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Taxing Land is Better than Neutral:
Land Taxes, Land Speculation and the Timing of Development

I. Introduction

Several writers have argued that an ad valorem tax on land can generate economic distortions by altering the profit-maximizing time of land development (Shoup [24], Skouras [26], Bentick [1]). These arguments are erroneous, but they have been widely cited (Douglas [7], Ellson [8], Fischel [10], Mathis 15], Mills [17], Noguchi [19], Pilai [21], Prest [22], Turnbull [30], Wildasin [31]). Some of the erroneous arguments analyze a tax that is levied only on undeveloped land. Others unwittingly analyze a tax that varies with how land is developed. It is not at all surprising that such taxes should alter the timing of development.

If a tax does not vary with how land is used then does not alter the timing of development when markets are perfect, because the tax subtracts a fixed amount from receipts at each point in time, so that whatever actions maximize the present value of returns before the tax continue to maximize the present value of returns after the tax (Davenport [6]). However, so many mistakes have been made in analyzing taxes on the value of land, and some of these mistakes have been copied by so many times by other writers, that it is worth identifying precisely the errors in the most prominent works in this tradition. To provide a foundation for the identification of these errors, this paper begins with a rigorous derivation of the mathematics of land development.

One of the insights that emerges from this derivation is that in a dynamic setting, "the rent of land" should not be defined as the net return to the use of land after payments to other factors, because then "the rent of land" would vary in an arbitrary way with the timing of development. Rather, "the rent of land" should be defined as the opportunity cost of leaving unimproved land unused.

While a tax on land is neutral when markets are perfect, it is generally better than neutral when markets have customary imperfections. In particular, if there are unarbitraged disparate beliefs about the optimal future use of land because of the lack of a futures market in land rent, then a tax on land helps prevent a winner's curse from generating an artificial scarcity of land for current use. And if there is dispersion in discount rates because of capital market imperfections, a tax on land helps to put land into the hands of persons with high

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discount rates, whose investments are generally more productive than those of the persons with low discount rates who would otherwise have the land.

But first to neutrality under perfect markets, and the errors that have been made in analyzing taxes on land.

II. The Mathematics of Rent, Land Development, and Land Taxation

Define the following symbols:

i, t	= time
H	= planning horizon
T	= time of development
T^*	= profit-maximizing time of development for a site
r	= interest rate
a	= ad valorem tax rate

$N(i, t)$ = net return for a site per year before taxes at time i, assuming that the site is developed in the way that is optimal if it is unimproved at the prior time t

$R(t)$ = rent of a site at time t, that is, the opportunity cost of leaving the site unused at time t

$S(t, a)$ = selling price of a site at time t if an ad valorem tax is levied at a rate of a

$V(t, a, T)$ = present value, discounted to time t, of net income from a site after ad valorem taxes at a rate of a, assuming that development occurs at time T

$C(T, a)$ = present value, discounted to time T, of net income from a site after ad valorem taxes at a rate of a, assuming that development occurs at time T, that is, $V(T, a, T)$.

Some of these terms represent distinctions that have not always been made in the literature, resulting in considerable confusion. Note in particular the distinction between $N(i, t)$ and $R(i)$. The net return from a site at a particular time, $N(i, t)$, depends on the time when use of the site began. The rent of a site at a particular time, $R(t)$, on the other hand, is defined to be independent of when use of the site happened to start. To achieve this independence, rent is defined not directly in terms of what can be achieved by use of a site, but rather indirectly, by what is lost from a lack of use of the site. $R(i)$ can be defined in terms of $N(i, t)$ by

$$(1) \qquad R(t) = N(t, t) - \int_t^\infty \frac{d}{dt} N(i, t) \, e^{-r(i-t)} \, di.$$

That is, if one starts with an unimproved site at time t, the cost of leaving the site unimproved is the return that can be earned from immediate use at time t minus the present

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