If Agricultural Land Taxation Is So Efficient, Why Is It So Rarely Used?

Jonathan Skinner

The land tax enjoys a distinguished pedigree in the theoretical literature on tax efficiency, yet it is rarely used as a serious revenue source in rural areas of developing countries. This article considers three drawbacks of the land tax relative to taxes on exports or marketed output: (1) capitalization effects of the land tax impose a large burden on the current generation, (2) land taxation increases the riskiness of net farmer income, and (3) administration of the land tax entails costly informational requirements. This article demonstrates that only the second and third drawbacks are valid economic arguments against the land tax. Simulations based on an economic model of farm behavior suggest that farmers may still prefer a land tax to an export tax despite the increased uncertainty of their after-tax income. Administrative costs are therefore the best explanation of the weak link between the theoretical and practical aspects of land taxation.

Liberalized agricultural export policies, realigned exchange rates, and a reduced role for marketing authorities have created a favorable environment for agricultural growth in many developing economies. But these policies are not without cost; countries lose an important source of revenue from the agricultural sector. Given the lack of foreign credit and strained capability of other taxes, some countries are seeking alternative methods for taxing income from the agricultural sector.

One prospect for raising revenue is a tax based on land area or quality. The land tax has a great potential for revenue collection since land is readily observable and in fixed supply. The land tax causes no distortion of output prices; farmers are encouraged to produce at high levels because they receive the full price for their crops. Furthermore, the land tax has enjoyed a distinguished pedigree in the theoretical literature since Ricardo. For example, Newbery (1987, p. 381) acknowledges that the efficiency of the land tax is “not in doubt” while Lewis (1984, p. 167) writes that “it is the likely impact of the land tax in increasing farm marketing that explains its appeal to many economists.”

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It is therefore paradoxical that the use of land taxation has eroded so rapidly during the past several decades. In 1940, agricultural land taxation as a fraction of central government tax revenue was 23 percent in Egypt, 19 percent in India (which then included what are now Bangladesh and Pakistan), and 5 percent in Chile (Bird 1974). By 1987, no country in this group collected more than 1 percent of central government revenue from agricultural land taxation, and few countries relied on land taxation for more than 3 percent of government revenue (Strasma and others 1987). In 1959, Wald concluded that when governments have had a choice, they have been inclined to favor a strengthening of income or export taxes, or an extension of indirect taxes, over an increase in land taxes (p. 63).

This article examines three potential explanations for why the agricultural land tax is so rarely used for raising more than a trivial fraction of central government revenue. The first is that current landowners object to land taxation because they bear more than 100 percent of the tax burden. Any increase in land taxation leads to a large capital loss in land value because the prospect of future tax payments depresses current land prices. This article shows that while the capitalization effect of land taxation is substantial, the prospect of future export or commodity taxation similarly depresses current land prices. Replacing an export tax with a land tax could even increase land prices. Hence the capitalization effect is not a good explanation for why land taxation has declined in use.

The second drawback of the land tax is that farmers suffer from the undesirable risk characteristics of a land tax in the presence of imperfect insurance markets, as shown by Hoff (this issue). The land tax must be paid each year regardless of the success or price of the crop, while commodity taxes pool risk by taxing only the value of marketed output. This article makes some illustrative calculations of welfare under a land tax and output tax that show that a land tax generally dominates an output tax when the output tax rate is high, even in the presence of substantial consumption uncertainty. Furthermore, as Hoff has demonstrated, combining both taxes is Pareto efficient relative to either tax alone. In Uruguay, for example, the government uses a land tax to raise revenue from cattle ranchers, but it still retains the export tax to stabilize the domestic price for producers and especially urban consumers (Jarvis and Medero 1988).

The third reason why land taxation may be little used to collect revenue lies in administrative factors. Unlike the commodity or export tax, which is based on readily observable measures of output, the land tax is based on site value, market value, or net income, measures which in rural areas with sparse land markets are often difficult to observe. Landowners have every incentive to un-

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1. The time-series pattern of other countries not mentioned in the text has also exhibited a strong downward secular trend in land taxation (Bird 1974, pp. 34–35, and Skinner 1990). One problem with the statistics on land taxation is that the International Monetary Fund statistics used by Strasma and others do not report local government land tax revenue for many countries. Local governments appear to have been more successful in maintaining land taxes. The contrast between central and local government agricultural tax policy is discussed briefly at the end of this article.
derstate the value of their taxable land. The administrative costs of ensuring compliance may thus offset the efficiency gains of the land tax.\textsuperscript{2} Using a model developed by Stern (1982), I show that if a society has an aversion to inequality, a nondistortionary land tax based imperfectly on land value can make society worse off than an export tax administered without error. Problems of compliance and land valuation are the weakest link between the theoretical superiority of the land tax and its practical incarnation.\textsuperscript{3}

While there is a wide gap between the positive analysis presented below and the normative process by which governments make choices, the implication of this article is that neither capitalization nor risk factors are good explanations for why governments choose export or commodity taxes over the land tax. Instead, the difficulty of administering the land tax may be the best explanation for its gradual erosion.

The next section presents a general model of an economy with agricultural and urban sectors. Each section that follows addresses the question of why land taxation is a declining source of revenue: section II examines capitalization effects, section III the increased risk imposed on farmers by land taxation, and section IV the problem of administration. Section V concludes with some reflections on the political dimension of land taxation and the distinction between central and local government revenue sources.

I. Theoretical Model of Land Ownership and Taxation

The organization of farm production and the type of land taxation vary widely among countries, so one must be careful about defining a single economic model.\textsuperscript{4} In Asian countries such as Bangladesh, India, and Indonesia, the land tax falls on small-scale farmers who often consume a large fraction of their own production. In several Latin American countries, land taxation is used to tax the vast estates that may grow crops (or raise cattle) only for the export trade. Land taxation is far less prevalent in African countries without a tradition of individual property rights in land.

The type of land taxation also differs across countries. In some cases, land taxes are similar to imputed income taxes; the tax is based on the market value of the land, or the annualized net profits from land. In other countries, an attempt is made to base the tax on land quality, such as soil quality and distance to the nearest paved road. A third method is to simply use land area as the base with no attempt to distinguish quality. In the model that follows, a proportional

\begin{itemize}
  \item \textsuperscript{2} Slemrod (1990) emphasizes the distinction between optimal taxation and optimal tax systems. Land taxation is an optimal tax, but may not be an optimal tax system once administrative expenses are accounted for.
  \item \textsuperscript{3} Bird (1974) reached a similar conclusion in his international comparisons of agricultural land tax administration.
  \item \textsuperscript{4} See Bird (1974) and Strasma and others (1987) for more detailed discussion of different land tax systems.
\end{itemize}
tax based on quality-adjusted land area is assumed, although costly assessment may be required to determine the land quality.

The Agricultural Sector

The agricultural sector produces a tradable commodity \( x \) subject to an export tax \( \tau \) at the border. The domestic price \( p \) depends on the export tax and on the world price \( p^* \), that is assumed constant. Neglecting transportation costs, one can write

\[
p_j = p^*_j (1 - \tau)
\]

where \( j \) denotes the time period. Define the units of the traded good so that \( p^* \) is equal to 1 in terms of the numeraire nontraded good. The assumption of \( p^* = 1 \) will be maintained throughout the analysis.

The product function of the tradable good for each farmer \( i \) in period \( j \) is given by

\[
x_{ij} = F(L_{ij}, T_{ij}, e_{ij})
\]

where \( F \) is assumed to have constant returns to scale, \( L_{ij} \) is the farmer's labor supply, \( T_{ij} \) is quantity of land, and \( e_{ij} \) is a multiplicative random variable reflecting weather conditions and other factors. Let \( F_{Lj} \) and \( F_{Tj} \) be the marginal product of labor and land in period \( j \). Assume that workers are paid their marginal product \( w_j = p_j F_{Lj} \) and the (spot) annual rental value of land is \( p_j F_{Tj} \).

In the derivations that follow, assume competitive markets and a representative farmer subject to uniform random shocks \( (e_{ij} = e_j) \). Hence there is an equivalence between market outcomes and individual choices, so that aggregate measures of output or revenue are calculated by multiplying individual quantities by the number of farmers (this assumption is relaxed in section IV).

Assume that individuals in the agricultural sector consume only the tradable good \( x \), the numeraire good \( z \), and leisure \( l \), and that each individual lives for two periods. Expected lifetime utility for an individual in the agricultural sector (indicated by a superscript \( a \)) is written

\[
EU^a = U(x^1, z^1, l^1) + (1 + \delta)^{-1}E[U(x^2, z^2, l^2)]
\]

where the individual subscript \( i \) is suppressed, \( \delta \) is the time preference rate, and \( E \) is the expectations operator conditional on information in period 1.

At any given point in time, there are two generations alive. The younger generation provides a fraction \( L_j \) of time for work (equal to \( 1 - l_j \), or the fraction not spent in leisure) for which they receive a wage. At the end of the first period, they choose consumption, and use the remaining income to purchase assets for their elderly years in the second period. Hence only the older generation owns land or capital.

One can write the farmer's first-period full income as being the wage rate, \( w \), times the full endowment of time, 1.0. The farmer then "buys" leisure (at the
wage $w_1$, consumes the two commodities $x$ and $z$, and saves the remainder as $S$.
That is, letting $m_1$ be expenditures in period 1,
\begin{equation}
  w_1 = m_1 + S = p_1 x_1^t + z_1^t + l_1 w_1 + S.
\end{equation}

The budget constraint in the second period is more complicated since the elderly generation splits their life cycle saving between land and traditional capital. Furthermore, there may be unexpected capital gains or losses when land is sold at the end of period 2 to finance consumption. Saving $S$ is distributed between purchases from previous generations of land at the end of period one, $Q_j T$, where $Q_j$ is the price of one unit of land in period $j$, plus investments in traditional assets $K$ which pay a fixed, untaxed rate of return $r$.

Total income in the second period consists of income flows net of the land tax $\Gamma$ plus the sale of land and capital stocks;
\begin{equation}
  m_2 = w_2 + (Q_2 + p_2 F T_2 - \Gamma) T + (1 + r) K.
\end{equation}

Since total saving $S = K + Q_2 T$, one can also express equation 4 as
\begin{equation}
  m_2 = w_2 + (Q_2 + p_2 F T_2 - \Gamma) T + (1 + r) (S - Q_2 T)
\end{equation}

The arbitrage condition for the price of land holds that in a world of certainty and in steady-state equilibrium in which $Q_j = Q_{j+1}$, one dollar invested in land should yield the same net return as the same dollar in capital $K$;
\begin{equation}
  p F_{ij} - \Gamma = r Q_j
\end{equation}

Finally, it will be easier for derivations in later sections to express the utility function in its indirect form as a function of prices and income. Equation 2 can therefore be rewritten in terms of $p_j$, the price of leisure $w_j$, and full income $m_j$;
\begin{equation}
  EU^a = V^a(p_1, w_1, m_1) + (1 + \delta)^{-1} EU^a(p_2, w_2, m_2).
\end{equation}

To this point, only the agricultural sector has been discussed. Because export tax policy also affects the domestic price of the traded good, the welfare implications for consumers in the urban sector must also be considered.

The Urban Sector

Individuals in the urban sector purchase the tradable good $x$ from the rural sector. Holding other prices constant, the urban indirect utility function is written solely as a function of the domestic price of $x$;
\begin{equation}
  U^b = U^b(x_1^b, z_1^b) + (1 + \delta)^{-1} U^b(x_2^b, z_2^b)
  = V^b(p_1) + (1 + \delta)^{-1} V^b(p_2)
\end{equation}

where $b$ denotes the urban sector and $V^b$ is the indirect utility function. The implicit assumption in equation 7 is that policies in the agricultural sector do not

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5. Adding a capital income tax on $rK$ would complicate the model without changing the basic results.
affect income in the urban sector, but only affect the domestic price of x: the urban sector consumes imported goods purchased with foreign exchange earned from the agricultural exported goods. (A more general treatment of the urban sector would also account for changes in import demand as a consequence of tax policy shifts.)

**Taxation and Revenue**

Because the agricultural production function assumes constant returns to scale, there are no pure profits. Hence the export tax is equivalent to an equal-rate factor tax on labor and land at rate . For a given tax regime , the present value of aggregate tax revenue can be expressed as

\[
R = \tau F_{11} L_1 + \frac{\tau F_{12} L_2 + (\tau F_{12} + \Gamma)T}{1 + r} - \tau(X^a + X^b)
\]

where \(X^a\) and \(X^b\) are the present value of aggregate expenditures on x goods by the rural and urban consumers (for example, \(X^a = x^a + (1 + r)^{-1} x^a\)). Revenue here is defined in terms of the present value for a given generation. This is to preserve comparability with shifts in social welfare or in utility, which are also measured on a lifetime basis.

**Making Urban-Rural Welfare Comparisons**

Replacing an export tax with a revenue-neutral land tax will affect not just the production incentives of farmers, but also the prices paid by urban consumers for the tradable good x. Furthermore, replacing an export or commodity tax with land taxation may affect different farmers differently depending on their landholdings and productivity. To provide a means of quantifying these comparisons between urban and rural individuals (or among rural farmers), the social welfare function is written

\[
\Omega(U^{a1}, U^{a2}, \ldots, U^{bk})
\]

where \(U^{ak}\) reflects the utility of farmers with different landholdings k.

Even in its most general form, the model is quite simple and ignores rural-urban migration (for example, Heady and Mitra 1987), the impact of taxation on urban land and income, and variation in international exchange rates. Nevertheless, the general model can be used in the subsequent sections to analyze the impact of land taxation on intergenerational equity, risk patterns, and tax administration.

## II. Land Taxation and Capitalization Effects

What is the relative benefit of switching from an export tax to a land tax in a model of perfect certainty and identical farmers? The answer to this question must be considered in short-run and long-run frameworks because the tax affects current generations much differently from future generations.

To simplify the general model in section I, assume the individual retires in the
second period \((l_2 = 1)\) and the production function is linear; \(F = F_L L_1 + F_T T\) where \(F_L\) and \(F_T\) are constants. The strategy used below for determining whether the land tax should be increased or reduced is based on the marginal shadow-price analysis in Ahmed and Stern (1984). First, one measures the (negative) impact on social welfare of raising the land tax by a sufficient amount to increase revenue by one rupee. Then one evaluates the same measure for the export tax. These two shadow-price measures are defined to be

\[
\lambda_r = \frac{-\partial \Omega}{\partial \tau} \quad \text{and} \quad \lambda_r = \frac{-\partial \Omega}{\partial \Gamma}.
\]

A welfare-improving reform occurs when an increase in the tax with lowest social cost is coupled with a revenue-neutral decline in the tax with highest social cost. For example, when \(\lambda_r < \lambda_r\), a shift in taxes from the export tax toward land taxation is efficient; when the two measures are equal, the tax system is at a local optimum. Note that this procedure provides only the direction, but not the magnitude, of welfare-improving change in the tax system.

A shift in the land tax will have a different impact on current generations than on future generations. The short run is defined as the period during which all land is held by a given older generation. The market price of land, \(Q_2\), must fall by enough to restore equality between the after-tax yield of land and that on capital assets. From the arbitrage condition \(5, dQ_2/d\Gamma = -1/r\). That is, a one-unit increase in the land tax \(\Gamma\) will impose a capital loss on the old generation of \(1/r\) per unit of \(T\) held.

Expressing \(U^a\) and \(U^b\) in terms of their indirect utility functions and using Roy's identity holding \(Q_1\) constant implies that the short-run (SR) impact of the land tax on social welfare is

\[
\lambda_r(SR) = \left(\frac{\partial \Omega}{\partial U^a}\right)\frac{\nu^2(1 + \delta)^{-1}(1 + r)(1 + r)}{(1 + r)^{-1}}.
\]

With appropriate normalization, equation 10 can be rearranged to show that

\[
\lambda_r(SR) = \frac{1 + r}{r} > 1.
\]

6. This second assumption is maintained because the young provide labor and the old own land. When the production function is nonlinear, shifts in, say, labor supply by the young affect the return to land for the old. This "pecuniary externality" complicates the analysis and is therefore ruled out by assumption.

7. One cannot determine the optimal tax rates using this procedure because local, not global, parameters are used in the marginal assessment.

8. The capitalization effect derived above depends crucially on the assumption that the marginal product of land is unaffected by the supply of capital and that the interest rate is held constant. If the land tax encourages capital accumulation, and the marginal product of land is thereby enhanced, the capitalization effects will be less than \(1/r\) (Chamley and Wright 1987).

9. Equation 10' is derived by using \(dQ_2/d\Gamma = -1/r\) from the arbitrage condition, \(\partial V_1/\partial m_2 = [(1 + \delta)/(1 + r)][\partial V_1/\partial m_1]\) from the Euler equation, and normalizing \(\partial \Omega/\partial U^a_\partial V_1/\partial m_1 = 1\).
That is, holding the interest rate constant, the landowner is worse off by 
\((1 + r)/r\) for every increase in tax revenue of \$1.\(^\text{10}\) For example, suppose the 
interest rate were 6 percent; a \$1 revenue increase from the land tax would make 
individuals currently alive worse off by \$17.67 (\$1 paid in tax plus \$1/0.06 lost 
in property value). Even if one views \(r\) as reflecting the accumulated return over 
a twenty-year span of time (so that the \(r\) used in 10\(^\text{t}\) is written as 1.06\(^{20}\) - 1), the 
cost to existing landowners is \$1.45 per \$1 in revenue collected. It is no surprise 
that in this simplified model, the landowners would object quite strenuously to a 
land tax.\(^\text{11}\)

While the short-run impact of the land tax is very costly to the current 
generation of landowners, the long-run (LR) characteristics of the land tax when both 
\(Q_1\) and \(Q_2\) adjust to the new tax regime are highly favorable to future land-
obners. Future generations will buy and sell land at a price that is reduced by the 
amount \(1/\text{r}\) per increase in \(\Gamma\). The marginal impact of the land tax on social 
welfare in the long run is given by

\[
\lambda_{\text{r}}(\text{LR}) = \frac{V_2(1 + \delta)^{-1}[\partial Q_2/\partial \Gamma - 1 - (1 + r)\partial Q_1/\partial \Gamma]}{T(1 + r)^{-1}} = 0.
\]

In the long run, the land tax is even better than a lump sum tax; future 
generations bear no burden at all, but gain revenue at the expense of the land-
obners alive at the time of the tax.\(^\text{12}\) In sum, a life cycle model implies that land 
taxation is never "lump sum" in that the revenue collection is equal to the 
equivalent monetary loss of the individual. Current generations bear more than 
the burden of the tax, (in the ratio \((1 + r)/r\), and future generations bear no 
burden. Only when individuals live forever and never sell their land (or when 
they have strong Ricardian bequest functions) is the tax lump-sum in the sense of 
reducing lifetime wealth by the present value of the tax revenue.

Can the capitalization of the land tax explain the preference in most develop-
ing countries for export taxes over land taxes? The answer is no. As is shown 
below, export taxes have similar capitalization effects that can be larger in 
magnitude than those for land taxation.

Once again, the short-run impact of the export tax on current generations 
differs from the long-run impact. The older generation suffers a capital loss 
when the export tax is increased; from the arbitrage condition 5, \(dQ_2/d\tau =

\text{10. As discussed in note 8, in an overlapping generations model with endogenous capital, a land tax} 
\text{will generally increase the stock of reproducible capital, reduce the interest rate, and hence cushion the} 
capitalization effects (Chamley and Wright 1987).

\text{11. The assumption of perfect capital markets is a strong one, especially for developing countries. But} 
capitalization effects hold even with imperfect capital markets. However, this model neglects the import-
tant role of land equity as collateral in rural credit markets (Feder and Feeny, this issue).

\text{12. See Feldstein (1977) and Chamley and Wright (1987) for a detailed analysis of the impact of land} 
taxation on capital accumulation.
The total change in income of this older transition generation is given by
\[ \frac{dm_2(SR)}{d\tau} = -F_T \left( \frac{1 + r}{r} \right) T. \] (12)

Additional effects of the export tax are (1) wage rates fall, so some of the burden is borne by the younger generation in the rural areas, and (2) the domestic price of the tradable \( x \) declines, making urban consumers of \( x \) better off (see Trapido 1988). The overall impact on social welfare is
\[ \lambda_i(SR) = \left[ \frac{F_T T(1 + r)/r - (X_2 + \Psi_b x^2)}{F_T T - X_2 - \tau(\partial X_2/\partial p_2)} \right] \] (13)
where \( X_2 = x_2^2 + x_2^3 \) and
\[ \Psi_b = \frac{\partial \Omega}{\partial U_b} \frac{\partial U_b}{\partial m_b}. \]

The parameter \( \Psi_b \) summarizes the weight that the social welfare function places on marginal consumption of \( x \) by urban consumers relative to the benchmark of agricultural consumers. For example, if urban consumers are wealthier than rural consumers and society values equality, then \( \Psi_b < 1 \).

The stylized economy jumps directly to a new steady state, so the welfare changes of those who are young during the transition can be described by the long-run analysis. Once again expressing the marginal social cost of the export tax as the ratio of the change in social welfare to the change in revenue,
\[ \lambda_i(LR) = \frac{F_L L_1 - (X^a + \Psi_b X^b)}{F_L L_1 + \frac{F_T T}{1 + r} - X - \tau \left( F_L (\partial L_1/\partial \omega_1 + \partial X/\partial \rho) \right)} \] (14)
where \( X = X^a + X^b \), or the total present value of combined urban and rural traded goods consumption. The numerator describes the (negative) shift in money income; the rural sector is worse off because of lower real wages \( F_L L_1 \), but that loss is cushioned by the fall in prices for domestic consumption of \( x \). The denominator reflects the present value of the change in revenue as a consequence of increasing \( \tau \).

Suppose that the urban consumers are weighted equally in the social welfare function with agricultural consumers (so that \( \Psi_b = 1 \)) and that the present value of total domestic consumption of \( x \) exceeds gross first-period earnings \( F_L L_1 \). Then \( \lambda_i(LR) < 0 \); the export tax makes future generations better off even if the revenue is simply tossed into the ocean. Future generations would therefore prefer an export tax even to a nondistortional land tax. But this does not mean that the export tax is more efficient than the land tax. Long-run benefits of an

13. Note that time subscripts can be dropped from \( F_T \) and \( F_L \) because the production function is linear.
export tax come at the expense of short-term capital losses suffered by the transitional generation. Summed over all generations, land taxation is more efficient than export taxation.14

Finally, the relative impact of land and export taxation on land values can be derived. The effect of a one-rupee increase in land tax revenue on the price of land is

\[ \left( \frac{\partial Q_2}{\partial R} \right)_{SR} \left( \frac{\partial \Gamma}{\partial \tau} \right) = \frac{1}{r} \]

while the impact on land prices per rupee paid in export taxes by the transitional generation is

\[ \left( \frac{\partial Q_2}{\partial R} \right)_{SR} \left( \frac{\partial \tau}{\partial R} \right) = \frac{F_T/r}{F_T - X - \frac{\alpha X_2}{\partial p_2}} \]

which will generally be greater than 1/r. In part this strong result is a consequence of assuming that the transitional generation does not work, so the export tax affects only its income from land. In general, the outcome is ambiguous.

To summarize, the argument that taxpayers object to the land tax because they thereby suffer capitalization effects is probably not a good explanation for why the land tax is rarely used. Export taxes also depress land prices, and it is further shown that replacing an export tax with an equal-revenue land tax could increase land prices.

III. The Land Tax Imposes More Risk on Farmers

To this point, the model has been cast in a model of perfect certainty. One of the major differences between land taxation and commodity taxation is that commodity taxation reduces risk borne by farmers. Hoff (this issue) has demonstrated a stronger result: any Pareto-efficient tax system will involve at least partial risk pooling using commodity or export taxation.

Treating uncertainty in an overlapping generation model can give a somewhat misleading picture of the effect of tax policy. In the long run, land prices adjust so that the rate of return on land—corrected for differences in risk—is the same as the return on other investments, so that future farmers do not bear the burden of past tax policy choices. I therefore focus on economic behavior in the second period for those individuals who have already purchased their land, thereby collapsing the model to a traditional one-period framework. Assume further that farmers consume only current income from wage earnings and land investments.

The question to be addressed in this section is: what is the magnitude of

14. This can be shown by taking the present value of \( \lambda \) and \( \lambda \tau \) across generations. The ratio of the loss in social welfare to revenue collected across all generations is 1.0 for the land tax, and assuming that \( \frac{\psi_p}{p} = 1 \) (to abstract from redistributional issues), this same ratio always exceeds one for the export tax.
uncertainty necessary to find the land tax deficient in comparison with the export tax? To answer this question, one must specify an exact form for the second-period utility function;

\[
EU = \frac{E(x^{\phi_1}, z^{\phi_2}, \phi_3)}{\phi_1 + \phi_2 + \phi_3}
\]

subject to the budget constraint

\[
px + z + wI = m = \omega + (pF_T - \Gamma)T
\]

where the agricultural and time subscripts can be suppressed to simplify the equations. The production function is

\[
F = T^{1-\delta} (1 - I)^{\delta} (1 + \epsilon)
\]

where \(\epsilon\) is the random variable, such as rain, reflecting unexpected differences in productivity.\(^{15}\)

The model is straightforward to solve using iterative methods; the solution technique is described in the appendix. Initially optimal labor and commodity choices are determined given a particular level of export taxation \(\tau\) and degree of riskiness. Then the export tax is removed, and a new land tax \(\Gamma\) is imposed to the point where the indirect expected utility function is equal to the benchmark case with export taxation. That is, \(\Gamma^*\) is determined such that

\[
EV[1 - \tau, m(\tau, 0; \epsilon)] = EV[1, m(0, \Gamma^*; \epsilon)].
\]

The measure of the efficiency gain or loss is the difference between revenue raised under the land tax, \(\Gamma^*T\), versus revenue raised under the export tax. The difference is the compensating variation with utility held at its original value.

I assume a binomial distribution with \(\epsilon = +\omega\) or \(-\omega\), each with probability 0.5. The coefficient of variation, or the ratio of the standard deviation to average output, is approximately \(\omega\). Other parameters are \(g = 0.5\) and \(T = 1\). Recall that switching from export taxation to land taxation will harm the urban sector because the domestic price \(p\) will rise from \((1 - \tau)\) to 1. Land tax revenue is therefore defined to be revenue net of the amount necessary to compensate urban residents for the higher price of \(x\) (equivalently, one can assume that all marketed production of \(x\) is exported). Finally, the utility function parameters are \(\phi_i = 0.1, j = 1, 2, 3\), yielding a measure of constant relative risk aversion equal to 0.7 (equal to \(1 - \Sigma \phi_i\)), well within the range of 0.3 to 1.7 estimated for the majority of Indian rice farmers (Binswanger 1980).

Results are shown in table 1. The numbers shown are a measure of compensating variation as a fraction of initial full income \(m\). The value is positive if the land tax is more efficient and negative if the land tax is less efficient. For example, when there is no uncertainty, the efficiency gain of replacing a 50

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15. I assume labor supply is chosen after \(\epsilon\) is revealed to the farmer. Allowing \(l\) to be chosen before \(\epsilon\) is revealed will increase the impact of uncertainty on production decisions.
Table 1. Welfare Effects of Replacing an Export Tax with a Land Tax

<table>
<thead>
<tr>
<th>Percentage of income</th>
<th>Coefficient of variation</th>
<th>Relative risk aversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Export tax</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
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<td>0.09</td>
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<td>10</td>
<td>0.12</td>
<td>0.05</td>
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<tr>
<td>30</td>
<td>1.61</td>
<td>1.42</td>
</tr>
<tr>
<td>50</td>
<td>7.40</td>
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<tr>
<td>Export tax</td>
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<tr>
<td>10</td>
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<tr>
<td>50</td>
<td>7.40</td>
<td>7.92</td>
</tr>
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a. Expressed as a percentage of initial full income m. Positive value denotes welfare gain from shift to land tax, negative value denotes welfare loss.

percent export tax with a land tax is 7.41 percent of total income, or 27.6 percent of revenue collected. As the uncertainty in production becomes more pronounced, the export tax can dominate land taxation.16 Hoff's theoretical results are confirmed for low levels of export taxation. A 10 percent export tax can benefit farmers who face uncertainty; even when the coefficient of variation is 0.2, the export tax is as efficient as the land tax. But for higher export tax rates, the land tax is more efficient even for large degrees of uncertainty.

Table 1 also reports results for alternative parameters of the utility function when \( \phi_j \) is scaled down to \(-0.5\) (leading to an Arrow-Pratt measure of 2.50), and up to \( \phi_j = 0.2\) (an Arrow-Pratt measure of 0.4). The benefits of an export tax are greater for those with greater aversion to risk, but the qualitative conclusions are similar.

It is likely that these calculations overstate the benefits of the reduced risk provided by the export tax. The absence of credit markets in rural areas does not mean that farmers are forced to consume their current net income, as is assumed in the model above. While farmers may find it difficult to borrow, they are not prevented from saving. As Deaton (1989) has demonstrated, farmers can insure against part of their income risk with precautionary saving even in the absence of credit markets.

Hoff (this issue) demonstrated that a combination of a land tax to raise revenue and an export tax to stabilize income Pareto dominates either tax in

16. These calculations do not account for the increased risk assumed by the government under an export tax. Also, it may appear that for some parameters, the efficiency gain of a land tax increases when the coefficient of variation rises from 0.0 to 0.1. The puzzle is resolved by noting that the absolute gain from land taxation is less when the coefficient of variation is 0.1, but m declines by even more, causing the ratio to rise.
isolation. There is an optimal tradeoff between the insurance benefits of an export tax and the improved incentives of a land tax. If a nondistorting insurance program were possible that reduced \( \omega \) to zero, it would yield the efficiency gains shown in the first column of table 1.

In Uruguay, cattle ranchers face substantial uncertainty from international fluctuations in beef prices. Jarvis and Medero (1988) have argued that the central government collects revenue from the land tax and uses variable export tax rates to dampen the international price oscillations as well as to shield urban beef consumers from domestic price swings. Thus the government in Uruguay uses both export and land taxation to raise revenue and reduce risk.

IV. THE LAND TAX ENTAILS GREATER ADMINISTRATIVE AND EVASION COSTS

In theory the problem of collecting land taxes is straightforward: conduct a cadastral survey that assesses the market or site value of each plot of land, and send a tax bill to each owner. In practice, cadastral surveys are expensive and time consuming, tax offices are short on assessors, assessments are eroded by inflation, and courts are often swamped by appeals from irate landowners.\(^{17}\) As Richard Bird's classic 1974 book on land taxation argues: "the administrative constraint on effective land tax administration is so severe in most developing countries today that virtually all the more refined fiscal devices beloved of theorists can and should be discarded for this reason alone. Not only will they not be well administered; they will in all likelihood be so poorly administered as to produce neither equity, efficiency, nor revenue (p. 223)." The careful survey by Strasma and others (1987) provides recent documentation of the difficulties inherent in the effective administration of the tax.

The purpose of this section is to provide a model of why countries have had a much harder time administering the land tax than other types of tax. The strong incentive to misrepresent the true value of one's land leaves the government with a difficult choice of either allowing widespread evasion or spending valuable resources to enforce compliance. For example, the administrative cost of the land development tax in Bangladesh during the mid-1980s was more than half the tax revenue. These administrative costs must be reckoned as real resource costs—just like the traditional Harberger efficiency cost of distortionary taxation.\(^ {18}\) Few commodity or trade taxes entail efficiency costs in excess of 50 percent of tax revenue.

Once again the general model from section I is specialized to address the issue at hand. As in section III, I abstract from capitalization effects, and focus instead on second-period production decisions of landowners. It is assumed that all life

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17. Strasma and others (1987) suggested that the administrative capability of the government is overwhelmed if 5 percent of landowners appeal their tax assessment.

18. Of course, administrative costs of land taxation in Bangladesh also yield social benefits such as maintaining records of land ownership.
cycle capital is invested in land. Since the primary focus here is on equity and utility among farmers of different types, I assume that all marketed sales of $x$ bypass the urban sector and are sold in export markets.

Assume there are two types of people with identical farm plot sizes. Normalize the population size of each group at unity. Person $n$, the benchmark (normal) individual, supplies $L_n = 1 - l_n$ units of labor and owns $T$ effective units of land. The high-quality farmer (person $h$) is endowed with $\xi > 1$ units of effective labor (that is, he is a more productive worker) and $\beta T$ effective units of land, with $\beta > 1$. Utility for each person is given by $V_i = EV_x(p, \omega_i, m_i)$, where the implicit wage $\omega_i$ may differ across types. Expected full income is written

$$E_m_n = \omega_n + [pF_Tn - [1 + \pi_2(\beta - 1)]\Gamma]T$$

$$E_m_h = \omega_h + [pF_Tt - [\beta - \pi_1(\beta - 1)]\Gamma]T.$$

With probability $\pi_1$, the administrative agency incorrectly assesses the high-quality land as normal land, and with probability $\pi_2$ normal land is incorrectly assessed as high-quality land (see Stern 1982).

The probability $\pi_1$ (or, in a group of many farmers, the fraction who are misassessed) is endogenously determined as an optimal response by each individual to the tax premium on high-quality land $\Gamma(\beta - 1)$ and administrative effort, measured as administrative costs per unit of land $c$; $\pi_1 = \pi_1[c, \Gamma(\beta - 1)]$, with $\pi_{11} < 0$ and $\pi_{12} > 0$, with the second subscript denoting the derivative with respect to the $i$th argument. Similarly, the higher the administrative effort or cost $c$, the less likely that low-quality land is misassessed; $\pi_{21} < 0$. Noting that total physical land area is $2T$, revenue net of administrative costs is

$$R = \tau(x_n^* + x_h^*) + [1 + \beta + (\pi_2 - \pi_1)(\beta - 1)T\Gamma - 2cT$$

where $x_i^*$ is net marketed sales of the tradable good.

Assume no administrative costs of the export tax. This is an obvious simplification; the point is that the export tax is administered at a central shipping area or airport, and typically entails low costs of administration. Smuggling can be discouraged by imposing large penalties for avoiding export taxes, even if not every smuggler can be caught. By contrast, it is difficult to impose large penalties for underreporting land quality, since reasonable people may differ over the "true" value of land (Skinner 1990).

Figure 1 plots after-tax income against original income. Assume that all production of the $x$ good is marketed and not consumed so the after-tax income line is straight. Given a pure output tax regime, the two types will reveal their

19. The endogenous functions $\pi_1$ can be derived using the standard model of expected evasion in which the individual's decision to evade depends on the probability of an "audit" or assessment (implicitly a function of $c$), the gains from evading $[\Gamma(\beta - 1)]$, and the penalty of being caught (see Allingham and Sandmo 1972). One problem with this type of model is that it would predict that everyone should evade, since the penalties are rarely large enough to justify reporting land quality truthfully (Skinner and Slemrod 1985).

20. This assumption need not be maintained for the analytical derivations below.
productive capacity through their marketed output and locate on a "separating equilibrium" (see for example Stiglitz 1987 or Stern 1982): person $n$ at $A_n$ and person $h$ at $A_h$. Tax authorities need only collect the tax per unit of output, rather than determine who is a high- or low-ability farmer.

If tax authorities can identify which land is the high-quality land, a more efficient tax on land area can be assessed. Lines $BB'$ and $DD'$ reflect the after-tax budget lines of the low-quality and high-quality types, respectively, under a pure land tax regime yielding the same revenue as the output tax regime did. Each farmer will be better off at $V^h_2$ and $V^h_4$. The problem, however, is the self-selection criterion—unlike the commodity tax regime, type $h$ farmers will be better off to represent their land value as low-quality, and attain utility level $V^h_3$.
The model presented above reflects this tendency toward a pooling equilibrium; unless real costs are expended to forcibly separate high-quality from low-quality landowners, everyone will represent his land as low-quality.

Of course, one option would be to base the tax only on land acreage. In the model above, each farmer owns the same acreage, so each would pay the same tax and face budget line $GG'$. Note that while this tax is perfectly efficient, it is less equitable, since the utility of type $n$ farmers drops to $V^n$, while the type $h$ farmer's utility rises to $V^h$. As the diagram is drawn, the normal farmer's utility declines relative to utility under the export tax.

Is it therefore better for the government to spend more money on administration to ensure that type $h$ owners declare their land truthfully? Not necessarily, since administration costs reduce net revenue (also see Kaplow 1989). In general, to raise more revenue from the land tax the government is faced with two choices; either spend more on administration or raise the rates. In the derivations below, it is shown that neither option may be socially efficient at the margin relative to an export tax.

Since we are concerned here only with different types of farmers, let $\Omega = \Omega(V_n,V_h,\cdot)$, with $\Psi_i = (\partial V_i/\partial V_j)(\partial V_i/\partial m_i)$, $i = n, h$, and $\Psi_n$ normalized to 1 (so that for a concave social welfare function, $\Psi_n < 1$). Then the marginal social cost of raising $1$ in revenue from an export tax can be derived using Roy's identity;

$$\lambda'_c = -\frac{\partial \Omega}{\partial c} / \frac{\partial R}{\partial c} = \frac{x^*_n + \Psi_n x^*_h}{x^*_n + x^*_h + \tau \left( \frac{\partial x^*_n}{\partial c} + \frac{\partial x^*_h}{\partial c} \right)}.$$ 

Once again, the numerator is weighted by the relative value of income in the social welfare function.

Another option available to the tax administrators is to increase spending on administration, with a shadow cost of

$$\lambda'_a = -\frac{\partial \Omega}{\partial a} / \frac{\partial R}{\partial a} = \frac{(\pi_{21} - \Psi_n \pi_{11})(\beta - 1)}{(\pi_{21} - \pi_{11})(\beta - 1) - 2/\Gamma}.$$ 

This method of raising taxes is equitable since type $n$ farmers are likely to pay less in taxes ($\pi_{21} < 0$) and type $h$ farmers more ($-\pi_{11} > 0$). But spending money on tax administration makes little sense when statutory rates $\Gamma$ are low. It may be socially inefficient (no matter how equitable) to increase $c$ if the consequent tax revenue collected is minimal.

Finally, the simplest choice available to the government is to simply raise the statutory tax rate $\Gamma$ holding $c$ constant. The shadow cost of raising revenue by increasing the land tax rate is

$$\lambda'_\Gamma = -\frac{\partial \Omega}{\partial \Gamma} / \frac{\partial R}{\partial \Gamma} = \frac{1 + \pi_2(\beta - 1) + \Psi_n[\beta - \pi_1(\beta - 1)]}{1 + \beta + (\pi_2 - \pi_1)(\beta - 1) - \Gamma \pi_{12}(\beta - 1)^2}.$$ 

Raising the statutory tax rate $\Gamma$ is not equitable if, for example, the degree of
existing tax evasion by type \( h \) farmers is high. The denominator suggests further that the effective tax revenue collection from increasing the statutory rate \( r \) may be diminished if as a consequence evasion becomes more widespread. Hence revenue is not simply a constant proportion \( \Gamma \) of total quality-adjusted land \( 1 + \beta \).

The following example illustrates how one might compare the three tax choices. Assume that high-productivity farmers enjoy only half the weight of normal farmers in the social welfare function \((\psi_h = 0.5)\), high-quality land is assessed at double the value of normal land \((\beta = 2)\), the land tax \( \Gamma \) is 2.5 percent of the market value for land \((\pi_1 = 0.25)\), the export elasticity is 1.0, \( \pi_2 \) is zero, and \( \pi_{11} = -100 \) and \( \pi_{12} = 50 \). Assuming that \( \pi_{11} = -100 \) means that an increase in administrative expenses of 0.1 percent of land value reduces evasion by 10 percent. Assuming that \( \pi_{12} = 50 \) means that increasing statutory rates by 10 percent (from 0.025 of land value to 0.0275) increases evasion by 5 percent. Then the calculated values of the shadow prices \( \lambda' \) of raising $1 of extra revenue through an increase in the export tax rate, land tax assessment effort, or land tax rate, are\(^{21}\)

\[
\lambda_e' = 0.95 \\
\lambda_i' = 2.50 \\
\lambda_r' = 1.25.
\]

For these illustrative parameters, the export tax is the least costly way of raising revenues. In sum, accounting for the overall cost of the tax system inclusive of administrative and evasion costs, rather than just the distortions under particular tax rates, alters the traditional comparison of the land tax versus the export or commodity tax (Slemord 1990).

V. CONCLUSION AND DISCUSSION

Despite the theoretical pedigree of the agricultural land tax, its empirical importance in raising central government revenue continues to slide. This article has proposed three reasons for why the land tax has been allowed to decline in importance. First, current generations of landowners may suffer large capital

\[21\] Additional parameter assumptions are that effective labor units on high-quality land, \( \xi \), are 2 (implying, with \( \beta = 2 \), that \( x^e_1 = 2x^o_1 \)), and the existing export tax rate \( r \) is 30 percent. Letting \( \eta \) be the export elasticity, the calculations are:

\[
\lambda_e' = \frac{x^e_1(1 + 0.5 \times 2)}{3x^o_1(1 - \eta_n)} = 0.95, \text{ from equation } 23
\]

\[
\lambda_i' = \frac{0.5 \times 100}{(100 - 2)/0.025} = 2.50, \text{ from equation } 24
\]

\[
\lambda_r' = \frac{1 + 0.5(2 - 0.25)}{3 - 0.25 - 0.025 \times 50} = 1.25, \text{ from equation } 25.
\]
losses if land prices decline by the full present value of future tax assessments. But this is not a convincing explanation for why land taxes are now rarely used, since export taxes also depress land prices. In fact, replacing an export tax with a land tax could increase land prices.

The second reason is that relative to an export tax, the land tax thrusts more uncertainty upon the farmer. Regardless of the crop outcome, the land tax must be paid. However, numerical calculations suggested that the degree of uncertainty about farm income must be very large, and (in general) the level of taxation low, before an export tax is preferred to a land tax. Furthermore, the combination of both the land and export taxes will Pareto dominate either in isolation (Hoff, this issue).

Finally, administering the land tax is difficult. Farmers with high-quality land have a strong incentive to represent it as low-quality land. Since there are few penalties for underassessment, real resources must be expended by the government to prevent the land tax from collapsing to a pooling equilibrium in which all farmers pay the same fee per acre. Once administration costs are included, the land tax may be less efficient than an export tax.

Is this last problem—which I view as the most important defect of the land tax—a fatal shortcoming? When markets for land are thin or incomplete, the difficulty of assigning market value or net income to each parcel is likely to ensure that such land taxes are rarely used. But there are alternative methods of collecting land tax which avoid the necessity of tax assessors’ placing a market value on each parcel with periodic updating. For example, a crude index of land quality depending on the soil type, distance from major roads, and irrigation facilities can be determined for each plot of land. The tax assessment could then be calculated by multiplying the year-specific tax rate by the permanent index, thereby avoiding the necessity for yearly reassessment.

Such a procedure holds promise, especially as technological methods of mapping and soil quality assessment improve. However, it is unlikely that the tax rate could be set at a high level, since net income from land may vary widely even within these crude assessments of quality, leading to horizontal inequities. My suspicion is that the administrative difficulties of collecting land taxes will ensure its continued decline in providing central government revenue in developing countries.

Local government land taxation apparently has not experienced the same decline in use. One explanation may be that local governments have few other tax instruments available to them. Commodity taxes may be easily evaded, export taxes are unavailable, and income taxes in rural areas are impossible to administer. In this view, land taxes may be unappealing to local governments, but there are no better alternatives. Furthermore, modest local government revenue requirements imply a low land tax rate, reducing evasion and allowing for a simpler tax structure.

22. There are no comprehensive statistics on local government use of agricultural land taxation.
One shortcoming of the analysis to this point is that government tax choices are presumed to be guided by efficiency or equity considerations. An alternative view is that land taxation is more efficient and equitable than export taxation, but political barriers and vested interests have blocked its use. This is a theme often sounded in previous studies: "The weakness of land taxation is that while it arouses the opposition of the landed interests, it does not hold out an obvious appeal to any other important group" (Hirschman 1964, p. 433).

Examples of political opposition blocking land taxation abound. Most recently, a 1986 World Bank–financed project in Argentina laid the administrative groundwork for a new land tax designed to reduce its heavy reliance on export taxes. Agricultural political groups, viewing the proposed tax as yet another in a long history of revenue transfers from agriculture, effectively scuttled the proposal (Trapido 1988).

The historical evidence may appear perplexing in light of two results from section II implying that large landowners should support a revenue-neutral shift from export to land taxation. First, switching to a land tax may increase the value of land through capitalization effects. And second, replacing the export tax increases the domestic price of the tradable good and consequently benefits landowners at the expense of urban consumers. Why, then, the strong opposition to land taxation from landowners? The answer is that historically, land tax increases were rarely paired with export tax cutbacks. In Argentina, for example, the government made no pledge to reduce its export tax once the proposed land tax was implemented. Political objections by landowners were not surprising under those circumstances. By contrast, landowners in Uruguay during the late 1960s actively supported a land tax paired with a cut in export taxes (Jarvis 1986, 1987).

The question still remains as to why landowners object more vehemently to increased land taxes than to increased export taxes or various forms of implicit taxation. Perhaps the land tax is unpopular because it is explicit rather than implicit. Standard economic models do not admit any such difference between the two taxes. But there is some evidence that explicit tax payments generate more taxpayer resistance than implicit taxes collected at an intermediate stage of production, although such effects are difficult to measure.23 Still, the secular decline of central government land tax revenue is a good example of how administrative difficulties can outweigh textbook efficiency.

APPENDIX: A Model of Uncertainty

The utility function in equation 17 can be expressed in its indirect form:

\[
V(\tau, \Gamma; \epsilon) = (\phi_1 + \phi_2 + \phi_3)^{-1} \frac{m(\tau, \Gamma; \epsilon)^{\rho}}{(1 - \tau)^{\rho} \sigma F_L(\epsilon)^{\rho}},
\]

23. As Nicholas Stern has pointed out, Margaret Thatcher lost political ground over a very explicit poll tax. Her support for the poll tax was precisely to make explicit—and presumably less popular—the financing of local councils dominated by the Labour Party.
where $\phi = \phi_1 + \phi_2 + \phi_3$. Note that $m$ must be derived implicitly, since $F_l$ and $F_T$ both depend on the marginal product of labor, $1 - l$, while the leisure demanded depends on total income $m$. The inner loop of the simulation therefore solves first for the optimal $l$ conditional on the realization of $e$ and the tax and uncertainty parameters. The expected value of the indirect utility function is $0.5[V(e = \omega) + V(e = -\omega)]$.

Revenue is written

$$R' = (A-2)\tau[\omega(1 - l) + F_T] + \Gamma T.$$ 

In the counterfactual, the export tax is replaced with the land tax. This tax is adjusted using iterative methods in the outer loop until expected utility is equal to the baseline case of the export tax. If more revenue can be raised under the land tax holding expected utility constant, then the land tax is more efficient, and conversely. (The BASIC program is available from the author upon request.)

References


