

The Economics of Efficient Taxes on Land*

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1. Introduction

Land can be taxed in a number of different ways. It can be taxed according to its area. It can be taxed according to estimates of its sale value, as occurs under the property tax of the U.S. and other countries. It can be taxed according to estimates of its rental value. Sales of land can be taxed according to selling price, or according to the difference between selling price and the previous selling price.

This review is concerned with taxes on land that have little or no detrimental effects on economic incentives. Therefore it concentrates on taxes on land according to estimates of sale value or rental value. Taxes on land according to area discourage the use of marginal land. Taxes on land sales, whether the base is the full sale price or the increase in price since the previous sale, encourage people to hold on to land when someone else could use it more productively. These taxes are therefore excluded from this review. The review also excludes taxes on depletable minerals.

Section 2 deals with classical views of taxes on land, covering the ideas of François Quesnay, Adam Smith, David Ricardo, James Mill, John McCulloch, John Stuart Mill and Henry George, and influences and controversies among these writers. The two issues that provoked the greatest disagreement were whether it was possible to separate the value of land from the value of improvements for tax purposes and whether or to what extent a tax on land could be fair.

Section 3 develops the mathematics of taxes on land. It presents some new definitions that are needed to avoid confusion and errors that have entered the literature on land taxation. The most significant innovation is that, because the actual return to land typically varies with the time of development, which can be accidental, it is useful to define “the rent of land” as the opportunity cost of leaving vacant land vacant.

Section 4 deals with land speculation and the timing of development discusses three issues: 1. In a world with incomplete futures markets for land, the distribution of income among persons with different beliefs about whether it is efficient to develop land now or hold it idle varies with the level of taxes on land. Not taxing land can create a “social winner’s curse” in which an artificial scarcity of land arises from the fact that land is worth the most to those who have the most extreme beliefs about future speculative gains from land. 2. In a world with imperfect capital markets, a tax on land makes land relatively less attractive to those with low discount rates and relatively more attractive to those with high discount rates. This probably accelerates development. 3. Some writers have asserted that in a world of perfect markets, a tax on land distorts the timing of development. This widely copied error arises from a failure to distinguish a tax on the sale value of land from a hypothetical tax on the present value of planned net income from land.

Section 5 deals with income effects of taxes on land. It discusses the possibility that taxes on land are partly shifted. If these effects occur, they do not constitute distortions, and they do not occur in open economies or if taxes are accompanied by benefits of corresponding value.

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Section 6 is concerned with the adequacy of land as a tax base. It discusses the circumstances under which public spending will raise land rent by enough to pay for the spending.

Section 7 deals with the ethics of taxing land. In this section, three sources of land rent are identified: nature, public services, and private activities. The greatest ethical controversy arises with respect to the component of rent attributable to nature. George argued that what is provided by nature should be regarded as the common heritage of all, so that all rent from this source should be collected publicly. Those who currently have extensive land holdings have been most vocal in asserting that the imposition of such a tax would be an unjust confiscation of property. A rent-seeking perspective says that it may be better to accept the status quo than to suffer the losses from conflict that arises when the status quo is subject to challenge. A separation of constitutional from legislative choices create a forum in which advances in moral evolution can be incorporated into legal institutions without enduring all of the losses from rent-seeking conflict that would arise if existing rights had no protection from new legislation.

Section 8 summarizes the conclusions of the paper.

2. Classical Views Regarding the Taxation of Land

It is appropriate to begin a discussion of the economics of taxing land with an extensive discussion of the ideas of classical economists on the subject, because they developed many positions that can still be supported and also debated some subjects that are still controversial. A review of their positions uncovers ideas of continuing relevance and also provides insights into chains of influence.

The Physiocrats

That taxing land is a uniquely attractive way for governments to obtain revenue was one of the central tenets of the Physiocratic system developed by François Quesnay and his followers in the 1750s and 1760s. In his “General Maxims for the Government of an Agricultural Kingdom,” Quesnay (1963 [1756], p. 232) says in Maxim V:

That taxes should not be destructive or disproportionate to the mass of the nation’s revenue; that their increase should follow the increase of the revenue; and that they should be laid directly on the net product of landed property, and not on men’s wages, or on produce, where they would increase the cost of collection, operate to the detriment of trade, and destroy every year a portion of the nation’s wealth. [Emphasis in the original.]

Quesnay’s concern about taxes that “operate to the detriment of trade” corresponds to the modern concern about the dead-weight loss of taxation. What Quesnay meant by “the net product of landed property” was the return to owners of land after subtracting any money they had advanced for seeds or other inputs, that is, the rent of land. Economists from Adam Smith on have acknowledged the validity of Quesnay’s insight that a tax on rent, unlike a tax on almost any other base, does not “operate to the detriment of trade,” that is, it has no dead-weight loss.

The Physiocrats went on to argue that, since all taxes were in the end paid out of rent, it would be sensible to replace all other taxes by a single tax on rent. However, the premise that all other taxes are in the end paid out of rent would be valid only if other inputs were supplied perfectly elastically. When other inputs have finite elasticities, taxes on them are not shifted completely to rent, and it is no longer the case that the owners of land are better off with a single

tax on land. Nevertheless, one can still give the Physiocrats credit for first having the insight that taxing the rent of land is a uniquely non-destructive way for governments to obtain revenue. This idea formed part of the heritage from which all subsequent classical economists wrote about taxing land.

Adam Smith

Smith (1937 [1776], pp. 777-78) offers four maxims of taxation that were widely accepted and quoted by subsequent classical writers:

I. The subjects of every state ought to contribute towards the support of the government, as nearly as possible, in proportion to their respective abilities; that is in proportion to the revenue they enjoy under the protection of the state. The expense of government to the individuals of a great nation, is like the expense of management to the joint tenants of a great estate, who are all obliged to contribute in proportion to their respective interests in the estate. In the observation or neglect of this maxim consists, what is called the equality or inequality of taxation. Every tax, it must be observed once for all, which falls finally upon one only of the three sorts of revenue above mentioned [rent, profit and wages], is necessarily unequal, in so far as it does not affect the other two. In the following examination of different taxes I shall seldom take much further notice of this sort of inequality, but shall, in most cases, confine my observations to that inequality which is occasioned by a particular tax falling unequally even upon that particular sort of private revenue which is affected by it.

II. The tax which each individual is bound to pay ought to be certain, and not arbitrary.

...

III. Every tax ought to be levied at the time, or in the manner, in which it is most likely to be convenient for the contributor to pay it. . . .

IV. Every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible, over and above what it brings into the public treasure of the state. . . .

Note that while the first clause of Smith's first maxim sounds like what a modern writer would call an ability-to-pay principle, the second clause and second sentence indicate that he might equally well be thinking of a benefits-received principle. It is reasonable to conclude that Smith did not distinguish between an ability-to-pay principle and a benefits-received principle, or consider the possibility that they might conflict. The remarks at the end of the first maxim suggest that Smith may not have considered it improper to have a tax that fell on one factor and not others.

Smith discusses separately taxes on "the rent of land," by which he means the rent of agricultural land, and taxes on "ground-rents," by which he means the rent of land under buildings. In his discussion of taxes on the rent of land, Smith notes that such a tax can be levied either according to a schedule that is fixed once and then left unaltered, or according to a schedule that is updated regularly. The land tax in England was levied in Smith's time according to a schedule that had been established about a century earlier, in the reign of William and Mary. This schedule, the product of a notional rental value of the land and a tax rate, was known to bear only a cursory relation to the true rental value of land even when it was initiated and had become even more outdated in the intervening century. Smith notes the efficiency of such a tax, saying

(1937, p. 780), “As it has no tendency to diminish the quantity, it can have none to raise the price of that produce. It does not obstruct the industry of the people.”

Smith says that, since rents had risen almost everywhere in the intervening century, the invariance of taxes had generally operated to the benefit of landowners. But the opposite could also have happened. Furthermore, the system had only been workable because there had been no great change in either the value of silver or the silver content of money.

Smith then takes up the case of a tax on rent that varies with every variation in rent, mentioning that the Physiocrats regarded such a tax as the most equitable of all taxes. Smith comments favorably on the practice of the Venetians of requiring all leases to be registered publicly and using these values as the basis of taxation, with “equitable estimations” and a 20% discount for land that is cultivated by those who own it. He notes that such a system can discourage owners of land from improving their land. To overcome this difficulty, he recommends that owners who are contemplating improvements be allowed to have their taxes fixed at pre-improvement levels for periods long enough to recover their investments.

Smith notes that some jurisdictions relied on systems of assessment that had reputations for being very accurate. But he doubts that governments would undertake the effort needed to keep assessments accurate, and therefore he regards systems based on recorded leases to be better.

Smith also discusses taxes proportional to what land produces, noting that these can be quite disproportional to rent and that they discourage both the improvement of land and its cultivation.

Smith’s discussion of taxes on ground-rents occurs within his discussion of taxes on houses. He notes that a tax on houses is a combination of a tax on buildings, which he says is passed on to the occupiers of buildings, and a tax on ground-rent, which is paid by the owner of the land. (Smith’s assertion that a tax on buildings is paid entirely by the occupiers of buildings is true only if there is a perfectly elastic supply of capital.) Smith regards ground-rent as a highly suitable base for taxation (1937, pp. 795-96):

Ground-rents are a still more proper subject of taxation than the rent of houses. A tax upon ground-rents would not raise the rents of houses. It would fall altogether upon the owner of the ground-rent, who acts always as a monopolist, and exacts the greatest rent which can be got for the use of his ground. . . .

Both ground-rents and the ordinary rent of land are a species of revenue which the owner, in many cases, enjoys without any care or attention of his own. Though a part of this revenue should be taken from him in order to defray the expenses of the state, no discouragement will thereby be given to any sort of industry. The annual produce of the land and labour of the society, the real wealth and revenue of the great body of the people, might be the same after such a tax as before. Ground-rents, and the ordinary rent of land, are, therefore, perhaps, the species of revenue which can best bear to have a peculiar tax imposed upon them.

Ground-rents seem, in this respect, a more proper subject of peculiar taxation than even the ordinary rent of land. The ordinary rent of land is, in many cases, owing partly at least to the attention and good management of the landlord. A very heavy tax might discourage too much this attention and good management. Ground-rents, so far as they exceed the ordinary rent of land, are altogether owing to the good government of the sovereign, which, by protecting the industry either of the whole people, or of the inhabitants of some particular place, enables them to pay so much more than its real value for the ground which they build their houses upon; or to make to its owner so much more than compensation for the loss which he might sustain by this use of it. Nothing can be more reasonable than that a fund

which owes its existence to the good government of the state, should be taxed peculiarly, or should contribute something more than the greater part of other funds, towards the support of that government.

The remarks at the end of this passage indicate that Smith favored a tax on ground-rents as an expression of a benefits-received principle.

David Ricardo

Ricardo's law of rent allows the rent of land to be described as the residual after paying the costs of variable factors of production. With this law, Ricardo provided a theoretical foundation for the idea that taxes on rent are a source of revenue that is particularly attractive for its lack of harmful effects on an economy. Ricardo used the law of rent as the basis for distinguishing between taxes that inhibit production and those that do not. He says (1911 [1821], p. 115):

A land-tax, levied in proportion to the rent of land, and varying with every variation in rent, is in effect a tax on rent; and as such a tax will not apply to that land which yields no rent, nor to the produce of that capital which is employed on the land with a view to profit merely, and which never pays rent; it will not in any way affect the price of raw produce, but will fall wholly on the landlords.

Ricardo goes on to say that a tax on all cultivated land, no matter how low, will raise the price of agricultural products by causing some land to be withdrawn from production. Thus Ricardo criticizes Smith's assertion (1937, p. 788) that taxes on agricultural production are equivalent to taxes on rent and are paid by landlords. In fairness to Smith, it should be mentioned that he undoubtedly understood that a tax on agricultural production discourages improvement and cultivation. But he did not take the next step and see that this implies that it raises the price of agricultural goods, thereby shifting some of the tax from landowners to consumers.

Ricardo then criticizes Smith's claim (1937, p. 780) that, when a land tax "is assessed upon each district according to a certain invariable canon, . . . the landlord is in all cases the real contributor, . . ." Ricardo says that such a tax will cause some land to be withdrawn from production. For Ricardo's criticism to be valid, there must be some land that is taxed in excess of the rent of the land. If a historically fixed assessment happened never to exceed the rent of land, no land would be withdrawn from production, and the tax would be paid entirely by landlords. Since the land tax in England was very low, it is possible that this condition was met.

In his discussion of taxes on houses, Ricardo quotes from Smith's remarks on taxes on ground-rent and the ordinary rent of land. He then comments (1911, p. 131):

It must be admitted that the effects of these taxes would be such as Adam Smith has described; but it would surely be very unjust to tax exclusively the revenue of any particular class of a community. The burdens of the state should be borne by all in proportion to their means: this is one of the four maxims mentioned by Adam Smith which should govern all taxation. Rent often belongs to those who, after many years of toil, have realised their gains and expended their fortunes in the purchase of land or houses; and it certainly would be an infringement of that principle which should ever be held sacred, the security of property, to subject it to unequal taxation. . . . And if it be considered that land, regarded as a fit subject

for exclusive taxation, would not only be reduced in price, to compensate for the risk of that taxation, but in proportion to the indefinite nature and uncertain value of the risk would become a fit subject for speculations, partaking more of the nature of gambling than of sober trade, it will appear probable that the hands into which land would in that case be most apt to fall would be the hands of those who possess more of the qualities of the gambler than of the qualities of the sober-minded proprietor, who is likely to employ his land to the greatest advantage.

It is possible that when Ricardo wrote these words, he was thinking about his own circumstances. According to the Encyclopedia Britannica (1992), Ricardo, having made a fortune in the stock market, had retired to his extensive land holdings in Gloucestershire at the time that he wrote *The Principles of Political Economy and Taxation*.

Ricardo's appeal to Smith's first maxim treats it as if it is exclusively an ability-to-pay principle and neglects the part of the maxim that has a benefits-received flavor. His comments on risk make sense only if it is assumed that he is referring, not to a regime in which land is subject to a particular tax, but rather to a society in which land has come to be "regarded as a fit subject for exclusive taxation," but no action in that direction has yet been taken. In other words, Ricardo is suggesting here that, because of the consequences with respect to perceived risk, it would be harmful to an economy if people started to think that a particular tax on land would be appropriate, even without action in that direction being taken.

Ricardo did not address Smith's argument that ground-rent is a particularly suitable base for taxation because it is the result of good government.

James Mill

James Mill (1824, p. 242) repeats what had become the received wisdom about taxes on rent:

It is sufficiently obvious, that the share of the rent of land, which may be taken to defray the expenses of the government, does not affect the industry of the country. The cultivation of the land depends upon the capitalist; . . . To him it is a matter of perfect indifference whether he pays the surplus, in the shape of rent, to an individual proprietor, or, in that of revenue, to a government collector.

He goes on to say that when European monarchs financed their governments by income from royal lands and levies on barons, all of the expense of government came from rent. In Asia, somewhat similarly, the practice of the principal monarchs had been to place levies on individual cultivators of amounts that corresponded to rent.

Mill then argues that if people were to migrate to a new country, a rule of financing government from the rent of land would be particularly attractive because "industry would not by that means sustain the smallest depression; and . . . the expense of government would be defrayed without imposing any burden upon any individual" (1824, p. 243). Since land, Mill argues, would yield more than what government would need to expend, the surplus rent might as well be disposed of by letting land be private property, subject to whatever taxes are needed to support government. Mill (1824, pp. 244-45) then offers a version of Ricardo's argument that in existing circumstances, singling out land would be unfair:

Where land has, however, been converted into private property, without making rent in

a peculiar manner answerable for the public expenses; where it has been bought and sold upon such terms, and the expectations of individuals have been adjusted to that order of things, rent of land could not be taken to supply exclusively the wants of government, without injustice. It would be partial and unequal taxation; laying the burden of the state upon one set of individuals, and exempting the rest. It is a measure, therefore, never to be thought of by any government which would regulate its proceedings by the principles of justice.

Mill then argues that if the rent of land rises as a result of legislation, it would be proper and expedient for the legislature to appropriate the increase in rent for public purposes. Furthermore, he argues, the legislature increases rent by measures that permit population to increase. Therefore increases in rent can be subject to special taxation without injustice. Mill allows, however, that there would be practical difficulties in distinguishing between the amount of rent that had been conferred upon landowners by previous legislation and that which might properly be appropriated.

Mill next makes reference to an article on taxation, written by “M’Culloch” for the Supplement to the Encyclopedia Britannica. Mill describes this article as “masterly” (1824, p. 248) and says it asserts “that the whole of what the land can ever yield, is conferred, in the case supposed [when rent increases as a result of growth of a community], on the owner of the land, by the previous legislation.” Mill agrees that if this premise is true, then a tax on land would be improper partial taxation of only one class. But he disputes the premise:

The real question is, whether any thing, beyond a certain amount of annual benefit, namely, what is at present derived, with such increase as can be rationally anticipated within the number of years’ purchase for which the land would sell, can, in a really equitable, excluding a merely technical, mode of considering the subject, be regarded as the property of the land-owner.

It is understandable that Mill should question the assertion that no special tax on land can ever be justified. However, Mill’s proposal to allow “such increase as can be rationally anticipated within the number of years’ purchase for which the land would sell” does not provide either a principled or a practical distinction between the part of rent that he regards as justly belonging to the owners of land and the part that can justly be the subject of a special tax.

John R. McCulloch

The “M’Culloch” to whom James Mill referred was presumably John R. McCulloch (born 1789; died 1864), whose treatise on taxation (1968 [1852; first edition, 1845]) discusses taxes on land in some detail. McCulloch begins his discussion of taxes on rent (1968, p. 41) with a criticism of Adam Smith: “Dr. Smith’s opinion that taxes on the rent of land, taking the term in its popular and broadest sense, fall wholly on landlords, is, no doubt, an error.” The reason, McCulloch says, is that rent in the sense of payments to landlords is a combination of return to land and return to capital. But it is clear that Adam Smith understood this, because he says (1937, p. 784): “The discouragement which a variable land-tax of this kind might give to the improvement of land, seems to be the most important objection which can be made to it.” However, McCulloch is in any case right to emphasize the fact that payments to landlords include a return to capital as well as a return to land.

McCulloch then acknowledges that if a tax is levied only on rent, it will have no effect on the price or quantity of agricultural production and will be paid entirely by landlords. But he objects to taxes on rent on practical grounds (1968, pp. 44-45):

In a practical point of view, taxes on the rent of land are extremely objectionable. It is, as already stated, quite impossible to separate rent into its elements, or to say how much is paid for the soil and how much for improvements. No two agriculturists ever arrive, in any case of this kind, unless by accident, at the same conclusion; and the best judges affirm that, generally speaking, the distinction is impracticable. When, therefore, a tax is laid on rent, it is necessarily proportioned to its gross amount, or to the total sum paid to the landlords, without regard to the sources whence it is derived. Inasmuch, too, as it is for the interest of all parties to conceal its amount, it is no easy matter to ascertain this gross rental. But, without laying any stress on this circumstance, a tax on rent is one of the least expedient that can be suggested. It has always been, and will unavoidably continue to be, a formidable barrier to improvements.

Then McCulloch says that even if the distinction could be made, a tax on rent would be unjust (1968, pp. 45-46):

If direct contributions for the public service be resorted to, they should, in as far as possible, be universal, and proportioned to the means of all classes of contributors. Governments should never abandon this fundamental principle or yield to exaggerated and fallacious estimates of the advantages to be derived from laying taxes on certain classes of individuals, or descriptions of income. All sorts of property which have been lawfully acquired should be considered as equally sacred and equally entitled to protection. It is true, as has been stated by Mr. Ogilvie [fn: *Essay on the Right of Property in Land*, passim] and others, that landlords, as such, are not producers, but merely receivers of income which would otherwise belong to the state. But a right of property in land has everywhere been coeval with the establishment of civilized societies; and to invade it, whether by depriving landlords of any of the advantages fairly resulting from its possession, or by making them contribute more than their fair share to the exigencies of the state, would be barefaced oppression and robbery.

McCulloch goes on to dispute the idea that a new nation such as Australia or the United States ought to retain public ownership of land and lease it. Such a practice, he says, would discourage improvement and result in neglect of land. The establishment of a right of private property in land, he says, is “the grand source of civilization,” inspiring love of country and posterity.

McCulloch rails against the Physiocrats’ assertion that land is the only source of wealth, and their proposal for a single tax on land. He estimated the gross annual rent of Great Britain and Ireland to be about £60 million in 1848 (based on income tax returns), while public expenditures were £73 million, so that a single tax on land would not raise enough revenue to finance government. In this calculation he appears to have taken no account of land that was cultivated by those who owned it, or of the rental value of urban land used for owner-occupied housing and businesses. But McCulloch would say that this proves nothing about the possibility of financing government from rent alone, because he believed that most of the income of landlords was a return to capital rather than land.

McCulloch acknowledges that the British tax on land has not obstructed improvements at all. But he believed that any increase in this tax would be wrong (1968, pp. 56-57):

We may regret, perhaps, that this tax was not more equally distributed, and its limits somewhat extended at the Revolution. But it cannot now be interfered with. It has been placed on its present footing for more than a century and a half; so that, whether it were at its establishment unwisely limited or unfairly assessed, has long ceased to be a matter of any practical importance. New rights, new interests, and new generations have grown up under the existing system; the lapse of time having completely obviated or sanctioned any defects in its original constitution. The landlords have long stood, in respect of taxation, on the same footing as the rest of the community; and can with justice be subjected to such taxes only as are laid on merchants, manufacturers, and other capitalists. It is obvious, therefore, that all projects for laying particular burdens on the land, however varnished or disguised, should no longer be looked upon as projects for the imposition of equitable taxes, but for the confiscation of a portion of the property of the landlords! If such flagitious schemes be ever entertained, they will form a precedent that will justify the repudiation of the public debt and the subversion of every right.

McCulloch mentions an instance in which local assessments were so high as to cause people to abandon land. He then lumps together taxes on rent and on the gross product of land (1968, p. 57):

The more, indeed, that their operation is inquired into, the more clearly it will appear that taxes proportioned to the rent or to the nett or gross produce of the land are the bane of every country in which they exist.

Nevertheless, McCulloch ranks different forms of taxes on land (1968, pp. 60-61):

But when, despite its inequality and other bad consequences, the imposition of a tax on land, or on the rent of land, is determined upon, the preferable plan is to estimate the value of land or the rent as fairly as practicable; and having done so, to make the assessment perpetual at a low per-centage upon such valuation, without ever varying the latter or the rate. Variations in the rate are least pernicious; but all uncertainty, either as to the valuation or the rate, inevitably discourages the employment of capital on the land, and depresses the most important branch of national industry. . . .

. . . [With respect to local taxes] the limitation of the rate is unluckily impracticable; but we shall do what is next best, if we declare that the valuation on which it is to be raised shall be a perpetual maximum; and that though, under certain circumstances, it may be reduced, it shall not, under any circumstances, nor in any case whatever, be increased. It is, of course to be understood that this limitation of the valuation applies only to land; for it will be afterwards seen that but little, if any, inconvenience arises from varying the assessments in the case of buildings, and such like descriptions of property.

McCulloch's positions on taxing land form a fascinating combination of standard analysis, reasonable new arguments, and outrageous errors. He is correct in observing that a tax on land that exceeds rent can drive people off of land. It is also true that an anticipation of the possibility of such a tax in the future can discourage investment. But it does not follow that the best tax on

land is a tax at a vary low rate on assessments that can fall but not rise. Such an argument makes no allowance for the fact that the opportunity cost of not increasing the tax on land and enduring a slight risk of discouraging investment is that either some other tax with serious harmful effects will have to be raised, or public expenditures will need to fall. And it makes little sense to endorse increases in assessments on buildings while condemning increases in assessments on land on the ground that they discourage improvements.

McCulloch's comments serve as a useful reminder that the consequences of a real tax depend not on logical consequences derived by theoreticians, but rather on the expectations induced by the actual behavior of those who administer the tax. Still, it seems exceedingly narrow-minded to suppose that it is not possible to devise instructions for those who administer a land tax that will allow increases in land value due to changing external circumstances to be taxed, while excluding increases in value resulting from capital improvements. It seems particularly strange that McCulloch should be unable to imagine justification for increasing assessments when increases in land value are often due to public expenditures. Perhaps this blindness comes partly from having considered "land" to be only agricultural land and not urban land. But the seemingly blind deference to the interest of those who own land might also be traced to the fact that McCulloch was, as described by the Dictionary of National Biography (1917, Vol. XII, p. 463), the eldest son of the laird of Auchengool, and thus presumably the owner of a significant amount of land himself.

John Stuart Mill

In his discussion of general principles of taxation, John Stuart Mill develops a variation of his father's argument with respect to a special tax on land. He argues (1965 [1848], pp. 819-21) that the rent of land increases as a result of the progress of society, and therefore the owners of land have no just claim to this increase in their income. He proposes a valuation of all land in the country. Upon revaluation at a later time, Mill suggests that it would be possible to estimate how much of the increase in the rental value of land was due to causes other than the efforts of the owners of land, and levy a tax on this base. He argues (1965, p. 821) that in making future increments in rent subject to special taxation, "every shadow of injustice to the landlords would be obviated, if the present market-price of their land were secured to them; since that includes the present value of all future expectations."

Mill's conclusion is not justified by economic theory. If the rent of land were invariably equal to the product of its sale price and the interest rate, then one might argue that every increase in rent or in the sale price of land represented an unanticipated windfall. However, there is no reason why people should expect rent to be invariant over time. Expectations of non-constant rents are reflected in sale prices that differ from the rent divided by the interest rate. Thus one cannot in general be sure that an increase in rent and in selling price is not something that an owner of land anticipated and bargained for, leading to a rate of current return on investment that was less than the interest rate in the years preceding the realization of the rise in rent and selling price. In these circumstances, a tax on the increase in the selling price of land has the discriminatory character that Mill condemned.

There is an argument for special taxes on increases in rent, suggested by Adam Smith and James Mill, to which this objection does not apply. To the extent that increases in rent and selling price are the result of government actions, taxing the increase is a reasonably unobjectionable form of tax discrimination. An owner of land might still say, "When I bought this land, I anticipated that a bridge would be built beside it, and paid for by others. I

acknowledge that I am better off having the bridge built and paying the taxes assigned to me than I would be without any bridge, but it is still unfair to require me to pay.” Such an argument is unlikely to be convincing. The general principle that might be proposed is that if it is permissible for society to decide to do X (not build a bridge), then it is permissible for society to decide to do any Y that makes everyone better off than with X.

Mill also argues (1965, pp. 821-22) that the existing land tax should be regarded not as a tax, but rather as a reservation of a part of the rent of land for the State, and therefore not a departure from the principle of equal taxation.

In his subsequent discussion of taxes on rent, Mill makes the standard argument that a tax on rent is paid entirely by landlords, provided that the return to improvements is properly excluded from the base, and that such a tax therefore has no other effects on an economy. However, he nevertheless opposes such a tax, saying (1965, p. 826), “A peculiar tax on the income of any class, not balanced by taxes on other classes, is a violation of justice, and amounts to a partial confiscation.” Thus he approves only of a tax on “a portion of any future increase [in rents] arising from the mere action of natural causes.” However, he argues that, “[E]ven this could not be justly done, without offering as an alternative the market price of the land.”

Mill appears to be saying, in other words, that to tax increases in rent justly, one must offer to buy all land from landowners at the prices that prevail at the time from which rent increases are to be taxed. If selling prices could be determined adequately, this more restrictive position would overcome to some extent the objection raised earlier regarding anticipations of future increases in rent. It would not deal with a person who predicts accurately that his land will have a high future value that current markets do not recognize and argues that this rise in rent is a return on his investment of effort in identifying profitable opportunities that others do not see.

Henry George

Henry George first set out his views on taxing land in a pamphlet titled “Our Land and Land Policy, National and State,” which he published in 1871 (George, Jr., 1960 [1900], p. 220). He elaborated his views in *Progress and Poverty* (1960 [1879]). George’s primary concern was not to devise a better tax system, but rather to explain why a growing incidence of poverty accompanied the maturation of a new society, and to offer a remedy for this phenomenon. From his experience in California in the 1850s and 1860s, he saw a causal connection between the rise in rent that accompanied progress and the concurrent fall of wages (George, Jr., p. 210). He viewed this as a result of an artificial scarcity of land caused by speculators withholding land from production. The remedy that George proposed (1960, pp. 403-07) was to abolish all taxes except for a tax on land values. He argued that this would make land more accessible to those who wanted to use it productively and make land speculation unprofitable. The greater accessibility of land and removal of other taxes would raise wages and lower prices, thereby raising the standard of living of workers.

Like the economists who preceded him, George argued that taxes on land were paid entirely by land owners and did not add to costs. What distinguished George from earlier writers was that, while Ricardo, James Mill, McCulloch and John Stuart Mill regarded the concentration of taxes on land as an unjust confiscation of property, George regarded it as just and proper, rectifying the error that had been made when individuals had been allowed to appropriate rent disproportionately. George took the position (1960, p. 334) that only human effort could create a right of ownership:

What constitutes the rightful basis of property? What is it that enables a man justly to say of a thing, "It is mine!" From what springs the sentiment which acknowledges his exclusive right as against all the world? Is it not, primarily, the right of a man to himself, to the use of his powers, to the enjoyment of the fruits of his own exertions?

George argued that, since no one made the land, people could claim only a right to the human improvements to land. All had equal rights to the value of land, which rights were properly recognized by public collection of the rental value of unimproved land from every possessor of land. However long land may have been held subject to little or no taxes, the claim of all to share in rent could properly be asserted at any time.

There is an obvious similarity between George's proposal and that of the Physiocrats. However, where George saw his proposal as one of restoring justice, the Physiocrats saw their proposal as a measure to increase the net incomes of land owners (which it would do if labor and capital were supplied perfectly elastically).

In stark contrast with McCulloch, George (1960, p. 418) held that the separation of the value of land from improvements was simple:

Were all taxes placed upon land values, irrespective of improvements, the scheme of taxation would be so simple and clear, and public attention would be so directed to it, that the valuation of taxation could and would be made with the same certainty that a real estate agent can determine the price a seller can get for a lot.

At the time that George wrote, the rental value of land in the U.S. was considerably greater than government spending. One of George's critics, as reported by Cord (1965, pp. 38-39), estimated in 1885 that a tax on land might produce revenues four times greater than government expenditures. George proposed leaving landowners with enough rent to give land titles some sale value (1960, p. 405), but collecting the preponderance of the rent of land whether it was needed for public purposes or not (1960, p. 406). (Using any surplus for a citizens' dividend would adequately dispose of any surplus.)

George's proposal leaves unaddressed the question of how the rent of land ought to be divided among levels of government.

Summary

The classical writers were unanimous in their agreement that a tax on land was paid entirely by the owners of land and had no detrimental effects on production, whether the tax was levied on sale value, rental value, or, like the British land tax, an arbitrary historical figure for each parcel. This conclusion was subject to the requirements that the tax be less than the rental value of the land and that the assessment procedure exclude all human improvements from the tax base. McCulloch was convinced that no such assessment procedure could be devised, George that such assessment was simple.

Ricardo said that the belief that land was suitable for special taxation would make the holding of land risky, thereby causing cultivators to be replaced by gamblers as holders of land. George said that land would tend to be held by speculators if it was not taxed. Since these propositions involve different premises, they are not contradictory.

Smith and James Mill said that land was particularly suited to special taxation when increases in land value were the result of government action. John Stuart Mill argued for a tax on

all future increases in land value, provided that owners of land were given the opportunity to sell their land at the price prevailing before the tax. McCulloch regarded any taxation focused on land as unjust and inexpedient.

Smith and George saw no difficulty with respect to justice in taxing land. George asserted, in fact, that justice required it. Ricardo, James Mill, McCulloch and John Stuart Mill, on the other hand, regarded it as unjust to subject land to new special taxation. James Mill regarded the taxation of land as highly appropriate for a new country. McCulloch thought any new country should replicate the land ownership institutions of England, regarding the attachment to land as an important source of social stability. George saw the same virtue in recognizing equal claims to the value of unimproved land.

3. The Mathematics of Rent, Land Value 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 time t , $t \leq i$.
$R(t)$	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 $R(t)$. The net return from a site at time i , $N(i, t)$, depends on the time, t , when use of the site began. The rent of a site at time i , $R(i)$, 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 can be defined in terms of N by

$$R(t) = N(t, t) - \int_t^{\infty} \left[\frac{d}{dt} N(i, t) \right] e^{-r(i-t)} di \quad (1)$$

That is, if one starts with an unimproved site at time t , the cost of leaving the site unimproved is the return that could be earned from immediate use at time t minus the present value of the change in all future returns that results from postponing the start of use of the site.

The rent of a site can also be specified in terms of the site's changing selling price, as the present value of the cost of postponing the date from which a user has use of a site:

$$R(t) = -\frac{d}{di}S(i,0)e^{-r(t-i)}\Big|_{i=t} = rS(t,0) - \frac{d}{dt}S(t,0) \quad (2)$$

A discrete version of this definition was introduced in Tideman (1990, pp. 342-43). The first term of the derivative in (2) is the cost of postponing the start of a given flow of income, and the second is the cost of the change in the size of the flow that comes from postponement. It can be seen from (2) that if a site is appreciating at the interest rate, then there is no cost to postponing use, and its rent is zero.

If rent can be defined either by (1) or by (2), then the two should be equal, and they are. This emerges from manipulation of a general expression for the selling price of an untaxed site:

$$S(t,0) = \int_t^{\infty} N(i,t)e^{-r(i-t)}di \quad (3)$$

Differentiating (3),

$$\begin{aligned} \frac{d}{dt}S(t,0) &= \int_t^{\infty} \left[\frac{d}{dt}N(i,t) + rN(i,t) \right] e^{-r(i-t)}di - N(t,t) \\ &= \int_t^{\infty} \left[\frac{d}{dt}N(i,t) \right] e^{-r(i-t)}di + rS(t,0) - N(t,t) \end{aligned} \quad (4)$$

Substituting from (4) for $d/dt S(t,0)$ in (2) yields (1), establishing the equivalence of (1) and (2).

When an ad valorem tax on land at a rate of a is introduced, (3) becomes

$$S(t,a) = \int_t^{\infty} [N(i,t) - aS(i,a)]N(i,t)e^{-r(i-t)}di \quad (5)$$

That is, the present value of all future taxes is capitalized into the selling price of land. It is worth noting that this analysis takes no account of how the proceeds of the tax are used. In any practical application, it would be important to ask whether the rental value of land was increased by services financed by the tax.

Equation (5) seems to suggest that the determination of a current selling price of a site would require that the selling price at every future time be determined first. However, a simplification is possible. Differentiating (5),

$$\frac{d}{dt}S(t,a) = \int_t^{\infty} \left[\frac{d}{dt}N(i,t) \right] e^{-r(i-t)}di + rS(t,a) - N(t,t) + aS(t,a). \quad (6)$$

Substituting from (1) and combining terms,

$$\frac{d}{dt} S(t, a) = -R(t) + (r + a)S(t, a). \quad (7)$$

The general solution to differential equation (7) is

$$S(t, a) = \int_t^H R(i) e^{-(r+a)(i-t)} di + S(H, a) e^{-(r+a)(H-t)}, \quad (8)$$

where H represents the horizon of the time period under consideration. This may be verified by differentiating (8) and observing that (7) is obtained. When H is ∞ , (8) becomes

$$S(t, a) = \int_t^H R(i) e^{-(r+a)(i-t)} di. \quad (9)$$

Thus the selling price of land that is subject to an ad valorem tax can be expressed as the present value of future rent, discounted at the sum of the interest rate and the tax rate. It is important to note that the rent employed in (9) is not the income received from use of the site, but rather the opportunity cost of leaving the site unused, as specified in (1).

The fraction of the value of land that is taken by an ad valorem tax at a rate of a can be expressed as

$$\frac{S(T, 0) - S(t, a)}{S(T, 0)} \quad (10)$$

If $R(i)$ is constant, then (10) is $a/(r + a)$. If $R(i)$ grows at a rate of g , then (10) is $a/(r + a - g)$. Thus an ad valorem tax falls more heavily on land that is growing in value than on land that has a constant value.

With this background in the mathematics of taxing land, the discussion of modern views can proceed.

4. Land Speculation and the Timing of Development

From the perspective of the classical theory of maximizing behavior, there is something strange and apparently unwarranted about George's concern with land speculation. The owner of any asset should be expected to seek to employ it in such a way as to maximize the present discounted value of future returns. If the owner of a parcel of land leaves it unused, classical maximizing theory would suggest that this should be regarded as part of a plan by the owner for optimal use of the land through time. Efficient use of developed land requires durable immobile structures. It would be wasteful to build these before they can be used, so it should be expected that land will be undeveloped for some span of time before it is used intensively. The incomes of land speculators come from undertaking successfully the socially valuable activity of determining the best time for land to be developed. This position was taken by Ely (1920).

One might also question whether it would be possible for taxes on land to affect the amount of land speculation. If a tax on land is levied in such a way that there is no action that the owner of land can take that will affect the amount of the tax, then how can the tax affect the owner's choice between developing land now and developing it later? This position was taken by Davenport (1917).

The way that taxing land can reduce the amount of speculation was clarified by Brown (1927), who pointed out that the participants in a market can have different beliefs about the future, and that taxation can affect the relative value of land to persons with different beliefs. In particular, land taxation takes some of the gain that would otherwise accrue to those who leave land undeveloped because they foresee rises in rent that others do not foresee, thereby generating greater reductions in the value of land for those who foresee rises in rent of land than for others.

This point is worth developing in some detail, using a model somewhat different than Brown used. Suppose that there is a site near a mine, which would be a good place to put a restaurant for the miners. But it is not certain how much ore is in the mine, and therefore what the demand for restaurant services will be. Whatever the amount of ore, the mine will be worked for just two periods; the site will have no value after the second period. If the ore that has already been discovered is all that will be discovered, then there will be 100 workers in period one and 100 in period two. The best use of the site is then “Plan A,” building a small cafe, which will generate a net return to the site of 100 in each period. It is possible that at the end of the first period, a second seam will be discovered, leading to the use of 400 workers in the second period. If it were certain that that would occur, the best use of the site would be “Plan B,” operating out of trailers for the first period and building a large restaurant for the second period. This would lead to a net return to the site of 50 for the first period and 400 for the second. If Plan A is undertaken and the second seam is discovered, then the return in the second period is 200, because the cafe can adjust by accommodating more customers and raising prices. If Plan B is undertaken and the second seam is not discovered, then the best use of the site in the second period will be to continue to use the trailers and achieve a return of 50 in the second period. The possibilities can be considered as a two-by-two game against nature, as shown in Figure 1. (No discounting is done here because discounting does not affect the issues that are addressed in this model.)

Figure 1: Returns in First and Second Periods as Functions of the State of Nature and Action Taken

	No Discovery	Discovery
Plan A	100, 100	100, 200
Plan B	50, 50	50, 400

If some people believe that the discovery will occur and others that it will not, then the land will be most valuable to those who believe that the discovery will occur, and Plan B will be implemented.

Now suppose there is a tax that collects 80% of the rent of land. What effect, if any, will this have on how the site is used? As with the continuous-time model in the previous section, the rent of land for one period in this discrete-time model is the opportunity cost of leaving land unused for the period in question, assuming that the land will be used in any subsequent periods. Thus the rent of this site must be identified first for the second period, and then for the first.

If the discovery is not made, the rent for the second period will be 50, because operation with trailers will then be the best use of the site. If the discovery is made, the rent will be 400. For

people who believe that the discovery will not be made, the rent of the site for the first period is 150, because this is the amount that must be added to the second period rent that they expect, to generate a total of 200, the net return to the site under Plan A. For people who believe that the discovery will be made, the expected rent of the site for the second period is 400, so the amount they would bid for the first period is 50. Since those who believe the discovery will not be made have the higher bid, their bid determines the rent in the first period. Thus the tax is 120 in the first period and either 320 or 40 in the second period, depending on whether or not the discovery is made. Thus the net returns after taxes are as shown in Figure 2. The return from Plan A for those who expect no discovery is now greater than the return from Plan B for those who expect a discovery, and Plan A will be implemented. Thus the tax has changed the use of the land. Note that this tax-induced change in the use of the land occurs independently of what is actually most efficient, that is, whether the discovery will actually occur. Thus, in a world with non-uniform beliefs, a tax on rent can either improve or worsen the allocation of land.

Figure 2: Net Returns in First and Second Periods after an 80% Tax on Rent, as Functions of the State of Nature and Action Taken

	No Discovery	Discovery
Plan A	-20, 60	-20, -120
Plan B	-70, 10	-70, 80

This rather surprising result can be regarded as a consequence of a lack of complete markets. The proponents of Plan A and Plan B have different beliefs about the rent of the site in the second period. In a world with complete markets, these disparate beliefs would be arbitrated through the determination of a market-clearing probability of the discovery, and hence a market-clearing expected rent in the second period. If the probability of the discovery is p , then the expected return from Plan A (in the absence of land taxes) is $100 + 200p + 100(1 - p)$. The expected return from Plan B is $50 + 400p + 50(1 - p)$. These two quantities are equal if $p = 0.4$. If p is greater than 0.4, then plan B has the greater expected return. If p is less than 0.4, then Plan A has the greater expected return.

The expected rent of the site for the second period is $400p + 50(1 - p) = 50 + 350p$. With complete markets, a person who was considering implementing Plan A could purchase for this price an insurance policy that would pay the rent in the second period. The rent that such a person would be willing to pay for the first period, believing that the probability of discovery is p , would be $100 + 200p + 100(1 - p) - 50 - 350p = 150 - 250p$. For a person who planned to buy an insurance policy to pay the rent in the second period and implement Plan B, the first period bid would be $50 + 400p + 50(1 - p) - 50 - 350p = 50$. The first-period bids of those who contemplate Plan A and those who contemplate Plan B are equal if and only if $p = 0.4$.

Thus with complete markets, the market for insurance policies to pay the second year's rent yields a price that informs people in the first period whether Plan A or Plan B is better (in terms of the market-clearing probability that the discovery will be made). Without complete markets, those who believe the probability of rise in the value of land is high trade on that knowledge by

buying land. The concern of Brown (1927) was that this concentrates land in the hands of those who have the most extreme beliefs about future rises in land values. In a variation on the theme of the winner's curse (Milgrom and Weber, 1982), such persons may generally experience less than normal returns. But in the process, they create an artificial scarcity of land for current use, thereby shifting the curse to society.

Ely (1920) was correct in saying that there is a socially valuable service to be performed in identifying the optimal time of land development. But it does not follow that institutions that award all of the rent of land to private owners provide the best possible incentive for the performance of that service. If identifying the optimal time of land development is a service, it is because people differ in their ability to foresee future opportunities. The social value of withholding land that would otherwise be developed is measured by the increase in total return that becomes possible by virtue of the fact that land has not been developed. In the example above, if the discovery is going to be made, then, from Figure 1, the social value of using Plan B rather than Plan A is $450 - 300$, or 150. However, the private value (with respect to this one site) of knowing that the discovery will be made, if everyone else believes that it will not be made, is $450 - 200$, or 250. Awarding all of the increase in value to the person who makes the decision to withhold land from development would equate private and social returns only if early development would eliminate all of the gains that the currently unforeseen possibility would allow. The excess of the private return over the social return not only concentrates land in the hands of those who have the most extreme opinions about future possibilities, but also induces an inefficient flow of resources to the activity of trying to be the first one to perceive future opportunities. This kind of distortion with respect to discovering opportunities has been discussed previously by Paul Samuelson (1957) and Jack Hirshleifer (1972).

A tax on rent reduces the gain from being the first one to perceive future opportunities. If it is high enough, as in Figure 2 above, the tax can make it unprofitable to bid land away from premature development. As with most situations in the economics of discovery, it is difficult to devise a set of institutions that provides the right incentives. The level of taxes on rent that would reward only efficient expenditures of resources in identifying future opportunities depends on how much of the gain from unforeseen opportunities is lost by premature development.

Even if all gain from identifying future opportunities were eliminated by taxes on rent, there might be a market for the services of those with unique abilities to foresee future opportunities, in the form of a service that forecast future rents reliably. The person planning to implement Plan A in the example could be saved from a costly mistake by purchasing an accurate forecast of the future rent of the site.

Mason Gaffney (1961, 1973) identified another way in which the taxation of land can improve the allocation of resources. He pointed out that taxing land can improve the efficiency of land development decisions by mitigating the effects of friction in the lending market. Land, he suggested, is an investment that commends itself to investors with low discount rates and high opportunity costs of their time. It requires little attention; unlike investments in on-going enterprises, land is unlikely to fall greatly in value as a consequence of neglect. Potential users of land, on the other hand, are likely to be people who have above-average discount rates. Because of the combination of differing capacities of borrowers to offer collateral and the difficulties in identifying borrowers who will be good risks, an equilibrium can persist in which competing bidders for land have quite divergent discount rates. In such circumstances, the taxation of land ameliorates the variation in discount rates. The taxes are capitalized into lower purchase prices, so the tax has the effect of substituting a recurring annual charge for a one-time charge. This makes land relatively more attractive to people with high discount rates and

relatively less attractive to people with low discount rates. At the margin, this will shift land out of the hands of people who are likely to leave it idle, and into the hands of people who are likely to develop it. Since this circumvents friction in the lending market, the consequent earlier development of land is more efficient.

A number of writers have argued that an ad valorem tax on land can shift the profit-maximizing time of development for a given owner of land, even with perfect markets. Some of these arguments involve logical errors. Some analyze a tax that is levied only on undeveloped land. Others analyze a tax that varies with how land is developed. That such taxes should alter the timing of development is not at all surprising. Among these arguments, there is none that is valid and applies to a tax that is independent of how land is used and when it is developed. An excellent review of these arguments can be found in Kris Feder's doctoral dissertation (1993).

That a tax that does not vary with how land is used does not alter the timing of development (with perfect markets) is a simple consequence of the fact that 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. However, so many mistakes have been made in analyzing such a tax, and some of these have been copied by so many other writers, that it is worth identifying the errors in some of the most prominent papers in this tradition.

The idea that a tax on land could shift the optimal timing of development even with perfect markets seems to have originated with Donald Shoup (1969, 1970). He analyzed a situation in which a site yields no return prior to development, and the return that can be achieved depends on when land is developed. Considering first a situation without taxes, Shoup said (1970, p. 37):

. . . let $V(T)$ stand for the development value of the land at any future time T if it is developed in its highest and best use at time T

. . . If there are no operating expenses and no interim rent receivable for the use of the land in the period preceding the time of development, the present value (at time t) of the land, $P(t, T)$, for any future development date, T , is given by the formula

$$P(t, T) = V(T)e^{-r(T-t)}, \quad t < T \quad (1)$$

where r is the (instantaneous) rate of discount applicable in the real estate market.

There is an ambiguity and a possible mistake in this statement. Two true statements, in standardized terminology introduced in the previous section, are

$$V(t, 0, T) = C(T, 0) e^{-r(T-t)}, \quad t < T \quad (11)$$

and

$$S(t, 0) = C(T^*, 0)e^{-r(T-t)}, \quad t < T. \quad (12)$$

In other words, the present value of returns associated with future development at any specified time can be computed by discounting the present value of returns from the time of development

back to the present. But the sale value of the site is found by discounting returns from the optimal time of development back to the present. For Shoup's statement to be true, he would have to mean by $P(t, T)$ and "the present value (at time t) of the land," the present value of returns associated with a particular plan and not the sale value of the land.

Shoup showed that at the optimal time of development, his $V(T)$ would be growing at the interest rate. This is true. Shoup (1970, p. 38) then introduced

ad valorem property taxes which are (or ought to be) levied on land as a fixed proportion of its market value. Let us assume that the tax is levied each period as a fixed percentage, a , of the market value of the land in the same period, and that the development value of the land, $V(t)$ [that is, in standardized notation, $C(T, a)$], is figured after all taxes. Then equation (1) is altered to

$$P(t, T) = V(T)e^{-r(T-t)} \int_t^T aP(i, T)e^{-r(i-t)} di. \quad (5)$$

For this to be a true statement about an ad valorem tax, the $P(i, T)$ in the integral must be $S(i, a)$ in standardized terminology, the sale value of the site at time i . However, the $P(i, T)$ on the left hand side, as indicated above, must be not sale value but rather $V(t, a, T)$ in standardized terminology, the present value of future returns associated with a particular plan. At a minimum, Shoup's terminology does not distinguish properly between these concepts, and he may have made a conceptual error.

Shoup showed that with the tax, his $V(t)$ would grow prior to development at a rate equal to the sum of the interest rate and the tax rate, so that the after-tax return would be the interest rate. This is true. Shoup then concluded (1970, p. 39):

Thus the effect of the property taxes on vacant land is to bring development when the rate of increase of the development value, $V'(T)/V(T)$ [that is, $C'(T, a)/C(T, a)$ in standardized notation], of the bare site equals the sum of the interest rate and the tax rate. It is interesting that the difference between this optimal development timing condition and the one found previously in the absence of a land tax is one sense in which even a pure site value tax may not be perfectly neutral in its effect on resource allocation, as is frequently claimed.

It is true, as Shoup says, that when land is taxed, the rate of growth of the after-tax value at the optimal time of development is the sum of the interest rate and the tax rate. However, this does not entail a shift in the timing of development, as long as the tax is a true ad valorem tax. Shoup seems to have believed that the rate of growth of value at any point in time would be the same with the tax as without it. This is not true. The introduction of an ad valorem tax on land changes the sale value and the rate of growth of sale value at each point in time; the time when the condition for profit-maximizing development is satisfied remains unchanged.

To see this, note first that the present value of future returns net of taxes can be found by subtracting taxes from the present value of future returns in the absence of taxes. Thus

$$C(T, a) = C(T, 0) - \int_T^\infty aS(t, a)e^{-r(t-T)} dt. \quad (13)$$

Thus the rate of growth of C , taking account of taxes, is

$$\frac{\frac{d}{dt} \left[C(T, 0) - \int_T^{\infty} aS(t, a)e^{-r(t-T)} dt \right]}{C(T, 0) - \int_T^{\infty} aS(t, a)e^{-r(t-T)} dt}. \quad (14)$$

At T^* , $C'(T, 0)$ is $rC(T, 0)$, so (14) is

$$\frac{rC(T^*, 0) - r \int_{T^*}^{\infty} aS(t, a)e^{-r(t-T^*)} dt + aS(T^*, a)}{C(T^*, 0) - \int_{T^*}^{\infty} aS(t, a)e^{-r(t-T^*)} dt} \quad (15)$$

which is

$$r + \frac{aS(T^*, a)}{C(T^*, a)} = r + a. \quad (16)$$

Thus the rate of growth of developed value net of taxes, at the time of development that is optimal in the absence of taxes, is the sum of the interest rate and the tax rate. The shift of development that Shoup discussed to the time “when the rate of increase of the development value, . . . of the bare site equals the sum of the interest rate and the tax rate” is no shift at all.

If one interprets $P(i, T)$ in Shoup’s equation (5) as $V(i, a, T)$ in standardized notation, to be consistent with the terminology on the left side of the equation, then what is described is not an ad valorem tax, but rather a peculiar tax that has been the subject of much inadvertent theorizing, though there is no evidence that any legislature ever sought to implement it. Under this tax, an assessor would be told to assess undeveloped land not according to its sale value, but rather according to the present value of a forecast of its price when developed. This means that an owner of land could change the tax that was currently owed by changing the date for which development was planned. This makes no sense. Nevertheless, because such a tax comes up so often in discussion of land taxes, it is necessary to have a name by which to refer to it. Such a tax will be called a tax on the present value of planned net income, or PVPNI.

The assessment of developed sites on the basis of PVPNI would involve a different set of complications. An assessor would need to determine how much of the value of the combination of land and improvements should be attributed to the improvements. The residual would be the value of the site. But any attribution of value to improvements that cannot be economically removed from a site, other than what the improvements add to a previously determined value of the site, would be arbitrary. If, as in the real world, unanticipated changing circumstances generate fluctuations in the value of the combination of land and improvements, any independent attribution of value to improvements would be even more dissociated from economic meaning. Shoup avoids this problem by not modeling improvements explicitly.

Because of the conceptual problems with both undeveloped and developed land, a tax on PVPNI is a theoretical construct that does not correspond to any real or plausibly potentially real tax.

A kernel of truth in Shoup's analysis is that a tax on PVPNI is non-neutral. With such a tax, it is possible to lower one's tax liability by selecting a plan with a lower present value of planned net income. That a tax whose magnitude can be changed by tax-payer action should be non-neutral is not at all surprising.

Athanasios Skouras (1978) had a different interpretation of Shoup's work. He analyzed a tax on undeveloped land that ceased as soon as land was developed and described such a tax (p. 130) as "the concern of Shoup's analysis." This interpretation of Shoup is hard to justify. It seems clear that Shoup had in mind a tax on land that continued after land was developed, because otherwise it would be pointless for him to mention that development value was figured net of taxes. Skouras shows that the tax he analyzes brings development forward, to the time when the rate of growth of developed value in the absence of a tax is equal to the sum of the interest rate and the tax rate, thus reaching the conclusion that Shoup seems to have thought followed from his analysis.

Skouras criticized Shoup, saying,

Shoup's conclusion that "the effect of the property tax on vacant land is to decrease the value of the land but to increase its rate of appreciation" is very misleading. There is no reason why the tax should affect the rate of appreciation, which depends on development potential. What the tax does is to increase the rate of appreciation required if a site is to remain undeveloped. In other words, the tax accelerates land development.

This criticism would be valid if Shoup had analyzed a tax that ceased when land was developed. However, a continuing ad valorem tax on land does both decrease the value of undeveloped land and, while it is economical to hold it undeveloped, increase its rate of appreciation. But it does not accelerate land development.

Michael Owen and Wayne Thirsk (1974) developed a model similar to Shoup's, but without referring to Shoup. They defined $P(0)$ as the present value of land, $V(t)$ as "the net-of-tax expected value of land in period t in its highest and best use" and b as the tax rate. To characterize the optimal time of development, they differentiated

$$P(0) = \int_0^t -bP(i)e^{-ri}di + V(t)e^{-rt} \quad (17)$$

and showed, as Shoup did, that the rate of growth of the price of land at the optimal time of development would be $r + a$. And like Shoup, they asserted (p. 252) that this involved a forward shift in the timing of development. But then they criticized the conclusion on the ground that "it suggests that current landowners would be able to shift some of the burden of future property taxes onto future purchasers of land." To make sense out of this puzzling comment one must presume that Owen and Thirsk had been assuming (strangely) in their earlier analysis that the selling price of land would not be affected by taxes on land. In any case, Owen and Thirsk then developed an equation in which post-development taxes were subtracted from their $V(t)$. Thus it seems that they meant to define $V(t)$ not as the net-of-tax value of land, which they said, but rather as the gross-of-tax value. Thus Owen and Thirsk said that the true expression for the sale value of land is

$$P(0) = \int_0^t -bP(i)e^{-ri}di + V(t)e^{-rt} - \int_t^{\infty} bP(i)e^{-ri}di. \quad (18)$$

If $V(t)$ is a gross-of-tax value, the tax described here falls prior to development on sale price and after development on what the sale price would be in the absence of taxes. This makes no sense as a tax and it also falsifies their subsequent assertion that $P(T) = V(T)$ when T is the development date. On the other hand, if $V(t)$ is a net-of-tax value, then Owen and Thirsk have subtracted taxes twice.

Owen and Thirsk made a further mathematical error when, in differentiating (18) with respect to t , they neglected to take account of the fact that t appears in limits of integration.

Brian Bentick criticized the Owen and Thirsk analysis. Bentick said (1979b, pp. 545-46):

. . . the model provides only one use for the land and this use does not commence until some time T . Therefore land must remain vacant until this time.

This interpretation of Owen and Thirsk is unjustified. While the Owen and Thirsk definition of $V(t)$ is ambiguous, it is hard to see how anything they said provides a basis Bentick's inference that they are assuming, in standardized notation, that $V(T, a, T) = 0$ for $T < T^*$.

In reply, Thirsk (1979) said that he and Owen did not intend to assume the condition that Bentick attributed to them. He said that what they meant by $V(t)$ was the sale value of land in the absence of taxes. This is clearly not what they said, although it does justify their assertion that taxes needed to be subtracted from their first result. However, this still leaves them with a bizarre tax and mathematical errors.

Bentick (1979b, p. 546) went on to say:

Now introduce property taxation into the model: [Owen and Thirsk] do this by correctly subtracting from [1] the capitalized value of all the taxes levied between 0 and time T , and of all taxes levied from time T thereafter. They then go through the above present value maximization exercise which I have argued is inappropriate, . . .

While Bentick's words here are somewhat ambiguous, it appears that he has endorsed the double subtraction of post-development taxes.

Seeking to overcoming what he saw as the principal limitation of the Owen and Thirsk analysis, Bentick (1979a, pp. 861-63) developed an example of the effects of taxing land that incorporated a choice between just two development possibilities:

Consider a piece of land which may be used in two alternative projects, 1 and 2. Project 1 offers the land immediate rentals of \$1.00 per year in perpetuity, while project 2 offers higher rentals of \$ c in perpetuity, but only after a gestation period of T years. . . . [P]roject 2 will be selected if

$$e^{-rT}c/r > 1/r \quad (1)$$

. . .

Now impose . . . an annual wealth tax, . . . at rate b , which is based on the current market value of land. Investors will now require a gross rate of return of

$r + b$ in order to continue enjoying a net return of r , and capitalization of the tax will cause the present values to decline so that project 2 will have to pass the more severe test

$$e^{-(r+b)}Tc/(r+b) > 1/(r+b) \quad (3)$$

...

It is incorrect for Bentick to equate a wealth tax with a tax on land. And his example of two development possibilities is more limited than the continuum of possibilities that Shoup used and Owen and Thirsk contended that they used. However, if Bentick's analysis were correct, the two possibilities might show the effect more clearly than a continuum. But the analysis is not correct. Inequality (3) is inappropriate because it assumes that the tax is not an ad valorem tax, but rather a tax on PVPNI. The tax varies, depending on which development option is chosen. If the tax is an ad valorem tax, Bentick's inequality (3) has no bearing on which project is more profitable.

Citing Bentick, Mills (1981, p. 125) said:

[T]hat part of the property tax which falls on unimproved land is widely thought to be neutral. . . .

This view of the tax on land is badly mistaken. It is true that a (less than 100 percent) tax on land income is neutral, but this does not extend necessarily to a tax on capitalized land value, or changes therein.

In Tideman (1982) I criticized both Bentick (1979a) and Mills (1981), on the ground that they were implicitly assuming that the value of land could be something other than what it would be worth if it were unimproved. Bentick (1982, p. 113) replied,

I agree . . . that . . . the current market value of a site is the price at which it would sell if it were not committed to any particular activity, and that this is the highest present value of net income streams that begin with bare land today. . . .

My original article shows that a tax on the market value of land is not neutral between uses of land which are *mutually exclusive*.

The last sentence is not true because the analysis did not follow the rule that the previous sentence endorses. In subsequent personal communication Bentick has indicated that he now understands that his non-neutrality result is a consequence of having computed taxes in such a way that they are affected by the choice of how the land is used.

Mills (1982) replied, accepting the neutrality of a true ad valorem tax, while saying,

The point of my previous note stands, however: when land value is computed (appraised) to include rent accruing to irrevocable previous commitments, the nature of induced non-neutrality is to favor land-uses with early-payoff income streams.

If this is an assertion that a tax on PVPNI is feasible, it can be challenged. But the statement could be interpreted as making the point that it is possible that assessors, who are supposed to

assess land according to the value it would have if unimproved, are influenced by the development decisions that owners of land make, and if such a bias in assessments is predictable, it motivates premature development.

It would not be necessary to spend so much time on erroneous theory except for the fact that these papers have become widely cited and followed. For example, after citing Bentick and Shoup, Douglas (1980, pp. 291-92) said:

As previously stated, it has been (and still is) commonly believed that the site value tax is neutral. The model presented in the previous section shows this is not true as long as the pattern of development can be altered to bring rental income nearer to the present. The key to the result is that, because of the lock-in effect produced by a development project, land value in a future period may be determined in part by the existence of capital on the land in that period.

Yukio Noguchi (1981, p. 20), citing Bentick, said, “Foresters have long recognized that the classical proposition that a tax on land value is neutral does not hold in an intertemporal setting.”

Edward Mathis and Charles Zech (1982, p. 3) said, “Mills [1981] . . . identifies two market distortions inherent in the real property tax: the traditional one that penalizes improvements and another which favors properties with early payoff income streams. The implementation of [land value taxation] eliminates the first distortion but enlarges the second.”

A. R. Prest (1985, p. 102), citing Bentick, said, “The consensus would now seem to be that [land value taxation] will not be neutral, at least in certain circumstances, in that it will provide an incentive to convert land to higher uses sooner than in the absence of the tax.”

William Fischel (1982, p. 253), citing Bentick and Mills, said, “The property tax on undeveloped land raises the holding costs of farmers and other speculators . . . and may tempt them to sell too soon for a low-density use that cannot then easily be reversed.”

Richard Ellson and Blain Roberts (1986, p. 477), citing Bentick and Shoup, said, “Value-based taxation favors near-term projects relative to far term.”

Vel Pillai (1987, p. 45), citing Bentick, said, “It is true that a tax on the value of land . . . may be non-neutral if, for example, (1) the time profiles of future income streams from various parcels of land differ from each other.”

Geoffrey Turnbull (1988, p. 557), citing Bentick, said, “[B]ecause land-value tax does not synchronize tax payments with rental receipts over time, it distorts the relative present values of mutually exclusive land uses . . . and alters development decisions.”

If any of these writers realized that they were discussing the properties of a tax on PVPNI rather than a tax on the value that land would have if it were unimproved, they do not make it clear.

Other writers have understood some or all of the errors in the “non-neutral land tax” tradition. David Wildasin made the source of the non-neutrality conclusion clear. He said (1982, p. 105):

[I]f one defines some *use independent . . . standard value*, a tax on this standard value will be equivalent to a use-independent per unit tax, and thus neutral. This does not contradict the Bentick-Mills conclusions because these authors consider taxes on the *current market value* of land and because, . . . physically homogeneous units of land will in general have values that differ over time depending on use.

While Wildasin's description of what must be done to achieve neutrality is correct, his description of the Bentick-Mills tax base as "the current market value of land" is not accurate. Their tax base is the present value of planned net income. To describe this as "the current market value of land" is to suppose that there is a market in which it is possible to observe the net returns from the planned use of land. But no such observation is possible. What can be observed is the current market value of the combination of land and improvements. Any attribution of value to land alone, other than what the land would be worth if it were unimproved, is hard to justify.

Wildasin (1982, p.107) also mentioned that a tax on the current rental income of land is non-neutral if tax rates change from year to year, because investors will tend to choose income streams that are heavy in years when taxes are light. While this is true, a tax on the rental *value* of land as defined by [1] or [2] is neutral even if rates change from year to year, because this definition is independent of how land is actually used. A tax on the rental *income* from land, even if rates are constant, is likely to be non-neutral in practice, because of the difficulty of separating the realized return to land from the returns to capital and entrepreneurship.

Steven Bourassa (1992, p. 110) said:

Bentick shows mathematically that the effect of a land tax may be to give the stream of land rents from the immediately developable project the higher present value. If it were correct, Bentick's result would be significant because it shows that taxes on land are not neutral in their allocational effects. . . .

Upon examination, however, it becomes clear that Bentick's analysis is incorrect. The fatal problem with his analysis is its confusion regarding the normal base for taxes on land.

The effects of any real tax on land, of course, depend not on theoretical calculations, but on the behavior of those who administer the tax, and on investors' expectations about their future behavior. What economic theory can show is that there is a set of instructions for those who administer a land tax that, if anticipated and followed in a world of perfect markets, would motivate owners of land to use it in the same way that they would use it if there were no tax. In a world of imperfect markets, taxing land can offset some of those imperfections and produce more efficient land use than is attained in the absence of the tax.

To summarize the discussion of the effects of land taxes on land speculation and the timing of development, land taxes discourage land speculation by reducing the value of land to those with extreme beliefs about its future value, by reducing the return to investments in discovering what land will rise in value, and by raising the value of land to those with high discount rates, relative to its value to those with low discount rates. A tax on PVPNI would create a bias toward early development of land, but an ad valorem tax on land creates no such bias.

5. Consequences of Income Effects of Taxing Land

One of the ways in which a tax on land can affect an economy is by changing the distribution of initial endowments, and hence, through income effects, changing the quantities and prices in the efficient equilibrium of the economy. A general feature of the redistribution of initial endowments that is entailed in taxing land is that resources are redistributed from the current generation to generations that have not yet been born. The current generation responds

by saving more, and future generations do not respond in the short run because they have not been born yet. Nichols (1970, pp. 336-37) says:

Taxing rents should lower the price of land and therefore the amount of capital gains on land which result from economic growth. To satisfy the same saving motives as before the tax was imposed will require an increase in the rate of capital accumulation.

The increase in savings that Nichols mentions occurs not only from the diminution of gains from holding land in a growing economy, but also from the one-time reduction in wealth from the initiation of a tax on land, even if the economy is static.

Martin Feldstein (1977) traces the effect on saving of taxing land in an overlapping generations model. In this model, a tax on land lowers the aggregate value of assets in which people can invest, which increases the demand for capital, and hence increases investment. The increased investment lowers the interest rate, which raises the value of land and thus shifts at least part of the land tax from owners of land to owners of capital.

Feldstein asserts that under some not implausible values of parameters, the effect on interest rates is great enough to make owners of land better off after the tax than before. However, Chamley and Wright (1987) show that the rise in the price of land can be at most one half of the tax on land.

Feldstein emphasizes that the effects he identifies, because they operate through income effects rather than substitution effects, do not qualify as distortions. There is no deadweight loss involved. It is also noteworthy that Feldstein's model is of a closed economy. If a tax on land is implemented in a small, open economy (e.g., a single city), there would be no impact on interest rates, and the consequences that Feldstein identifies would not arise.

Feldstein (1977) also discusses an effect of land taxes that operates through risk aversion and portfolio composition. A tax on land, he says, lowers the value of land without changing its relative riskiness. With the value of land diminished, investors would not be satisfied with the large percentage of their portfolios that would be held in the form of capital, and would therefore bid up land prices, thus again shifting some of the tax. Wolfgang Eckart (1983) also discusses this effect, but adds the qualification that if the tax on land is used to finance an invariant level of expenditures, with the tax rate changing to offset any fluctuations in land prices, then there is no risk associated with the tax. The only effect of the tax is to reduce the wealth of those who own land at the time that the tax is introduced. The portfolio selection effect disappears.

Calvo et al. (1979) note that Feldstein's result disappears if it is assumed that people have utility for the utility of their children and therefore make bequests to them, and that the proceeds of the tax are returned to citizens in either the older or the younger generation.

The models used by Feldstein and by Calvo et al. have only one kind of consumer. Feldstein mentions in passing (1977, p. 350) that his results would not apply if landowners were a distinct class. It is reasonable to speculate that the strong neutrality results of Calvo et al. would not persist if land were held by individuals with different levels of wealth, and the proceeds of the tax were not returned to citizens in proportion to their land holdings. As Fane (1984) points out, there is nothing surprising about the conclusion that lump-sum redistributions of income alter relative prices.

Fane (1984) also explains how Calvo et al. could have reached the conclusion that Feldstein's model (without bequests) yields some shifting of even a compensated tax. He says that Calvo et al. must have had in mind a situation in which a tax is levied and the proceeds are then returned to citizens period by period. A truly compensated tax, he argues, would involve

the government issuing perpetual bonds at the same time as it levied the tax, using the proceeds of the tax to pay the interest on the bonds, and using the proceeds of the bonds to make lump-sum payments to the owners of land at the time the tax was introduced. Such a scheme would have no effect on the equilibrium of the economy. Fane's truly compensated tax would also have no portfolio effect, since the bonds would substitute for land in portfolios.

The principal conclusions that can be drawn from the discussion of income effects of taxing land are that higher rates of saving can be expected and that part of the tax may be shifted. But such effects entail no inefficiency, and they do not arise if those who are taxed receive benefits corresponding to the taxes they pay. It is reasonable to conjecture that if a model along the lines of the ones discussed in this section included a labor-leisure choice as well as a consumption-saving choice, then, in addition to promoting saving, an uncompensated tax would raise output by inducing people to forego some leisure.

6. The Adequacy of Land Taxes for Financing Local Public Goods

Up to this point in the review, taxes have been considered primarily in isolation, without connection to the public services they might finance. It is as if taxes were exactions that must be tolerated, without any rationale. It might be hoped that in a democracy at least, taxes would entail a quid pro quo of public services that were worth at least as much as the taxes needed to pay for them.

With local public services, the ability to benefit from public spending depends on being close to the place where the spending occurs. This increases demand for land in the vicinity of places where public services are provided, raising land rents. Private production activities with marginal costs less than average costs share with public services the quality of requiring a subsidy if the efficiency of pricing at marginal cost is to be achieved. If in addition, the activity is one that, because of transportation cost or some other consideration, yields a lower benefit to those who are more distant from it, then that activity will also raise rents in the vicinity of the place where it is conducted. In recent years, economists have noted that for activities with distance-related benefits, there are interesting conditions under which the presence of an activity, whether it is a public service or a private production activity with marginal cost less than average cost, raises rent by enough to pay the difference between total cost and the sum of marginal costs at the efficient level of output. An excellent review of this literature can be found in Mieskowski and Zodrow (1989, pp. 1135-40).

The modern discussion of this subject started with Harold Hotelling, who suggested (1938, p. 242) that:

. . . taxes on incomes, inheritances, and the site value of land . . . might well be applied to cover the fixed costs of electric power plants, water works, railroads, and other industries in which the fixed costs are large, so as to reduce to the level of marginal costs the prices charged for the services and products of these industries.

It is puzzling that Hotelling would put income taxes and inheritance taxes in the same category with taxes on the site value of land, since only the last of these has no dead-weight loss, but in any case his paper initiated the discussion of the relationship between rents and subsidies to achieve marginal-cost pricing.

The more modern literature on relationships between rent and spending on activities with distance-related benefits addresses at least three distinct questions:

1. For a given population, what happens to rent as activities vary?
2. For a given pattern of activities, what happens to the relationship between rent and subsidies as population varies?
3. When population and activities are both optimized, what is the relationship between rent and subsidies?

Smolensky et al. (1970) provide an analysis that bears on the first question, though they did not address it directly. They discuss the efficient size and spacing of a local public facility, in a model in which the facility has a zero marginal cost of use, housing density is uniform, all households have the same demand for the facility, and use of the facility entails a travel cost that is proportional to distance traveled, with travel possible only in two perpendicular directions. With zero marginal cost of use, efficient use requires a zero marginal payment for use. With density assumed to be invariable, financing can be provided efficiently by lump-sum charges on either households or land; the two are equivalent. Smolensky et al. show that efficient provision requires size and spacing of the facility such that the gross benefit of a household that is most distant from a facility, on the boundary between the areas served by two facilities, is equal to the average net benefit. Thus a system of financing that equalized net benefits would involve no payment by households on the boundary between service areas, and the net benefit of every household, after paying its assigned share of costs, would be equal to the gross benefit of households on the boundary.

The model developed by Smolensky et al. does not include determination of the rent of land. However, with identical consumers, differential rents must reflect variations in net benefits. Thus the collection of differential rents provides exactly the amount of money necessary to provide the efficient level of the service.

Flatters et al. (1974, pp. 101-02)) explore a version of the third question, the problem of choosing the population size and level of consumption of a local public good that will maximize utility of identical citizens. There are no distinctions among locations within a city in the model that Flatters et al. use; what offsets the ability to spread the cost of the public good among additional citizens is diminishing marginal productivity of labor. Flatters et al. show (1974, fn. 3, p. 102) that when the utility of citizens is maximized, “all land rents are devoted to public good production and all wage income to private goods production.”

Vickrey (1977) considers an economy in which every city occupies a strip of land along a shoreline. There is more shoreline than is needed for cities, and land outside cities is assumed to have no value. The social cost of the land used by each activity is the addition to the transportation cost of the goods that are carried past the activity. Therefore if transportation cost is proportional to distance, the sum of transportation costs is equal to the total rental value of all land. Transportation cost is assumed to vary with the square of output, but this does not lead to infinitesimal plants, because larger plants permit the spreading of fixed costs. To achieve prices equal to marginal costs, firms need subsidies equal to their fixed costs. But under Vickrey’s assumptions, fixed cost is equal to transportation cost when average total cost is minimized, and the sum of transportation costs is equal to the sum of land rents, so that the sum of land rents is exactly equal to the sum of the subsidies that are needed to achieve marginal cost pricing. Thus Vickrey (1977, p. 339) proposes the “GHV” (George-Hotelling-Vickrey) Theorem:

In an economy of efficiently organized cities in a state of perfect competition with each other, the aggregate of the land rents (calculated as the marginal social cost of holding land)

generated by the urban agglomeration produced by the existence of activities with economies of scale within the city will equal the subsidies required to enable these activities to sell their output at prices equal to their respective marginal costs.

Vickrey then discusses reasons for thinking that this equality between the sum of rents and the sum of subsidies that efficient firms need to achieve marginal cost pricing will persist as various special conditions he has assumed are relaxed.

Vickrey (1977, pp. 342-43) also discusses a way in which surplus rent might be eliminated by labor mobility combined with competition among cities:

A more interesting concept would be that of a limited labour force, freely mobile among cities. Expansion of the scale of cities, and, possibly, the establishment of new cities, would lead to an increase in the demand for labour, and an increase in its wages, represented in this model by the level of the input coefficients to the labour supply activity, representing an increase in the supply of consumer goods necessary to produce a unit of labour for use in other activities in the city. Full competition among cities would, in this instance, lead (a) to the elimination of any new land rents to landlords, over and above the amounts taken to finance the fixed costs; and (b) to the transfer of this surplus, plus the additional surplus generated from the increase in efficiency to labour, at least in the case where there is no shortage of city sites and, hence, conceptually free entry for additional cities.

Arnott and Stiglitz (1979) clarify some of the logical relationships surrounding the equality of rents and public goods expenditures. An equality between rents and public goods expenditures produced by optimizing population is labeled by them the Henry George Theorem. They consider an economy of identical individuals who receive utility from lot size, a private good and a pure public good that is not congestible. Individuals are assumed to make a fixed number of trips to the center of an urban area and to have tastes such that everyone lives on a lot of unit size. Individuals compete for land which is auctioned by the government, with the proceeds of the auctions used to finance the public good and any residual divided equally among residents. Arnott and Stiglitz show that, for any level of spending on the public good, if the city has a population that maximizes per capita utility given that level of spending, then differential land rents will equal spending on the public good. In this case, differential land rent is the excess of rent above rent at the edge of the city. Arnott and Stiglitz then show that for an arbitrary distribution of the population with respect to some characteristic that parametrizes their utility functions and an arbitrary relative density function, as well as an arbitrary level of spending on a public good, it continues to be true that when population is optimized, the sum of differential rents is equal to spending on the public good. They note that this equality does not in general hold for an economy of multiple cities, because it is not in general possible to divide a prescribed number of people into a whole number of optimal sized cities.

The above result is achieved not by competition, but rather by population assignments by a planner. Arnott and Stiglitz (1979, p. 487) mention a working paper (Stiglitz, 1978) in which conditions under which competition achieves the planning optimum are identified. These conditions are:

1. Costless migration;
2. Freedom to form new cities on islands that are not scarce, with the right to exclude potential residents;

3. An economy large enough that each person regards the utility of non-residents as exogenous;
4. A combination of economies and diseconomies of scale resulting in optimal cities of a positive, finite size; and
5. Homogeneous land.

Arnott and Stiglitz (1979, p. 488) summarize their results as follows:

. . . in all large, Pareto optimal spatial economies in which differential land rents are well defined, the Henry George Theorem holds. Whether the Henry George Theorem holds in a competitive economy depends on, among other things, one's view of what constitutes competitive behavior in a spatial economy.

Arnott and Stiglitz (1979, p. 488) mention that the Henry George Theorem does not hold if differential rent is not well defined, as when land rent is not uniform along the city's boundary. I would conjecture that in this case, for a city with an optimal population, spending on the public good lies between differential land rent defined relative to the minimum and maximum values of rent at the boundary of the city.

Arnott and Stiglitz distinguish the Henry George Theorem from relationships that can be derived between differential land rents and the value of local amenities for a given population. The Henry George Theorem specifies an equality between land rent and spending on a public good when population is such as to maximize per capita utility, in a large economy in which the spatial distribution of economic activity is Pareto optimal and differential land rents are well defined. The capacity of differences in land rents to reflect differences in the value of public services, on the other hand, is derived from an assumption of perfectly mobile individuals with identical preferences. Arnott and Stiglitz (1979, pp. 494-96) show that when individuals vary in their valuations of amenities or disamenities, land rents systematically understate the value of amenities and overstate the cost of disamenities.

Variations in preferences would not cause impacts of amenities on rent to deviate from their aggregate value if people had preferences that fit discrete types, and there were enough people of each type to fill a whole number of cities of an optimal size. Both because people are not perfectly mobile and because there is a continuum of preference types, impacts on rent do not measure aggregate value perfectly. In the long run, people get some consumer surplus not reflected in rent from valuing the services they receive more than unsuccessful bidders. In the short run, the fact that people are not perfectly mobile means that when public services change, some people will incur moving costs to obtain services more suited to their preferences, and others will endure less than optimal locations because the potential savings are less than moving costs.

Tideman (1990, p. 349) mentions a further condition that would be needed for land rents to provide a perfect measure of differences in the value of local public services: Capital would need to be either perfectly mobile or not at all durable. (Capital is not incorporated in the Arnott and Stiglitz model.) As with the absence of perfect human mobility, the lack of perfect capital mobility means that the value of capital can fall (or rise, though this would be less common) because of a change in the services provided to a site.

These departures from the conditions needed for rent to reflect the value of services mean that not all efficient services can be financed by the increases in rent that they generate. They also mean that an ideal evaluation of the efficiency of a change in public services, or in a private

activity receiving a public subsidy, would be based on the sum of the change in land rents, the change in the value of immobile capital, and the change in the population's "locational surplus," that is, the amounts they would pay not to have to move from the area.

7. The Ethics of Taxing Land

A simple Benthamite approach to the ethics of taxing land would say that since taxes on land have the capacity to raise revenue without harming economic incentives, and actually improve allocation in some cases, they are good. As much revenue as possible should be collected from taxes on land before other taxes are considered. It must have been precisely because they were aware of this argument that Ricardo and McCulloch gave arguments with respect to justice for not concentrating taxes on land. More complex arguments arise when the taxation of land is considered from an ethical perspective.

An examination of the ethics of taxing land must give separate consideration to three different sources of the rent of land:

1. The value attributable to nature;
2. The value attributable to public services;
3. The value attributable to private activities.

Even if it is not possible to specify how the value of a given site might be divided among these causes, the ethical evaluation of taxes on value attributable to the different sources leads to different types of taxes.

Taxes on the Value of Land Attributable to Nature

What is meant by the value of land attributable to nature is the value of agricultural land that is not near roads or towns, as well as the value that land near natural harbors and other specially attractive features would have if they were not developed.

The strongest ethical argument for a special tax on the value of land attributable to nature is George's assertion that all persons have equal rights to the gifts of nature. Opposing this argument is the assertion of Ricardo and McCulloch that because long established institutions have assigned land rights to individuals, any special tax on land is unjust. George (1960, p. 339) replies that there has never been a power capable of granting a just title of exclusive ownership of land. The vast preponderance of land titles were created by unjust coercion. Collecting taxes on land is the righting of injustice.

Careful replies to this argument are rare. More common have been such responses as the Duke of Argyle's description (quoted in George, 1946 [1892], p. 55) of George as "such a preacher of unrighteousness as the world has never seen," and his ideas as "immoral doctrines" and "profligate conclusions." In a more temperate vein, Frank Taussig (1916, p. 106) said of the movement to collect more rent for public purposes:

Though the principles which underlie it are among the most settled in the theory of economics, they bring a shock to the common notions about the sanctity and stability of real property; and their application involves a disturbance of the common ways of dealing with real property.

George does indeed call on people to depart from a settled way of thinking. But that is not a

reason to reject his ideas.

One way of bringing coherence to objection based on property rights being settled is to call on the modern theory of rent-seeking (Krueger, 1974). When entitlements can be shifted by political success, societies will waste resources on efforts to organize political coalitions. It may be better to accept an unjust arrangement than to allow the battle over entitlements to continue. But such thinking would have left us with segregated schools, unenfranchised women and slavery. Societies need an avenue by which they can give recognition to their evolving moral progress.

The rent-seeking argument can be acknowledged while still accommodating new understandings about what justice requires for entitlements. A distinction between ordinary legislation and the process of constitutional amendment serves this function. The fifth and fourteenth amendments to the U.S. Constitution forbid the taking of property without just compensation. And yet the thirteenth amendment abolished slavery and prohibited any state from compensating those who had been called the owners of slaves. These provisions are consistent with the idea that any new understanding of the requirements of justice that eliminates all of the value of some assets can be implemented only through the constitutional process, with its greater guarantees that the change truly is a new understanding and not merely a rent-seeking success (Tideman, 1988).

A different sort of response to George is offered by Murray Rothbard (1982, chs. 9-11), who agrees that all unjust seizures of land, no matter how old, should be rectified, but asserts that the first person to transform land usefully acquires a right to its use in perpetuity. This perspective at least avoids the hypocrisy that is entailed when those who have land as the result of fighting say there should be no more fighting over land. But Rothbard's ethic is unattractive in other ways (Tideman, 1991, pp. 112-13). It provides incentives for the inefficient premature development of land and leaves no route by which some of what nature provides can be preserved undisturbed, even as a private park.

Some people reply to George by bringing up a hypothetical case of an elderly widow who has no way of supporting herself except from the rent of land purchased with her husband's hard-earned money. Collection of the full rental value of land would cause her to starve. There are two ways in which this objection can be answered. First, it is widely agreed that there are social obligations to provide for those who are unable to provide for themselves. There would be a social obligation to provide for the widow in some way if she had invested all her money in companies that failed. Second, when a society discovers that it has not been recognizing the rights of some persons, the new recognition of rights must lead to losses by some persons. If the cost of the "moral accident" of failing to recognize rights is assigned to those who would have benefited from the continued failure to recognize them, then people will be motivated to think carefully about the sustainability of the claims they purchase (Tideman, 1988, p. 1720).

Another possible response to George is the assertion that those who were born well after social institutions cannot have birthrights to land because the contingencies that led to their births would not have occurred under other institutions. But such an argument could be used to justify slavery, or any mistreatment of children by parents who chose to have children for the purpose of mistreating them.

Taxes on the Value of Land Attributable to Public Services

The argument for taxing the value of land attributable to public services goes back to Adam Smith's comment (1937, p. 796) that:

Nothing can be more reasonable than that a fund which owes its existence to the good government of the state, should be taxed peculiarly, or should contribute something more than the greater part of other funds, towards the support of that government. To collect through taxation the addition to the rental value of land that is attributable to public services is only to require people to pay for what they receive.

If there is an ethical argument against such a tax, it would be based on the idea that the exchange is compulsory rather than voluntary. Even this argument would not be valid if people were perfectly mobile and capital were either mobile or non-durable. To put the matter another way, because people are not perfectly mobile, it is possible for some people to be made worse off by changes in public services that are financed by the increases in rent that the services produce. The possibility of moving at some cost places an upper bound on potential harm from such rent-financed services. But such an upper bound must reflect not only the monetary costs of moving, but also the loss of utility from parting with familiar territory.

The ethical reply to this is three-fold. First, if there are going to be public services, their financing will have to come from somewhere. Financing public services by taxing the increases in rent that they generate has the virtue of approximating a benefits-based financing system. Second, if there are any personal characteristics such as age that are accepted as bases for discriminating among citizens and are believed to be correlated with benefits, holding location constant, then lump-sum compensation to those who are made worse off by changes in services can be provided. It is only those whose losses are not explainable by any acceptable basis of discrimination that must endure uncompensated losses. Finally, the decision to live in a polity with others can be regarded as agreement to take one's chances with respect to the possibility that future changes in public services will not be worth as much as their tax cost. Communities can have differing rules regarding the circumstances under which public services are changed, to accommodate varying attitudes toward the risk of such losses. For these reasons, the collection of rent to finance public services stands on quite a firm ethical foundation.

Taxes on the Value of Land Attributable to Private Activities

If there is a system of paying those who undertake activities that raise land rents according to the rises in rents that are attributable to their activities, then the collection of these rent increments to finance such subsidies has the same ethical basis as the collection of rent increments generated by public activities. If there is no such system, then the ethical basis for collecting these rent increments is akin to that for taxes on the value of land attributable to nature. These increments of rent are not due to actions of the landholders, so landholders cannot justly complain if the increments are collected publicly.

Ethical Conclusion

The most difficult aspect of the ethical principles underlying social collection of the rent of land, as Taussig said, is that "they bring a shock to the common notions about the sanctity and stability of real property." The accommodation of this shock in a changed perspective is referred to among advocates of Henry George's ideas as "seeing the cat." This expression originated in a speech by Judge James G. Maguire in the late 1880s, in support of Henry George's ideas (Post, 1930, pp. 12-14).

Maguire reported an occasion when he came upon a painting in a store window that

appeared to be a landscape, though a sign below it said, “Do you see the cat?” A group of people was looking at the painting, among whom one, described by another as a crank, insisted that what appeared to be a landscape was actually a cat. Maguire inquired of the crank how he could claim that the painting was a cat, and the crank replied by identifying a bird as one of the cat’s ears, a twig as an eye and so on. But Maguire could still see only a poorly drawn landscape. The crank said that the space between two branches was the cat’s tail. Maguire was about to say that there was no cat’s tail there, when suddenly the whole cat stood out before him, and he was thereafter never able to see anything in the picture but the cat. Thus the idea that nearly all the rent of land can and should be collected socially involves a rearrangement of perceptions into a new conception of a harmonious social order. This is the basic ethical challenge of the proposal that nearly all of the rent of land can and should be collected publicly.

8. Conclusions

Taxes on the sale value or the rental value of land are efficient in a world of perfect information because the amount of the tax that is due for any site is independent of any action that the owner of the site might take.

In conditions of imperfect information, these taxes discourage land speculation by making land unattractive to persons with extreme beliefs about the future value of land. It seems likely that this discouragement of speculation is in general efficient, although it can be inefficient if those with extreme beliefs are correct or if the tax makes it not worthwhile to acquire information that would save more in improved allocation than the cost of acquiring the information.

Taxing land also shifts land from persons with low discount rates to persons with high discount rates, mitigating capital market imperfections and probably shifting land from speculatively idle assignments to active use.

Taxing land can change the equilibrium of an economy through income effects on those who pay the tax. The general direction of such effects is to encourage more saving and, presumably, more work effort. These effects do not arise when land is taxed to provide additional public services that are worth what they cost, or if the proceeds are returned to persons who make bequests. The income effects would arise if a land tax were substituted for an income tax, because those who paid would be alive to respond, while many of those who were net beneficiaries would be unborn.

Efficient local public services (or efficiently subsidized private activities with distance-related benefits) raise surrounding land rents by enough to pay the difference between total costs and the revenue from marginal cost pricing, provided that tastes are standardized and other factors are perfectly mobile. The fact that tastes are not standardized means that some benefits will not be reflected in rents. The fact that people and capital are not perfectly mobile means that these factors are affected, generally negatively, by changes in services.

Taxes that fall solely on land raise different ethical issues, depending on whether one considers the component of rent due to nature, the component due to public services or the component due to private activities. To place a special tax on the component of rent due to public services is only to require people to pay for what they receive. If private activities are subsidized according to the rises in land rents that they engender, then these have the same ethical basis. The ethical basis of a tax on the component of rent due to nature is that people have an obligation to share the provenance of nature equally.

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