenues. The number of dishonest tax inspectors is so high relative to the probability of being audited that collection of positive net revenue is possible only by inducing dishonest tax inspectors to behave honestly.

### Extensions

So far, we have taken the monitoring level to be exogenous. The optimal monitoring level would, of course, be different in the two wage regimes. The model can also be extended to allow for more hierarchical bureaucracies in the spirit of Calvo and Wellicz (1979). We would find that the efficiency wage at any level would be a decreasing function of the amount of monitoring at higher levels.

We have also neglected the use of fines as an enforcement mechanism. If unlimited fines were possible, then even a small probability of being caught could be used to enforce honesty. More generally, the efficiency wage will be

a decreasing function of the fine level. The problem with this solution is that it presupposes the existence of an adequately functioning legal system, a luxury that many countries with widespread bureaucratic corruption do not possess. In the absence of effective legal sanctions, the second-best instrument of efficiency wages may still serve an important purpose.

The literature on bureaucratic corruption has emphasized the short duration of tenure in public offices as an impediment to establishing effective administration. Just why this is can be made precise in terms of our model. Suppose that we introduce some probability that an individual will have to leave public employment other than because he is dismissed. This acts just like an increase in his discount rate in our model so that it increases his efficiency wage. Hence, it becomes more expensive to enforce honesty.

There is a third wage strategy that we have not considered here, that of paying subreservation wages.<sup>23</sup> In this case the tax inspectorate is 100 percent dishonest, because of the adverse selection effect that was noted above. Surprisingly, this regime may sometimes be preferred to either of those studied so far (Besley and McLaren 1993). Capitation wages may be a good idea when the fraction of dishonest individuals in the economy is high ( $\gamma$  is high) and monitoring is very lax ( $q$  is low), so that paying efficiency wages is very expensive.

A fourth solution to the problems of corrupt tax administration involves explicit privatization of tax collection, that is, *tax farming*. This differs from the subreservation wage regime just described, since in this case  $\mu = 1$ ; that is, the government allows an inspector to legally pocket all tax revenues that he has raised, in exchange for a fee that is paid up front. In fact, if this can be done, it dominates all of the other alternatives that we have considered on the criterion of net revenues raised. The government can raise  $M\tau\gamma$  at a cost of just  $N\omega$ . It is interesting to note that this strategy was employed in the Roman Empire. There are, however, two problems with it. First, there is the difficulty of preventing tax collection from turning into extortion, as happened, for example, in Roman Sicily—admittedly under the eye of the voracious Governor Verres. Second, to work effectively the inspector must pledge money in advance—an insurmountable problem in economies with liquidity constraints. Moral hazard on the part of the government—for example, selling the rights to collecting taxes from a particular individual twice over—may also be a problem with this solution.

Clearly, there is much else that could be done to enrich the simple model of this section. The model is only a first step that serves to introduce the potential significance of wage incentives in tax compliance.

## Conclusions

This chapter has considered some aspects of administrative costs and policy design in developing countries. We have emphasized the importance of

viewing policies as rational responses to limited information and administrative capability. In the last section, we also looked at some possible determinants of administrative costs. The approach taken in this chapter has, however, been piecemeal, and there are many issues that we have not dealt with. What we have done, however, does serve to reinforce the point that the design of policy must take account of the full array of constraints that are faced by developing countries and that these may include administrative capacities.

## Appendix<sup>24</sup>

### *Derivation of the Efficiency Wage*

Since one earns  $\omega$  in every period, the value of being employed for life in the private sector is simply  $V^P \equiv \omega[1 + \delta]/\delta$ . The value of a dishonest life is given by

$$V^D = w + qb + qV^D/[1 + \delta] + [1 - q]V^P/[1 + \delta]$$

where we have assumed that the tax inspector is paid at the beginning of each period. This consists of four terms—the wage, the expected value of bribes, future lifetime utility (if not caught), and future lifetime utility (if caught and turned out into the private sector). This equation can be solved to yield

$$V^D = \frac{1 + \delta}{1 + \delta - q} \{w + qb + [1 - q]\omega/\delta\}.$$

The value of an honest life is  $V^H = \omega[1 + \delta]/\delta$ , since one is guaranteed to earn  $w$  each period. The tax inspector will behave dishonestly if and only if  $V^D > V^H$ , and the efficiency wage equates them. It is now straightforward to verify that the efficiency wage is that given in equation 20-17.

### *Number of Dishonest Tax Inspectors in the Reservation Wage Regime*

Consider next what happens to labor turnover under reservation wages. In every period, a fraction  $1 - q$  of the dishonest are located and dismissed. But since a fraction  $\gamma$  of all new hires is corrupt, the stock of dishonest tax inspectors must change according to

$$D_{t+1} - D_t = -[1 - \gamma][1 - q]D_t.$$

This is a simple first-order difference equation that can be solved to yield:

$$D_t = D_0[1 - [1 - \gamma][1 - q]]^t = \gamma N[1 - [1 - \gamma][1 - q]]^t$$

noting that  $N_o = \gamma N$ . Revenues are thus equal to

$$\frac{N}{M} \left[ [1 - q]D_t + N - D_t \right] \tau y M = N \left[ 1 - q\gamma \{1 - [1 - \gamma][1 - q]\}^t \right] \tau y.$$

The left-hand side says that taxes are collected both from the dishonest who are caught taking bribes and from the honest. To calculate the present value of revenues, note that

$$\sum_{t=0}^{\infty} \left[ \{1 - [1 - \gamma][1 - q]\} / [1 + \delta] \right]^t = [1 + \delta] / \{[1 - \gamma][1 - q] + \delta\}.$$

It is now straightforward for the reader to verify equation 20-20.

## Notes

The author is grateful to Steve Coate, Ravi Kanbur, Jim Poterba, Nick Stern, Joe Stiglitz, and especially Karla Hoff for helpful comments on an earlier draft. The usual caveat applies.

1. See Goode (1977) for a discussion of some of the difficulties.
2. As well as being a means of evading taxes, smuggling has served as a means to acquire consumer goods that are in short supply (Azam and Besley 1989).
3. Heller and Shell (1974) and Yitzhaki (1979) are exceptions. However, their concerns are somewhat different from those of this chapter.
4. We use  $\text{mod } t$  since subsidies are also costly to administer.
5. We are taking government revenues to be fixed exogenously. We shall consider transfer and expenditure policies in more detail below.
6. Stern (1987b) and Ahmed and Stern (1989) are exceptions. They consider the possibility that leakage via administrative costs affects tax reform rules. However, they take administrative costs to be fixed.
7. This could be modeled by making administrative costs depend on  $dt$  and  $dK$ .
8. This assumption is made for analytical convenience. The government may also wish to use targeted subsidy programs of the type discussed later in this chapter.
9. Let  $l$  denote the after-tax return. Then equation 20-9 can be derived from

$$W = \int U(l)df(l) = - \int \exp(-Al)dF(l) = - \exp(-A\mu_l + \frac{1}{2}A^2\sigma_l^2)$$

which follows from a standard property of the moment generating function of the normal distribution, where  $\mu_l$  and  $\sigma_l^2$  are, respectively, the mean and variance of  $l$ .

10. An alternative way of defining the inequality premium is as the difference between society's mean income and its equally distributed equivalent income as defined by Atkinson (1970). Note also that this inequality premium exactly parallels the risk premium, which is familiar from the theory of choice under uncertainty.

11. For a general discussion of targeting in relation to poverty alleviation programs, see Besley and Kanbur (1988).

12. The model developed here is based on Besley and Coate (1991). In related

work, Nichols and Zeckhauser (1982) have suggested that in-kind provision can be used to reduce the burden of the income tax. They develop their argument based on income being observable.

13. For a wide-ranging discussion of corruption in developing countries, see Gould and Amaro-Reyes (1983).

14. See the papers by Allingham and Sandmo (1972), Srinivasan (1973), and, more recently, Reinganum and Wilde (1985). Gang, Goswami, and Sanyal (1988) consider some implications of a corrupt inspectorate in a model of taxpayer compliance. Their model, unlike the one presented here, focuses on monitoring and fines as means of enforcing honest behavior.

15. See Becker and Stigler (1974) for some general discussion of these issues.

16. Honesty is not an absolute notion. It only makes sense to talk at a particular wage level. It is convenient, however, to refer to those who are dishonest at the reservation wage as the dishonest individuals, and to label those who behave honestly at the reservation wage as honest.

17. A more general analysis would take account of the effect on  $q$  of social norms and the fact that the government can vary its effort to seek out those who are dishonest.

18. Finite lives can be dealt with, as in the manner of Akerlof and Katz (1989).

19. This is proved in the appendix to this chapter.

20. Besley and McLaren (1993) consider a model with random dislocation of tax inspectors from their jobs, which implies a steady state in which there is a positive number of dishonest tax inspectors.

21. This is also proved in the appendix to this chapter.

22. To see this, note that equation 20-20 can be written in the form  $[q - k][-\gamma - k]$  where  $k$  is a positive constant. This makes sense, since to collect taxes that cover the wage bill when inspectors are paid only their reservation wage, it must be that

$$\lim_{q \rightarrow 1} \gamma(q) > 0 \quad \text{and} \quad \lim_{\gamma \rightarrow 1} q(\gamma) > 0.$$

The limiting values of  $q$  and  $\gamma$  are the same since they enter in tax revenues symmetrically—see equation 20-20.

23. Besley and McLaren (1993) describe this strategy as one of *capitulation wages*. Under capitulation wages, the government gets tax payments from two sources. First, there may be a minimal tax payment that every inspector declares for every taxpayer. It seems reasonable to suppose that the bribery problem is for extra tax payments over and above minimal levels. Second, the government gets tax payments from auditing.

24. This appendix is based on Besley and McLaren (1993).

## References

The word "processed" describes informally reproduced works that may not be commonly available through libraries.

Ahmed, Etisham, and Nicholas H. Stern. 1989. "Taxation for Developing Coun-

- tries." In H. B. Chenery and T. N. Srinivasan, eds., *Handbook of Development Economics*. Vol. 2. Amsterdam: North-Holland.
- Akerlof, George A. 1978. "The Economics of 'Tagging' as Applied to the Optimal Income Tax, Welfare Programs and Manpower Planning." *American Economic Review* 68: 8-19.
- Akerlof, George A., and Laurence F. Katz. 1989. "Workers' Trust Funds and the Logic of Wage Profiles." *Quarterly Journal of Economics* 104: 525-36.
- Allingham, M. G., and Agnar Sandmo. 1972. "Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics* 1: 323-38.
- Angrish, A. C. 1972. *Direct Taxation of Agriculture in India with Special Reference to Land Revenue and Agricultural Income Tax*. Bombay: Somaiya Publications.
- Arrow, Kenneth J. 1970. "The Organization of Economic Activity: Issues Pertinent to the Choice of Market vs. Non-market Allocation." In R. H. Haveman and J. Margolis, eds., *Public Expenditure and Policy Analysis*. Chicago: Markham.
- Atkinson, Anthony B. 1970. "On the Measurement of Inequality." *Journal of Economic Theory* 2: 244-63.
- Azam, Jean-Paul, and Timothy J. Besley. 1989. "General Equilibrium with Parallel Markets for Goods and Foreign Exchange: Theory and Application to Ghana." *World Development* 17: 1921-30.
- Balasubramanyan, V. N., and Sanjaya Lall. 1991. "The Principles of Targeting." In V. N. Balasubramanyan and Sanjaya Lall, eds., *The Current Issues in Development Economics*. London: Macmillan.
- Becker, Gary, and George Stigler. 1974. "Law Enforcement, Malfeasance and the Compensation of Enforcers." *Journal of Legal Studies* 3: 1-19.
- Besley, Timothy J., and Stephen Coate. 1992. "Workfare vs. Welfare: Incentive Arguments for Work Requirements in Poverty Alleviation Programs." *American Economic Review* 82 (1): 249-61.
- . 1991. "Public Provision of Private Goods and the Redistribution of Income." *American Economic Review* 81 (4): 979-84.
- Besley, T. J., and S. M. Ravi Kanbur. 1988. "Food Subsidies and Poverty Alleviation." *Economic Journal* 98: 701-19.
- . 1990. "The Principles of Targeting." PRE Working Paper 385. World Bank, Research Administration, Washington, D.C. Processed.
- Besley, T. J., and John McLaren. 1993. "Taxes and Bribery: The Role of Wage Incentives." *Economic Journal* 102.
- Bird, Richard M. 1974. *Taxing Agricultural Land in Developing Countries*. Cambridge, Mass.: Harvard University Press.
- . 1983. "Income Tax Reform in Developing Countries: The Administrative Dimension." *International Bulletin for Fiscal Documentation* 37: 3-14.
- Braverman, Avishay, and Jeffrey Hammer. 1988. "Computer Models for Agricultural Policy Analysis." *Finance and Development* (June): 34-37.
- Calvo, Guillermo, and S. Wellicz. 1979. "Hierarchy, Ability and Income Distribution." *Journal of Political Economy* 87: 991-1010.



- Gang, Ira N., Omkar Goswami, and Amal Sanyal. 1988. "Taxes, Fines and Bribes: A Model of Tax Evasion and Black Money for India." Department of Economics, Rutgers University, New Brunswick, N.J. Processed.
- Goode, Richard. 1977. "The Economic Definition of Income." In J. A. Pechman, ed., *The Comprehensive Income Tax*. Washington, D.C.: Brookings Institution.
- . 1984. *Government Finance in Developing Countries*. Washington, D.C.: Brookings Institution.
- Gould, D. J., and J. A. Amaro-Reyes. 1983. *The Effects of Corruption on Administrative Performance: Illustrations from Developing Countries*. Staff Working Paper 580. Washington, D.C.: World Bank.
- Heller, Walter P., and Karl Shell. 1974. "On Optimal Taxation with Costly Administration." *American Economic Review* 64: 338-45.
- Huntington, S. P. 1968. *Political Order in Changing Societies*. New Haven, Conn.: Yale University Press.
- Jimenez, Emanuel. 1987. *Pricing Policy in the Social Sectors: Cost Recovery for Education and Health in Developing Countries*. Baltimore, Md.: Johns Hopkins University Press.
- Mirrlees, James A. 1971. "An Exploration in the Theory of the Optimal Income Tax." *Review of Economic Studies* 38: 105-11.
- Newbery, David M. G., and Nicholas H. Stern, eds. 1987. *The Theory of Taxation for Developing Countries*. New York: Oxford University Press.
- Nichols, Albert L., and Richard Zeckhauser. 1982. "Targeting Transfers through Restrictions on Recipients." *American Economic Review* 72: 301-17.
- Radian, A. 1980. *Resource Mobilization in Poor Countries*. London: Transaction Books.
- Radner, Roy, and Joseph E. Stiglitz. 1981. "A Non-Concavity in the Value of Information" In M. Boyer and R. Kihlstrom, eds., *Bayesian Models in Economic Theory*. Amsterdam: North-Holland.
- Ravallion, Martin. 1989. "Market Responses to Anti-Hunger Policies: Effects on Wages, Prices and Employment." In J. Dreze and A. K. Sen, eds., *Hunger: Economics and Policy*. Oxford, U.K.: Oxford University Press.
- Reinganum, Jennifer R., and Louis L. Wilde. 1985. "Income Tax Compliance in a Principal Agent Model." *Journal of Public Economics* 26: 1-18.
- Roth, Alvin. 1979. *Axiomatic Models of Bargaining*. Berlin: Springer-Verlag.
- Shapiro, Carl, and Joseph E. Stiglitz. 1984. "Involuntary Unemployment as a Worker Discipline Device." *American Economic Review* 74: 433-44.
- Srinivasan, T. N. 1973. "Tax Evasion: A Model." *Journal of Public Economics* 2: 339-46.
- Stern, Nicholas H. 1982. "Optimal Income Taxation with Errors in Administration." *Journal of Public Economics* 17: 181-211.
- . 1987a. "The Theory of Optimal Commodity and Income Taxation." In D. M. G. Newbery and N. H. Stern, eds., *The Theory of Taxation for Developing Countries*. New York: Oxford University Press.

- . 1987b. "Aspects of the General Theory of Tax Reform." In D. M. G. Newbery and N. H. Stern, eds., *The Theory of Taxation for Developing Countries*. New York: Oxford University Press.
- Stiglitz, Joseph E. 1982. "Utilitarianism and Horizontal Equity: The Case for Random Taxation." *Journal of Public Economics* 18: 1-33.
- Streeten, Paul. 1981. *First Things First: Meeting Basic Needs in Developing Countries*. New York: Oxford University Press.
- Tanzi, Vito. 1987. "Quantitative Aspects of the Tax Systems of LDCs." In D. M. G. Newbery and N. H. Stern, eds., *The Theory of Taxation for Developing Countries*. New York: Oxford University Press.
- Weiss, Laurence W. 1976. "The Desirability of Cheating Incentives and Randomness in the Optimal Income Tax." *Journal of Political Economy* 84: 1343-52.
- Yitzhaki, Schlomo. 1979. "A Note on Optimal Taxation and Administrative Costs." *American Economic Review* 69: 475-80.