*The Incidence of a Tax on Urban Real Property**

By HERBERT A. SIMON

I

It is a curious fact that, although there has been common agreement among two generations of economists as to the fundamentals of tax incidence theory, no consensus has been reached with respect to the incidence of a tax on urban real property. Four principal schools of thought may be distinguished. The classical economists (including Marshall in this case) divided the tax into two portions—a tax upon site rent, and one upon improvements—considered the incidence of each, and combined the two effects.[1] Edgeworth, and some English writers who have followed him, denied the validity of this division, and concluded that, under conditions of inelastic demand, the tax would be borne entirely by the occupier.[2] Seligman distinguishes a tax upon selling value from a tax upon house rent. He follows the classical economists with respect to the incidence of the second.[3] Finally, Professor H. G. Brown, taking issue with all of these, divides the tax but concludes that a major share of the tax upon improvements will be borne by owners of capital in general.[4]

In part, these differences of opinion may be traced to explicit differences in the assumptions which are made with respect to the elasticities of

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[1] In this paper, we shall cite N. G. Pierson, *Principles of Economics* (London, 1902) as the proponent of the "classical" doctrine. Pierson develops the classical position in some detail (pp. 146–56), and is extensively cited by Edgeworth and Seligman in contrasting their own views with his.

[2] F. Y. Edgeworth, *Papers Relating to Political Economy* (London, 1925), Volume II, "The Pure Theory of Taxation," pp. 63–125 [Article 17, pp. 258–96 of this volume. Ed.], "Answers to Questions Put by the Local Taxation Commission," pp. 126–49, "Urban Rates," pp. 150–214.

[3] Edwin R. A. Seligman, *The Shifting and Incidence of Taxation*, 3d ed. (New York, 1910), pp. 277–325.

[4] Harry Gunnison Brown, *The Economics of Taxation* (New York, 1924), pp. 178–212, 213–62.

supply and demand for land and structures. In part, they may be traced to the fact that some writers give greater emphasis to frictional forces than do others. The fact remains, however, that even when these writers make the *same* explicit assumptions regarding elasticities, and even when they agree in ignoring, or abstracting from, frictional forces, they still reach different conclusions as to incidence. These disagreements can only lie in differences in unacknowledged assumptions which are implicit in the various analyses, or in faulty logic used in carrying out the deductions. It is the purpose of this paper to reconcile and amend, if possible, the doctrines to be found in published writings on the subject by discovering where the disagreements have their origin.[5] Since the four writers cited supply most of the dicta on incidence theory set forth in American and English textbooks, the inquiry is perhaps not without practical utility.

For purposes of our analysis, we shall make the following assumptions:

1. We shall consider only dwelling houses, and shall ignore the possibility of transferring land from one urban use to another (but not the possibility of taking it out of urban use altogether).
2. We shall assume that within our range of interest the house-building industry is an industry of constant costs, carried out under competitive conditions.
3. We shall assume that only a small proportion of all capital is in the house-building industry; and that there is complete elasticity of flow of capital from house-building to other uses.[6]
4. We shall assume that the demand for capital, other than in house-building, is moderately elastic.[7]
5. We shall examine both the case (A) where the total supply of capital is moderately elastic, and the case (a) where the total supply of capital is inelastic.
6. We shall assume that there is no supply of existing houses.[8]
7. We shall examine both the case (B) where the total demand for houses is

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[5] I am indebted to Professor Earl R. Rolph for criticism of an earlier draft of this paper.

[6] This is, of course, the classical assumption in the "long run." Conclusions respecting incidence drawn from this assumption hold equally well in the "moderately short run," provided only that *some* new capital is required for house-building, and that there is perfect competition between old and new houses. Cf. assumption 6 below.

[7] When we speak of "high elasticity" we shall, in our deductions, assume that the elasticity is infinite. When we speak of "low elasticity" we shall assume the elasticity to be zero. When we speak of "moderate elasticity," we shall assume the elasticity to be finite.

[8] Our conclusions would not be modified in the "moderately short run" if we were to assume only that a certain proportion of existing houses wear out each year, that the demand schedule for housing is not shifting downward more rapidly than houses become obsolescent, and that there is perfect competition between old and new houses. Cf. assumption 3 above.

moderately elastic, and the case (*b*) where the total demand for houses is inelastic.

8. We shall ignore frictional forces, and restrict our analysis to a static equilibrium and the "long run."

If we can reach some measure of agreement with respect to the incidence of urban real property taxes under this particular set of assumptions, the extension of the analysis to other cases (the relaxation, for example, of assumptions 3, 6, and 8) should not be difficult.

Where the total demand for houses is inelastic (assumption 7*b* above), Pierson concludes that a tax on house rent is divided between landowner and occupier in the ratio of the site value to the improvement value. The further assumption is made (assumption 3 above) that the elasticity of supply of capital for house construction is infinite, but no explicit assumption is made with respect to the elasticity of supply of all capital.

Under these same assumptions[9] Edgeworth concludes that the entire burden of the tax is upon the occupier.

Under identical assumptions Seligman concludes that a tax on house rental is borne by the occupier, but that a tax on the value of land and house is shared by the landowner and the occupier in the ratio of site value to improvement value. Seligman rests this remarkable conclusion on the contention that the tax on value is "separable" into its components, while the tax on gross rental is not.[10]

Without explicit assumption as to the elasticity of demand for houses, Brown concludes that the tax on site value is borne by the landowner, while the tax on improvement value is shared by owners of capital in general, occupiers, and (possibly) landowners. Under the further assumption 5*a* that the total supply of capital is inelastic, he concludes that the tax on improvement value is borne almost entirely by owners of capital in general.

There are thus revealed among these economists two principal areas of contention. The first three do not trace the incidence of any part of the tax to owners of capital, while Brown asserts that a part or all of the tax upon improvement values will rest upon owners of capital. Pierson and Brown hold that an urban real property tax is separable into a tax on site values and a tax upon improvements; Edgeworth denies the validity of the separation; Seligman straddles the fence.

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[9] The authors cited examined, of course, a large number of other alternatives as well, but we are particularly interested in discovering why they reached different conclusions even in those cases where they started from the same assumptions.

[10] *Op. cit.*, pp. 300–301.

II

Let us consider Brown's position first, and let us assume a tax on improvement values only[11]—granting for the moment the contention that the total tax is separable. Brown's theory diverges most widely from the usual one when (*a*) the total supply of capital is inelastic. Since, from assumption 3, house-building absorbs only a relatively small proportion of all available capital, a diversion of capital from this use (necessary in order to shift the tax to the occupier) cannot increase by more than a very small percentage the amount of capital available for other uses. Hence the diversion cannot, even if demand for capital is moderately elastic, cause a significant reduction in the price received for capital.[12] We may conclude that the net price received for capital will be only slightly reduced by the tax, and hence that occupiers will be forced to add the tax to their net rent, even though they may reduce the amount of capital demanded.[13]

Here the classical analysis ends—with the demonstration that the price paid for house-building capital (including the tax) will be increased by the full amount of the tax. The very small change in the net price received for capital is ignored. It is Brown's contribution to have shown that this change, though small, when multiplied by the total amount of capital supplied may significantly affect the total amount of interest paid.[14] The point is a subtle one, but one not at all uncommon in the realm of mathematics. It frequently happens in taking limits that the limit of the product of a very small number by a very large one is finite. So we find in the present case that the very small reduction in the price received for capital, when multiplied by the very large total amount of capital, is a quantity of the same order of magnitude as the total tax collection. More

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[11] Seligman points out that gross house rental is a composite price "from which there must be deducted expenses of maintenance, repairs, insurance and the like, in order to ascertain the net rent." *Op. cit.*, p. 298. In order to simplify our initial analysis, however, we shall assume that the difference between net rent and gross rental is negligible, and that a tax upon gross house rental is exactly equivalent to a tax upon income from house-building capital, or upon the capital value itself. Later we shall introduce as an additional complication the difference between gross rental and net rent.

[12] It will prove convenient in this paper to speak of interest as the "price received for capital."

[13] Brown seems to imply that this result depends on an assumption of diminishing returns for capital. *Op. cit.*, p. 180. This, however, is not the case, as our reasoning shows.

[14] Brown attributes the origin of this doctrine to H. J. Davenport and T. S. Adams. See Adams, "Tax Exemption Through Tax Capitalization: a Fiscal Fallacy," *American Economic Review* 6:271–87 (June, 1916), esp. pp. 273, 278; E. R. A. Seligman, "Tax Exemption Through Tax Capitalization: A Reply," *Ibid.*, 6:790–807 (December, 1916), esp. pp. 798–800; Davenport, "Theoretical Issues in the Single Tax," *Ibid.*, 7:1–30 (March, 1917), esp. footnote, pp. 26–28.

precisely, the amount lost in interest to owners of capital is to the amount yielded by the tax in the same ratio as the elasticity of demand for house-building capital is to the elasticity of demand for other capital. We shall attempt in the next paragraphs a verbal demonstration of this proposition, and append a mathematical demonstration at the end of this paper.

In order for price received to increase by the full amount of the tax when (B) demand is not inelastic, and when (a) the total supply of capital is inelastic, it is necessary that some capital be transferred from the house-building field to other uses. If A is the elasticity of demand—which in this case we shall define as the percentage that demand for house-building capital will be decreased by a $1 increase in rent[15]—then the amount of capital transferred will be Axt, where x is the amount of capital previously devoted to house-building, and t is the amount of the tax.

An increase, by Axt, in the supply of capital for other purposes will decrease by Axt/By the price paid for capital—where B is the elasticity of demand for other capital, defined as above—and y is the total amount of capital for other than house-building purposes. Multiplying this price change by y, the amount of capital to which it applies, we have a total loss in interest of $A(xt)/B$. But xt is the total yield of the tax. Thus we have proved our proposition.[16]

Suppose now that (b) the demand for houses is inelastic. In this case, as before, the net price received for capital will be unchanged. But there will be no need to transfer capital from the house-building field to prevent a reduction in interest. Hence there will be no decrease in total interest received by owners of capital, nor will there be a windfall to users of capital other than building capital. This same conclusion flows from our previous line of reasoning if we set A equal to zero.[17]

Consider now the case (A) that the total supply of capital is elastic. The results are the same as for (a), except that now under assumption (B) a somewhat smaller amount of interest will be lost to owners of capital than was lost in case (a), and a somewhat smaller gain will be realized by other users of capital. This becomes plausible when it is remembered that the loss in interest results from a transfer of capital to other uses. When the supply of capital is elastic, the amount offered will

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[15] We adopt this definition of elasticity in preference to the usual one—the percentage

be decreased to avoid transferring it to another use at a lower rate of interest.[18] In this case, the amount lost to owners of capital will be in the same ratio to the total tax collected as the elasticity of demand for house-building capital is to the *numerical* (not algebraic) sum of the elasticities of supply of capital and of demand for other capital.

We must now, as promised earlier, allow for the difference between gross rental and net rent. If k per cent of the gross rental represents interest on house-building capital, then a tax of t per cent on net rent will be for the occupier a tax of only kt per cent on gross rental. Hence the elasticities of demand, A and B, must be interpreted as elasticities of demand for *capital* with changes in the price of *capital*. It follows that the magnitude of these elasticities will depend upon the product of two factors: (1) the elasticities of demand for the products in which the capital is invested, and (2) the percentage which net rent, that is, interest on capital, is of gross rental for these products. If the elasticities are so interpreted, then the validity of the analysis set forth above is not affected by the difference between gross rental and net rent.

Professor Brown's position would appear, then, to be substantially correct, provided that the demand for housing is not much less elastic than the demand for other goods.[19] At this point, however, we must raise a very serious objection of method which, for that matter, Brown himself anticipates.[20] Our approach has been one of "partial equilibrium." We have disturbed certain price relationships in an equilibrium situation, and attempted to trace the consequences of the disturbance. To do so we have had to make a number of *ceteris paribus* assumptions about other prices and quantities in the economic situation which were not within our immediate purview. An analysis which makes use of partial equilibrium assumptions may be perfectly valid when it concerns only a narrow segment of a large economic area. Under such circumstances, *ceteris paribus* assumptions are a fair approximation to reality. We must view our conclusions with less confidence, however, when they extend to a large part of the economic system—when they attempt to predict changes in the rate of interest for the system as a whole. This is especially true when, as in the present case, we take very small effects and multiply them over a very wide area to arrive at a finite result.

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[18] Mathematical Appendix, Note 3, p. 430.

[19] It should be noted, however, that Seligman's entire treatment of this incidence problem is based upon an insistence that, *in fact*, the demand for housing is very inelastic. (*Op. cit.*, pp. 310–15.) He would, therefore, undoubtedly criticize Brown, as he criticizes Edgeworth (fn., p. 314), for drawing logically correct conclusions from empirically invalid assumptions.

[20] *Op. cit.*, pp. 182–98.

For example, underlying our entire analysis are the assumptions that the demand schedule for house-building capital is independent of the price of other capital; that the demand schedule for other capital is independent of the price of house-building capital; that the two demand schedules are independent of the total amount of taxes collected; and that production costs, cost of labor, equipment and materials, in both house-building industries and other industries, remain constant even when the equilibrium is disturbed and the quantities employed are altered. To trace the consequences which follow when these assumptions are relaxed is not easy. We have made a few attempts in this direction in a note.[21] Few positive conclusions flow from the analysis, but we reach this negative result: a partial equilibrium analysis is insufficient to show the incidence and effects of a tax upon a particular use of capital. The analysis shows only that, under almost any assumptions, the price of housing is increased by the approximate amount of the tax. The further effects of the tax and its final incidence depend upon very small price changes in other parts of the economy.

Professor Brown has performed a very valuable service, however, in pointing out that a tax upon a particular use of capital has repercussions upon income from capital in general. He has supplied an important corrective to the classical analysis which ignored these repercussions, and has shown that the earlier theory is valid only if the demand for houses is entirely inelastic and independent of the demand for other commodities.

III

Let us now see what conclusions we can reach with respect to the second point at issue. Is a tax on house rental separable into a tax on site value and a tax on building value? To avoid the verbal entanglements which characterize the discussion of this issue,[22] we shall understand the word "separable" in a very precise sense. A tax on house rental, or upon selling value, is separable if its effect upon the prices and quantities ex-

[21] Mathematical Appendix, Note 4, p. 431. This note should be interpreted as only suggestive of the various possibilities to be anticipated. A really satisfactory analysis involves the construction of a model of the entire economic system and a determination of the effects of disturbing its equilibrium by the imposition of a tax. This has been done for a simple system by my colleague, Dr. Ronald W. Shephard, in an unpublished thesis entitled "A Mathematical Theory of the Incidence of Taxation." He finds that the incidence is a function of certain elasticities in the system.

[22] Evidence Seligman, *op. cit.*, p. 300: "To attempt to separate the entire rental paid for a house into the net rent of the land and the gross rent of the building is therefore as ill-advised as it would be, in discussing a tax on pianos, to divide it into two parts, one of which corresponds to the rent of the land which produced the raw material."

changed is exactly equal to the combined effects of an equivalent tax upon site values, followed by a subsequent tax, at the appropriate rate, upon improvement values.

Let us consider first a tax upon the value of site and building. Seligman considers this tax to be separable,[23] apparently concluding that Edgeworth's arguments, which he quotes with respect to a tax on house rental,[24] are not equally cogent when applied to a tax on values. We shall show, on the contrary, that if Edgeworth's analysis is correct for a tax on house rental, it is equally applicable to a tax on value. In the initial analysis, however, we shall ignore the difference between net rent and gross rental.

In the case where (*b*) the total demand for houses is inelastic, Edgeworth concludes that the entire tax falls upon the occupier. In criticizing the classical position as stated by Pierson, he makes very clear the assumptions from which his own conclusion flows:

> The eminent Mr. N. G. Pierson, of Holland . . . has come to a different conclusion, namely, that the occupier of a house with a high ground rent, as in a central region, will, at most, pay only as much tax as what is paid by the occupier of an exactly similar house with (little or) no ground rent, as in a suburban periphery. Mr. Pierson deduces this conclusion from the assumption that the difference between the rents of the two houses may be expected to be the same after and before the imposition of the tax (or, at least, not greater after than before). This assumption would be appropriate if two similar houses dissimilarly situated . . . could be regarded as two units of the same commodity, analogous to two quarters of barley grown on a highly rented site and at the margin of cultivation respectively. But I submit that the two houses ought rather to be regarded as *different quantities of commodity*, analogous to the quantities of barley produced by the outlay of the same capital at the margin and on a highly rented site. There is no "anomaly" . . . in the supposition that the difference between the prices paid for those two quantities of produce should be increased by a tax. It is the received theory, as stated, e.g., by Mill (Book V, ch. iv, sec. 3, pars. 2, 3, 4).[25]

The dispute, then, lies in differing theories as to the nature of urban ground rent. Is urban rent analogous to that rent which a piece of agricultural land pays when the cost of transporting its product to market is less than the cost from marginal land? This is the analogy upon which Pierson's contention rests. Or is urban rent analogous to that rent which a piece of agricultural land pays when the product obtained from a given investment is greater there than on marginal land? This is the analogy which Edgeworth holds to be the correct one. Let us examine in somewhat

[23] *Ibid.*, p. 294.
[24] *Ibid.*, pp. 309–10.
[25] Edgeworth, *op. cit.*, p. 136 fn.

more detail the consequences which flow from these rival concepts, retaining our assumption that the total demand for houses is inelastic.

If we accept Pierson's assumption, then the difference in the respective prices paid for housing on two different sites cannot be affected by a tax. This difference is the rent paid for site. Hence, to determine the incidence of a tax we have only to calculate the total tax on a marginal house and on a super-marginal house. Each occupier will bear a tax equal to that on the marginal site, while any excess in tax paid on a super-marginal house will be borne by the site owner. We conclude that:

1. A tax on total value or gross rental will be shared by landowner and occupier,[26] in the ratio of site rent to building rent.[27]
2. A tax on improvement value or building rental only, being equal for houses on all sites,[28] will rest entirely on the occupier. A tax on site rent only, not resting on marginal sites, will remain entirely on the landowner. Hence the combined effect of the two taxes is equal to the effect of a combined tax.[29]

If we accept Edgeworth's assumption, then the ratio between the respective prices paid for housing on two different sites cannot be affected by a tax. Hence, to determine the incidence of a tax upon a house commanding a times the rent of a marginal house, we have only to calculate the tax assessed on the super-marginal house, and determine whether this is greater or less than a times the tax assessed on a marginal house. If it is greater, the excess will be paid by the site owner; if it is less, the site owner will not only shift the entire tax on to the occupier, but he will be able to secure from the occupier an increase in rent (after payment of the tax) equal in amount to the deficiency. We conclude:

1. A tax on the total value or gross rental of a super-marginal site will be exactly a times the tax on a marginal site. Hence the entire tax will be borne by the occupier.[30]
2. A tax on the value of the building alone will be no larger on a super-marginal than upon a marginal site. Hence the occupier will pay the entire tax, and will pay to the landlord, in addition, a rent increase of a times the tax, less the tax—that is, $(a - 1)$ times the tax. A tax on site values alone will be proportional to the site rent—that is, gross rental less building rental, or $(a - 1)$ times the rent of a marginal house. Since a tax on site rent does not touch the margin, it is paid entirely by the landowner. Hence it will take

[26] As shown in Section II, the occupier's portion of the tax may subsequently be shifted back to owners of capital.

[27] Mathematical Appendix, Note 5, p. 432.

[28] We are assuming, as is assumed throughout the literature, that the intensive margin of house-building is the same for all pieces of land, and is not altered by the tax.

[29] Mathematical Appendix, Note 6, p. 433.

[30] Mathematical Appendix, Note 7, p. 433.

from him exactly the amount of the windfall he received from the occupier, and we conclude that the combined effects of the two taxes is exactly equal to the effect of the combined tax.[31]

Up to this point we have been assuming net rent to be equal to gross rental. We shall now consider that gross rental is made up of three parts: site rent, rent on the building investment, and operating costs. The first two of these three components we shall continue to call net rent.

The results which flow from Pierson's assumption are not materially altered:

3. With a tax on gross rental, the ratio of occupier's to landowner's contributions will be equal to the ratio between interest plus operating costs on the one hand, and site rent on the other.[32]
4. With a tax on net rent, the ratio of occupier's to landowner's contributions will be equal to the ratio of interest to site rent.[33]

The conclusions from Edgeworth's assumption undergo a somewhat more important change:

3. With a tax on gross rental, the amount assessed on a super-marginal house will be just a times the amount assessed on a marginal house. Hence the entire tax will be borne by the occupier.[34]
4. Suppose, however, the tax were levied upon net rent. We may consider the gross rental of the super-marginal house as a times the interest on a marginal house plus a times the operating cost of a marginal house. The net rent tax would increase only the first of these two elements for a marginal house. But the tax on the super-marginal house would be assessed on a times both elements, reduced only by the operating cost of the super-marginal house. Hence, for sites where a is large, the landowner and the occupier would share the tax in the ratio that operating costs bear to interest on building investment. Strictly speaking, the occupier's share would be proportional to a times the interest on building investment, while the landowner's share would be proportional to $(a - 1)$ times the operating cost.[35]

This division is very different from that under the classical assumption. In the present case, the ratio of landowner's to occupier's share is approximately the same no matter how high the site rent. In the classical case, the landowner's share increases with the site rent.

We have now examined the incidence of a number of different taxes:

[31] Mathematical Appendix, Note 8, p. 433.
[32] Mathematical Appendix, Note 9, p. 434.
[33] Mathematical Appendix, Note 10, p. 434.
[34] Mathematical Appendix, Note 11, p. 434.
[35] Mathematical Appendix, Note 12, p. 434.

on site rent, on gross rental, on gross rental less site rent, on net rent, and on rent for house-building capital. For each of these, we have traced the consequences of Pierson's and of Edgeworth's theories of urban rent. It is clear, first of all, that Seligman's treatment of the incidence of urban real property taxes suffers from serious inconsistencies. He treats the taxes upon site value, upon improvement value, and upon sales value on the basis of the "classical" assumptions, while he follows Edgeworth in his treatment of a tax upon gross rental. He errs, consequently, in insisting that taxes on net rents are "separable," while taxes on gross rentals are not "separable." We have seen, on the contrary, that taxes of both kinds are separable, so far as their incidence and effects are concerned, but that the incidence is divided into two parts only under Pierson's assumptions, and not under Edgeworth's.[36]

IV

Which set of assumptions concerning rent is correct—Pierson's or Edgeworth's? This is clearly an empirical question, and not one that can be decided from *a priori* considerations. As a matter of fact, both assumptions involve a gross simplification of the true situation, for they both treat houses in different locations as quantities (whether the same or different quantities) of a single mythical commodity—"housing." Thus, Pierson's position results from considering site rent as a differential price for a single commodity, when the cost of transporting it to market varies. Edgeworth assumes expressly that site rent results when more of a single commodity can be produced for a given investment on one piece of land than on another. In truth, however, two dwelling places in different locations are not quantities of a single commodity, but *different* competing commodities. The problem of incidence involves a consideration of the effect of price changes upon the related demands for these two commodities. The simple formulae of Pierson and Edgeworth are merely special cases of a much more general problem of related demand.

Peculiarly enough, Edgeworth recognizes this fact when he treats of the related demands for "suburban" and "central" housing,[37] and when he discusses the incidence of local taxes which vary in adjoining localities.[38] Why he does not extend this concept to his consideration of general real property taxes is not entirely clear. Perhaps the deficiency has a purely

[36] Except, of course, for the portion of the tax on net rent which the landowner pays, even under Edgeworth's assumptions.

[37] *Op. cit.*, p. 81 [p. 275 of this volume. Ed.]

[38] *Ibid.*, pp. 175–76.

verbal origin—arising from the definition of "perfect substitution" which he uses. Apparently he considers commodities as perfect substitutes only if they can be substituted for one another in a fixed proportion.[39] So defined, the prices of two perfect substitutes would necessarily maintain the same ratio under all circumstances.

A more general treatment of related demands would consider two commodities to be perfect substitutes if the price of the one commodity were a single-valued function of the price of the other. The more restricted definition would require, in addition, that this function be a simple proportion. For example, if the general rent level were low, houses in desirable sites might command a greater differential rent than if the general rent level were high, for occupiers might feel financially able to spend more on "amenities." *At a given rent level*, there would be a definite fixed price ratio at which almost all occupiers would be indifferent as to the choice of a more desirable or a less desirable site. This ratio might decrease, however, with an increase in the price level.

Edgeworth accepts the more restricted definition of perfect substitution which requires the same price ratio to be maintained between the two commodities, whatever the price level. Pierson accepts a different, but equally restricted, definition of perfect substitution which requires the same absolute difference to be maintained between the prices of the two commodities, whatever the price level. A more general treatment would require that the price ratio, or price difference between the two commodities, be a function of the price level.[40]

We may indicate briefly how incidence varies when we consider the more general relationship of substitution. The following cases may be distinguished:

1. When the price of marginal houses increases, the price of super-marginal houses may actually decrease.
2. When the price of marginal houses increases, the price of super-marginal houses may remain the same.
3. When the price of marginal houses increases, the price of super-marginal houses may increase by a lesser amount.
4. The price of super-marginal houses may increase by exactly the same amount as the price of marginal houses.
5. The price of super-marginal houses may increase by a greater amount than the price of marginal houses, but not by a proportionately greater amount.

[39] See his footnote 3, *op. cit.*, p. 81.

[40] It should be pointed out that Pierson is clearly aware of this more general possibility. *Op. cit.*, pp. 148–50.

6. The price of super-marginal houses may increase proportionately to the increase in price of marginal houses.
7. The increase in price of super-marginal houses may be more than proportionate to the increase in price of marginal houses.

The incidence of a gross rental tax will be different in each of these seven cases. In case 1 the landowner not only pays the entire tax on the super-marginal house, but he pays a windfall to the occupier. In case 2 the landowner pays the entire tax on the super-marginal house. In case 3 the landowner pays more than the tax assessed on the site value, but less than the whole tax. In case 4—Pierson's—the tax is shared between landowner and occupier in the ratio of site value to building value. In case 5, the landowner bears some of the tax, but less than in 4. In case 6—Edgeworth's—the occupier pays the entire tax. In case 7 the occupier pays the tax and pays a windfall to the landowner in addition. From the standpoint of related demands, this is all that needs to be said about an urban real property tax.[41]

V

We may conclude our inquiry by summarizing the results of our discussion. First, except for Brown's work, analyses of the incidence of urban property taxes are faulty in assuming that a tax on a special kind of capital can under no circumstances be shifted back to capital in general. How

It goes without saying that practical application of the theory of incidence requires investigation of the validity of some of the empirical assumptions which are crucial to it—notably the elasticity of demand for housing, and the nature of the competitive demand functions for housing on different sites.

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