Land Rent, Taxation, and Public Policy:

*The Sources, Nature and Functions of Urban Land Rent**

By MASON GAFFNEY

I

RENT, TAXATION, AND THE ECONOMISTS

NOT MANY YEARS AGO, mention of taxing ground rent was likely to evoke at best pleadings of ignorance, usually well founded, and at worst scorn and rage, similarly founded. More recently, many economists have set out to dispel the ignorance. Netzer (1966)†, Harriss (1968), Gaffney (1962, 1964), Schwartz and Wert (1958), Clawson (1962), Hulten (1966), and Alyea (1967) have written on urban taxation in the United States. Turvey (1957) has written in the English context; Holland (1965), Lindholm (1965), and Kaldor (1963) in the developmental. McDonald (1965) and Gaffney (1967, 1966, 1965) have written on taxing rent from exhaustible resources; Brewer (1961) and Henley (1968) on rural land taxation. Clark (1965), Rawson (1961), and Groves (1948) have written on experience in Canada and Australia. A complete modern bibliography would go on for pages.

These modern restatements have a distinguished ancestry. Most economists are aware that the classical economists wrote seriously and favorably about taxing rent. Smith (1776) and Mill (1872) were advocatory, followed by Say (1830), Senior (1928), and Cairnes (1873). Ricardo (1911) stated the rationale curtly in his Chapter 10, "Taxes on Rent."

It is less well known that many neo-classical and interwar period economists argued for taxing rent. These were the years when the topic was dominated by the protagonistic personality of Henry George, who attacked economists as Mandarins and won their enmity. Marshall (1967) and Walker (1888, 1891) (1) debated him bitterly—yet they wrote lucidly of the advantages of taxing land and rent. Harry Gunnison Brown (2) is known as the advocate in this period, and is often thought to have stood alone. Many economists will be surprised, therefore, at the favorable

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treatment by Pigou (1949), Carver (1932), Graham (1942), Hotelling (1938), Hayes (1919–20), Bye and Hewett (1939), Trevelyan (1907), Zangerle (1927), Heaton (1925), and Simpson (1932). The interest of John R. Commons (1961), the institutionalist was particularly strong; he was an active political partisan.

On the continent, the contentious prose of George paled beside the florid Gallic advocacy of the father of the sober-sided art of mathematical economics, Walras (3). Another land-taxer was Wicksell (1958).

Naturally there have been also noncommittal writers, those reserving judgment, those wanting limited or modified taxation of rent, and so on. Among these are Anderson (1914), Simon (1959), Fisher (4), Wald (1959), Seligman (1913), the Hickses (5), Heilbrun (6), Jensen (7), Scheftel (1916), and Haig (1915a, 1915b, 1917).

There has also been the negative. Outright skeptics and critics include Cannan (1907), Edgeworth (1906), Hoxie (1915) and Darwin (1907), who emphasized the problem of street congestion. King (1921, 1924) objected to distinguishing land value increments from other speculative gains, as did Knight (1953). Ely (1922, 1930) objected to forcing unripe suburban land into premature use. A. Johnson (8) and Davenport (1917) took the opposite tack, that private collection of land value increments stimulated outmigration and building. V. Johnson and R. Barlow (1954) emphasize distributive inequity and regressivity. Ratcliff (1950) denies the possibility of defining ground rent, as do Keiper *et al.* (9). Kurnow (1959) believes the base to be inadequate.

The topic has not, then, been altogether neglected, as often thought. It has recurrently commanded the interest of economists over at least two centuries and continents. It has, however, been neglected in the senses that it is much bigger than the little treatment it has received, and even that little is not widely known. I will not review here the literature, nor reopen old debates, but will survey the topic, emphasizing several new issues and approaches, with a view to affording some notion of how vast the field really is and how much work is needed. In this and a subsequent paper I will treat the social functions of urban site rent; the necessity of taxing rent for it best to serve its social functions; alternative ways of taxing rent; and intergovernmental relations.

II

URBAN LAND RENT: MEANING, SOURCES, AND FUNCTIONS

A. *Meaning.* Essentially, rent is the net product of land after deducting non-land costs. It includes imputed service flow as well as cash flow, of

course, with the former assuming primary importance today because it is exempt from income tax.

There is a host of definitional details in applying the simple basic concept of rent. In respect to time, "rent" is originally an annual concept based on the yearly repetitive cycles of farming. Most urban ground rent, even under static assumptions, derives from an irregular stream of costs and revenues over the life of a building. To be sure, the ubiquitous parking lot yields yearly and even daily and hourly ground rent with a minimum of intertemporal dependence of costs and revenues. But most urban rent must be discovered by first forecasting the life of buildings; then discounting costs and revenues to the present; and finally multiplying this present value by the capital recovery coefficient (10), which converts to a level annuity over building life.

Under dynamic assumptions the definition of rent becomes even more interesting. Building lives must be foreshortened to allow for progressive locational obsolescence, to release the site for a series of higher and higher future uses. Land income now consists of two parts: simple ground rent from first-generation buildings; and value increments from the temporal approach of higher future rents. R. T. Ely developed his theory of "ripening costs" to justify postponing land improvement in this condition, but there was no pretense of rigor in his analysis, which was innocent of any real capital theory (1921, 1922, 1930). The Lutzes (1951) have applied capital theory to a parallel analytical problem and reversed the conclusion, I believe correctly. This correct determination of optimal life yields also a correct definition of rent.

In respect to quantity, additional land around a building yields increasing and then diminishing net service flows, so one need usually distinguish marginal from average net productivity, except in an equilibrium when all latent plottage has been realized by replatting. Even in this equilibrium, outlying incremental square feet are less productive to a land-using householder or firm than central ones, and as a whole unit expands, added subunits become marginal in location as well as quantity. All these little details need to be tidied up and specified in defining rent for any particular purposes (11).

The purpose of social policy, to which this paper is oriented, is generally best served by defining rent as the highest latent opportunity cost of land. Ideally, this rent would be charged against all land uses so as to eliminate all marginal extensions of land holding, in space or time, whose marginal service flow fell short of the marginal social cost.

There is a lingering tradition of regarding rent as a "residual." Al-

though economists generally recognize that residual and direct imputation are equivalent, the old idea persists. It is a poor convention. It makes of rent a wastebasket for the mistakes of managers and the slothfulness of heirs. Landowners dealing with lessees are more importunate: rent is due periodically with the passage of time, regardless of land use. Owner-occupants leasing land from themselves need to apply the same principle. If an owner fails to profit from good land, it is not the land's fault. For social as for private accounting, land should be imputed the highest available latent opportunity cost. Like the lawyer, its time is its stock in trade. Land-time is worthy of its hire—that is rent. Land as such is passive and unresponsible. It yields its service flow by being owned and available. It is always an input to its owner's economy, regardless of output. Actual use is a function of ownership and management.

Neither should land be regarded as a risk-bearing agent. Land is a flow resource, not a fund of circulating capital which can be depleted to meet losses. Land is best regarded as a hired factor, like daily labor, to which the capitalist employer advances "subsistence" (12). The owner demands regular payment, in advance of product completion and consumption. The great Wicksell nailed down this point (13). Landowners who lease land to building owners on long terms for level annual payments—the most common arrangement—confirm the point (14). The reason that common parlance and perception often confuse the landowner function with the capitalist function is that the functions are usually joined in the same person. Imputation of rent requires a functional analysis, however. Functionally, the owner of capital hires land and advances rent. Capital then carries the product over time, absorbing risk for better or worse. It is capital that is embodied in a product irreversibly, losing any scrap value commensurate with its previous value, while land retains a scrap value in general equal to its previous value—an unlosable measure and meaning of opportunity cost. It is capital whose return is meaningfully "residual."

If it is not already obvious, these definitional details assume great importance when we later ask how best to tax "rent," and what effects to expect. They assume great importance when we ask how much of urban property income is "rent." If the above definitional detail be used, the estimates of urban rent and land value made by Goldsmith (1962) and Kurnow (1959), often cited and relied upon, are meaningless. The allocation between land and buildings made by most tax assessors is meaningless. If rent is the latent opportunity cost of land, then most current operating income from property in older central cities is rent.

B. *The Sources of Rent.* Land rent is the joint product of three things: natural features, public spending, and private activity by others than the landowner.

Natural features include location at a natural confluence of routes, amenities, bearing strength, drainage, and so on. Non-economists, including many planners and engineers, often go overboard attributing all value to such natural features, with no regard for travel savings and mutual access. Economic model builders have a weakness for the other extreme, because time-distance is fun to model. The market plods ahead and resolves the several forces, disregarding unbalanced advice. Many economists, happily, are now developing models and evidence weighing and balancing various determinants of urban rent and value (Mills, 1967, 1968; Harriss, Tolley and Harrell, 1968; Shenkel 1968; Crocker 1968; Ridker 1967).

Public spending is essential to establish and maintain land tenure. Initially the public armed forces appropriated land for the nation; they now maintain sovereignty. In marginal outposts where American-owned land has been confiscated (Chile, Cuba, Guatemala, Mexico), or might be (Saudi Arabia, Philippines), the point is hard to miss, much as many would like to. Local police are equally essential: imagine collecting rent in Harlem without them. In this age of riots and rent strikes, looting, loitering, and absentee landlords, the need for hired force to maintain property institutions not commanding universal spontaneous compliance is all too clear.

Public spending also supplies works and services that add to land rent. Indeed, the entire net benefit from many public works is to be found in the added rents they create. Other public works, like water supply or power lines (where these are public) yield added revenue from user charges. In setting the level of user charges, the debate often, indeed customarily, proceeds without recognition that Newton's third law must apply, *i.e.,* for every added user charge there is an equal and opposite reaction in the form of lower rents on the limited land served. Fortunately the marginal cost pricers are bringing to increasing audiences this basic law of conservation of economic energy, which Hotelling (1938) made so clear.

A portion of what the world calls "land value" is produced by the landowner himself, as when he subdivides and pays much of the initial capital cost of streets. This still occasions some confusion in defining rent. But Marshall (1947) solved the dilemma long ago with his concept of "the public value of land." (See also Pigou 1949). What is rent depends on what the public does free for the landowner. If the public does nothing

there is no added rent from this source (15). A good working definition of rent is: that amount which could be taxed away without impairing any useful incentive.

Under current practice around American cities, some subdividers have to contribute something like $2,000 to the value of the finished lot, which may be from 10 to 100 per cent of its market value, depending on location. Clearly true land value is only the excess above this cost, and rent is the annual equivalent of land value. The landowner whose land income is all rent is he who just uses frontage along an existing public road. Taxation of rent would hit the latter harder than the subdivider, and it would help avoid the noxious pattern of sucker (16) driveways strung out for miles along trunk roads.

The private share of street improvements is overestimated by some analysts who look simply at the landowner's initial capital cost. After that, the public assumes maintenance, repair, snow removal, policing, and finally replacement. In most neighborhoods the original landowner's early contribution is long gone and may as well be forgotten. The landowner does continue to contribute in his capacity as a taxpayer; but not unless his tax payments get ahead of the service flows received back can he claim to have a net credit in creating rent.

Public authority today also gives—or denies—rent through control of land use by zoning. Where zoning is limiting, a monopoly rent attaches to it; and where this is appurtenant to land it may as well be regarded as part of land rent. The power that influential people have to get preferred zoning in a variety of places is temporarily another form of monopoly rent; but once exercised, it too becomes appurtenant to land.

A third source of urban land's productivity is complementary private activity on other land significantly linked to a given parcel. Positive spillover benefits, cumulating and reinforcing, are emphasized by urban economists as what cities are all about. Urban gravitation, magnetism, agglomeration economies, scale, critical mass, increasing returns, external economies, and now symbiosis and synergism are common terms for the phenomenon. I will use the last, indicating an interacting process where the whole comes to exceed the sum of its parts. The excess is rent.

Marshall (1947) and George (1879) perceived it long ago. Florence (1955), Futterman (1961), Thompson (1965), Gaffney (1958, pp. 503–07), and Chinitz (1964), among others, have eulogized it recently. E. M. Hoover (1948) sought to summarize the causes in three basic principles: multiples, massing of reserves, and bulk transactions. "Multiples" refers to specialization and subcontracting; "massing-of-reserves" to pooling of

supplies through mutual access; "bulk transactions" to large scale transfer and handling. Interpreted very broadly these spare words may be intended to subsume a host of gains from urban size and concentration, but it is probably not redundant to itemize cheaper distribution; greater markets and tax base to share the cost of—and warrant greater investments in—developing the city's basic locational assets, and supplying unique facilities and services. Larger markets also serve to whet competition, to maximize choice and variety, to foster innovation, to pool risks and maximize load factors, to improve credit, and to facilitate all human contact for economic, social, and political ends. Nothing short of several thousand pages can really convey the full force of urban synergism. The first thousand might profitably be the Yellow Pages. But Adam Smith captured the essence in one phrase, "The division of labor is limited by the extent of the market."

Frank H. Knight (1953) and other critics of the rent concept have emphasized how much of land rent is a "human product." But mark well the confusion in identifying the individual landowner with all humanity. Rent is the product of people, it is true, but they are other people than the rent collector. The human contribution to rent is given through public spending and synergistic spillovers.

Summing up, urban land rent derives from natural advantages, public spending, and synergism. It may be defined operationally as that which may be taxed away without impairing any functional economic motivation. So defined, it comprises a large share of the income of urban real estate.

C. *Economic Functions of Urban Land Rent.* Most prices and factor payments serve two functions: to elicit supply; and to ration it among competing demands.

Rent serves only the second of these. It is not that the supply is fixed, although the supply of natural advantages is fixed. Public spending and synergism both add to the want-satisfying service flow of land. But privately collected rent does not elicit public spending (except dishonestly). Neither does rent on one parcel stimulate private activity on other parcels of the sort that radiates synergistic spillover benefits. The synergistic part of urban rent is created, like the British Empire, in fits of absentmindedness; not aforethought by those who receive it.

High urban rents do cause fringe landowners to reallocate farm land to urban use. Some interpret this as "eliciting supply." But from an overall view, this is clearly part of the function of rationing the fixed land supply among competing uses. The city only gains what the farm loses.

Many words have been wasted over whether land supply is fixed or

elastic. The answer is in one's definitions and terms of reference, which need to be specified. The present subject is taxation of urban rent. In this context, an elastic supply is one that flees a jurisdiction in response to taxation. Taxing jurisdictions are defined as areas of land, from which land cannot, by definition, flee to escape taxes.

If anything, land supply rises due to taxing it. Higher taxes give the public more to spend to enhance the rentability of land. Taxes also increase the public motive to spend to create more rents, since taxes return a share of rent to the agency that creates it. We shall also see presently that taxing land rent may activate inert land. The resulting increased private activity spills over synergistic surpluses onto neighboring land, adding to real service flows from land (17). In view of these matters, land taxes do not erode their own base but tend to increase effective supply.

The function of rent is to ration land among competing demands. The tax authority must take care to announce (in Pigou's sense) taxes in such a way as not to impair this function. Rent communicates the economic signal letting no one believe that open space is a free good. It constrains owners to economize not just on nature's gift of raw space, important as that is; but also on the other factors that give land its value. These are public spending, and spilled-over synergism. The first obviously costs money. The second may seem "free" like nature; but it is, again like nature, scarce, and must be economized.

Indeed, the natural limit on land supply makes it the more important that rent be charged to ration land, to assure that mankind receive the maximum benefit from what land there is. Intensifying land use is a substitute for adding to land supply. When this function is obstructed, as by rent control or low-density zoning, the supply will not go around. The needed extra land may then be supplied, at enormous social cost, by extending urban infrastructures into the country. Charging market rents on central lands would supply it at no social cost.

Ely and Wehrwein described rent as the "sorter and arranger" of land uses, pursuing von Thünen's model where rent withholds central land from lower uses in order that they not interfere with higher and better ones. This only begins to indicate the rationing function of rent, however. Rent not merely sorts commerce from industry, it is much more subtle. It determines the optimal intensity of each use.

Intensity is the quotient of non-land inputs divided by output. It has several dimensions. An obvious one is height. High rent ordains high buildings. Marshall expounded the rationale artfully. Beginning with a high building, hold floor space constant while you cut the height and ex-

pand horizontally onto a larger site (all this in the planning stage, of course). Thus you lower building cost but increase land cost, with constant output. Optimal height is where the marginal saving of capital from adding land equals the price of land (18).

Another dimension of intensity is, of course, quality. Rent constrains people to enjoy their luxury in the form of better and lovelier buildings and plantings instead of wide grounds.

Yet another aspect of intensity is density of occupancy or use. This is not fully harmonious with quality, for there is up to a point a conflict between quality and crowding. The conflict is resolved in the market place. The poor compete with the rich for valuable land by doubling up at higher density. They compete so well that the 100 per cent location in most retail areas serves not the carriage trade but the mass market, sharp elbows and all. They compete so well that the rich, where they have the power, often dismiss the market referee and legislate for low-density zoning, a sort of compulsory land consumption. This strengthens their consumption dollars by giving preference to their style of consuming space. It helps them even more as owners: although it lowers some specific unit values, one would expect compulsory consumption to valorize the whole.

A final dimension of intensity is temporal. We have seen that rent is an annualized level amount derived from fluctuating yearly costs and revenues, over building life. Intensity is the quotient of non-land inputs divided by output, remember. These non-land inputs must be annualized to compare them with annual output, and compute intensity (19).

The findings from this operation are more than trivial, for they establish a trait of intensive land use that common parlance and perception overlook: to wit, shortness of building life. The annual input from a dollar invested in constructing a new building is the sum of depreciation and interest on the undepreciated balance. The shorter the life the greater the yearly depreciation input. In terms of output, that means a dollar invested so as to be recovered with interest in 20 years must yield a higher annual service flow than one to be recovered in 60 years.

It is very common for economists to deal casually with intensity in terms of building value and land value. This can lead to oversights. A million dollar building may represent high intensity or low, depending on the life over which it is designed to yield service enough to return the million with interest. The shorter the life, the higher the intensity.

A function of rent is to attenuate the lavish use of land-time, just as it constrains the careless use of land-space. This is easy to show with a little of the mathematics of capital theory; but most readers require some orien-

tation before they feel comfortable with that, so let us instead adapt Marshall's technique of common sense applied to rates of substitution between land and capital. Beginning with a short-lived building, hold the present value of future service flows constant while you cut the yearly service flow and expand temporally into a longer-lived building (all this in the planning stage, of course). Thus you lower building cost but increase the present value of the land-time required, with constant present value of output. Optimal planned life is where the marginal saving of capital from adding future land-time equals the present value of that increment of future land-time.

The higher the future rents, the greater the pressure not to substitute longevity for service flow.

Again, there are conflicts between the things that high rent stimulates. Tall buildings tend to be more durable. Rent promotes height but discourages longevity. Again, the market resolves the several forces and settles the conflict. Circumstances determine which force prevails in each case.

Mark that the subject was *planned* longevity. Another function of rent is to convey up-to-date information about changes in the scrap value of land. This new information is the basis for ultimately demolishing a building to salvage the land. The time to demolish is when the old building ceases to yield a return on the salvage value of the site. Almost always time will have brought some surprises and locational obsolescence, and the original plans should be modified.

While the latter point is in the literature (Gaffney 1964), the former is not. The role of rent in determining the planned longevity of capital is virgin intellectual territory. Whoever works out the analysis and what it implies for policy will have made a signal contribution to economics and the public welfare. The macro-economic implications are challenging. Rent affects replacement and turnover of capital, and hence demand for labor, factor proportions, and even gross investment and hence national income. There is a set of challenges worthy of anyone's steel.

III

THE SOCIAL IMPACT OF RENT

SO FAR WE HAVE SURVEYED the impact of rent only on individuals singly. But the rationing function of rent is more subtle yet, and more social. Rent coordinates interdependent activities of neighbors.

A remarkable accomplishment of rent is to encourage the production of spillover benefits—yes, even those which are produced in "fits of absent-

mindedness." Here is the invisible hand at work, once removed! This comes about because the "highest and best use" of land is usually that which most complements its neighbors.

The landowner is not trying to complement his neighbors; he wants access to them. But there is a law of reciprocity. Access is mutual, so what is the poor Scrooge to do? In spite of his worst intentions, he can only help himself by helping others. By using his land optimally he not only exploits the opportunities his neighbors and government have given him: he gives more back. If in addition he and his neighbor should happen to perceive this happy relation, and deliberately plan to maximize joint net benefits, there is no telling how far self-interest might carry them. And is it really unrealistic to anticipate a little public spirit, too?

So rent not only makes landowners economize on synergism, it makes them produce more. Rent thus plays a central role in a self-reinforcing multiplier process whereby growth begets growth. Like all feedback processes, this one is complex, powerful, temperamental, and imperfectly understood. It is what makes urban economics the mystery and challenge that it is. Like all multipliers, it has brakes too. Limited hinterland is an external one; congestion an internal one. We will see presently some ways to release these brakes.

Another function of rent is to determine the timing of land use succession. An old building should be demolished and replaced when its current operating income ceases to cover interest on the land value. Given static expectations, that is simply rent. Given growth expectations, that is rent from the first generation replacement plus an adjustment reflecting the economic value of bringing later generations nearer to the present (Lutz, 1951).

Rent not only tells the individual when to renew, it helps synchronize the succession of uses on neighboring sites. As a city expands, or as its center expands into old residential neighborhoods, high opportunity rents at the perimeter apply simultaneous pressure to all landowners there to convert to the higher use. With this mechanism in good working order, all private and public investments in the transition area can be made with secure knowledge that complementary and supplementary activity is forthcoming without costly delays. This is the triple-S principle: synchronized synergistic succession.

A last function of rent is to help plan the linkage or circulatory sector of the city—streets and utility lines. These generally raise rents, particularly when the user charges are kept low and equal to marginal cost. By capturing the surplus benefit from these works, rent can serve to mea-

sure the surplus, and simultaneously, if taxed, to finance the deficits of marginal cost pricing. Decisions of size, extension, and replacement of lines can then be made optimally (Gaffney 1962, pp. 157–68).

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1. Walker is known for his furious debates with Henry George, but evidently stood closer to him than many writers.

2. *The Economic Basis of Tax Reform* (1932). A complete list of Professor Brown's contributions to this topic would number thirty or more articles and books.

3. See L. Walras, *Études d'Economie Sociale* (1936). It is a pity that all of this is lost in the Jaffe translation, which altogether Bowdlerizes this aspect of Walras.

4. *House and Home* (1960). This work taken alone would place Fisher among the advocates, but elsewhere he expresses deep doubts about the feasibility of distinguishing land and buildings (1954).

5. In their *Report on Finance and Taxation in Jamaica* (1955) the Hickses question the feasibility of assessing land, but favor the assessment freeze approach to new buildings.

6. On allocative grounds Heilbrun (1966) is among the proponents, but he is concerned about adequacy of yield and equity.

7. In his "Exemption and Improvements" (1939) Jensen emphasizes the inadequacy of the base but is otherwise favorable.

8. Johnson (1914) asserts that land value increments stimulate both agriculture and building.

9. *Theory and Measurement of Rent* (1961). An extraordinary book in which the authors first deny that rent is definable and then purport to measure it.

10. In standard interest tables, the "annuity whose present value is one": $\frac{i}{1-(1+i)^{-L}}$ where i is interest rate and L is life. To capitalize in perpetuity, divide by i, but note this would assume stasis in perpetuity. For more detail see Gaffney (1962, pp. 154–57, and 1957).

11. A beginning has been made by M. Gaffney (1962).

12. The term has an archaic ring which may raise eyebrows; but this classical term expresses the relationship of capital to hired factors better than any later expression. If this be wages-fund heresy, make the most of it! (It is actually Wicksell).

13. *Value, Capital and Rent* (1958, pp. 98, 103, 115, 146–68). It is tragic that these penetrating insights have not yet found their way into common use and understanding.

14. Other lessors who take a "piece of the action" do not refute the point. Rather, they are assuming part of the capitalist's function of bearing risk, frequently involving a contribution to capital. As always in questions of functional imputation, the function must be distinguished from the person.

A landowner as such may also take a "piece" as an indirect and imperfect means of letting rent payments vary with variations in the exogenous factors determining rent. Farm landowners have devised a much better technique, the use of county average yields that reflect weather but not individual management. The public has an even better technique: the use of assessed land values, kept up to date rigorously.

15. Warren Roberts (1967) has written profoundly on the absence of rent under political turbulence, and rent as the product of an effective sovereign.

16. The analogy is to a twig growing directly from a tree-trunk without proper dendritic development of limbs and branches.

17. If there were a monopoly-breaking effect from activating inert land the result might be a net loss of rents to monopolists. There would, of course, be greater gains elsewhere. See my succeeding paper, "Land Rent, Taxation, and Public Policy: Taxation and the Functions of Urban Land Rent," section II, C, forthcoming in this *Journal*.

18. Marshall (1947, pp. 447–49). An excellent modern empirical English work is P. A. Stone, "Economics of Housing and Urban Development" (1959). Stone's work is

written from the viewpoint of a town-builder who holds streets and buildings equally in his purview. A work of high quality, it betrays an interesting technocratic blind spot. Economy of land is conceived as economy of streets and farm land. There is no use of market value, hence no economy of synergistic values or travel time.

19. Alternatively, one gets equivalent results by discounting all costs and incomes to present values, *but it must be done in perpetuity*, and most capital theorists overlook this, so their use of present value leads to error. Annualization gives the same result as the perpetuity approach, but without the use of a nebulous infinite future.

A Selected Bibliography on Land Rent Taxation

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Technology and Higher Education

INSTITUTIONS OF HIGHER EDUCATION continue to be in deep financial trouble, and cannot hope to escape that trouble by pursuing their old courses in their old ways. We find it still a reasonable article of faith that technology offers some promise of relief from the financial dilemma.

On the basis of a year's endeavor, we believe we can identify more narrowly the problems that the program confronts.

1. We must be careful not to permit ourselves, or to encourage others, to be guided by too strict a definition of "technology." The word is too readily taken to signify the computer and the television installation. We extend it to include the entire technology of the printed word, the whole range of classroom tools, and even the concepts of the learning module, self-paced instruction and the reordering of the presentation of learning materials, whether or not these are associated (as indeed often they are) with such more clearly technological devices as video cassettes and computer-assisted instruction.

2. Programs in educational technology can be designed around the hardware, the institution, or the discipline. In the first instance, one asks, "How can I use *e.g.* the computer in the educational process?" In the second instance, one asks, "How should I reorganize my institution to take advantage of educational technology?" In the third, one asks, "What technological instruments can be used to render more efficient the communication to students of a specific discipline?"

We have come to the conclusion that for the immediate future the disciplinary approach is likely to be the most fruitful, as indeed it has already been fruitful in the sciences, engineering and mathematics. We must identify the professor, discontented with the manner in which the educational process is now carried out, and desirous of developing the use of more sophisticated teaching and learning tools than he now possesses.

3. There are suggestions of a role for technology in education which goes beyond questions of economics. There has been, in higher education, a loosening of the constraints with respect to time and place. The growing emphasis on openness and flexibility is accompanied by a renewed interest in lifelong education and the promise that the growth of leisure will give the consumer of education considerable choice as to when and what and how he studies. The whole development seems to provide opportunities for the use of technology, or even to depend upon technology for its full realization. [From the Report for 1971.]

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