DEVELOPMENT TAXATION AND CONVERSION OF LOW INTENSITY LAND USES ON THE URBAN FRINGE

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ABSTRACT

Failure to adequately account for the user cost component of land use changes can lead to the premature and irreversible conversion of low intensity land uses to higher intensity use on the urban fringe. Development taxation (i.e., the imposition of an *ad valorem* tax on the transaction of converting land to higher intensity use) has been advocated as a practicable land use tool for guiding the land conversion process both spatially and temporally. This article argues that sole reliance on this taxation technique is unwarranted since important sources of inefficiency are introduced by uncertainty, irreversibility, and political feasibility considerations inherent in the development process. The advantages of integrated land use programs, utilizing a mixture of incentive and regulatory control tools, are discussed.

Public concern over the relationship between urban expansion and the land conversion process has intensified in recent years with diverse political groups expressing apprehension about premature and irreversible conversion of low intensity land uses to higher intensity use. Left unconstrained, it is argued, the urban development process may irreversibly misallocate land in the long-run since private decision-making in the development land market inadequately accounts for the user cost component of land use changes. That is, significant social costs may be incurred in the form of foregone net future benefits when the allocative decisions of urban fringe landowners are exclusively influenced by short-run gains and private costs.

In response to these concerns, economists have discussed the advantages of direct (i.e., taxing) control strategies where the taking issue is circumvented and

the efficiency advantages of the market mechanism can be effectively utilized. In particular, while criticizing the cost-effectiveness of nonmarket control programs [1], the use of development taxation has been proposed as a practicable land use policy tool for delaying and guiding conversion in a socially optimal manner [2]. This ad valorem tax would be levied directly on the transaction of moving land to higher intensity use and would be based upon the value of the property when sold for development. In addition to making decision makers aware of the social costs of conversion, such a taxation program would provide an explicit economic incentive to profit-maximizing landowners to restrict the uses of the land in socially desirable ways. Moreover, the revenue generated by development taxation could be used to help finance public land-use programs or to purchase lands directly for public use.

Efficient land-use policy is concerned with the optimal intertemporal allocation of land for various uses. With urban encroachment, land allocated to such low intensity uses as scenic and wilderness areas, open space, or agriculture will be subject to increasing conversion pressures. Given regional preservation objectives for these land uses,[1] efficacious land use policy must be adaptable to varying conversion pressures and institutional arrangements. In the following sections, it is argued that the inability of a development taxation program to provide this flexibility makes sole reliance on this land-use tool in achieving preservation objectives unwarranted. That is, real-world problems of application obviate much of the theoretical superiority of this market solution to nonmarket controls. When the administrative complications inherent in development taxation are realistically appraised, it is clear that a workable program of low intensity land management must augment the use of development taxation with complimentary nonmarket controls.

EFFICIENCY AND DEVELOPMENT TAXATION PROGRAMS

The management of low intensity land uses on the urban fringe through a program of development taxation is complicated in application by characteristics inherent in the land conversion process. Complexities generated by uncertainty, irreversibility, and political feasibility introduce several sources of potential inefficiency in a land-use program utilizing development taxation exclusively. Three sources of inefficiency are particularly important in this regard:

1. the effect of development taxation on landowners' expectations;
2. the differentiation of development taxation levels among regions; and

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[1] This is not to minimize the socioeconomic complexity of determining these standards. For example, recent work by Crosson [3] and Santana and Adams [4] casts considerable doubt on the necessity of preserving prime farm land. The discussion here, however, is restricted to evaluating the relative merits of alternative land-use policy tools in achieving preservation objectives as given.

3. institutional constraints imposed on the administration of a development taxation program.

Development Taxes and Landowner Expectations

When landowners have perfect information concerning future land prices and taxation rates (i.e., net land prices), imposing or increasing a development tax in a given period would result in less land being sold for development in that period. As the tax rate is raised, the marginal profit of selling land for development falls, making the conversion of land to higher intensity use less attractive compared to other periods. In reality, landowners are uncertain about future land prices and tax rates, and base conversion decisions on net land price expectations. The imposition of a development tax program can actually hasten conversion and exacerbate preservation problems if administered in such a way as to adversely affect these expectations.

Consider the case of an urban fringe landowner with net land price (ρ) expectations represented by ACDE in Figure 1.

The initial net land price (ρ_0) is shown growing over time at the rate of interest by AFB. Over the interval (t_0, t_1), net price is expected to increase more
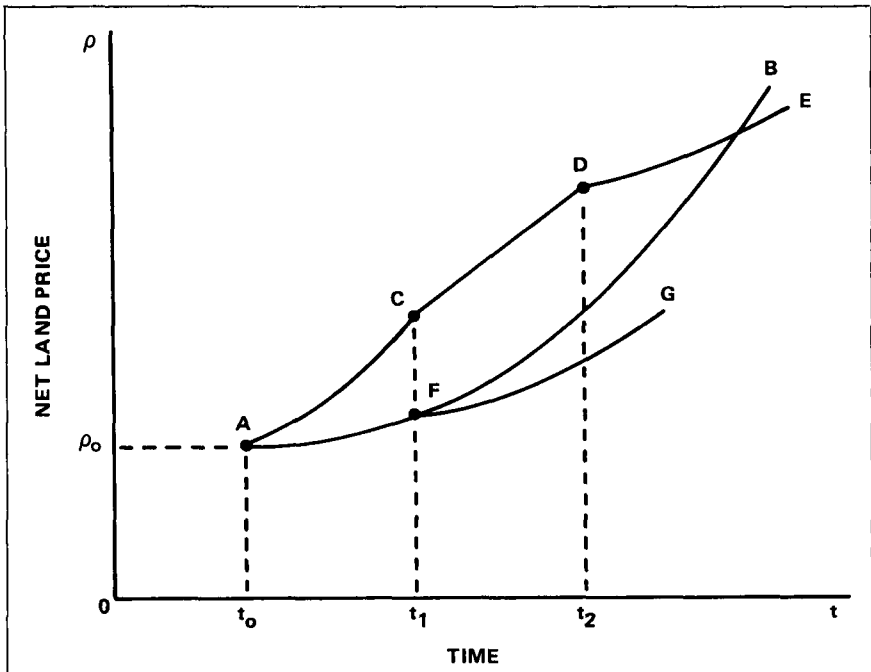

Figure 1. Net land price expectations of urban fringe landowners.

rapidly than AFB; over the interval (t_1,t_2), ρ is expected to increase at the rate of interest; and for $t > t_2$, growth at the rate of interest is expected to exceed the rate of increase in net land price. Under these conditions, land is withheld from development sale for $t_0 < t < t_1$ as capital gains are realized, whereas land would be converted for $t > t_2$ to avoid capital losses. The land is scheduled for conversion in the interval (t_1,t_2) since the landowner is indifferent between holding and selling only during this period.[2]

Now suppose that a development taxation program is initiated in t_0. It is announced that the program is expected to beneficially guide the land conversion process with the resulting tax proceeds to be used to purchase land for public use as open areas. Further, the tax rates will be adjusted periodically in response to changing conversion pressures and preservation objectives.

Clearly the effect on landowner expectations of this policy will depend heavily on how the program is administered. If, as a result of the tax program, landowners expect net price to grow more slowly than the relevant interest rate for that risk class, then land will be sold prematurely for development to avoid capital losses. In this example, if development taxes are levied initially over the period (t_0,t_1) so that ρ increases at the rate of interest (AF), landowners may adjust expectations of future net land prices downward accordingly (FG), resulting in premature conversion in the interval (t_0,t_1) to avoid capital losses in (t_1,t_2).

Two administrative implications can be drawn:

1. uncertainty surrounding future development tax schedules should be minimized so that landowners can formulate realistic net land price expectations; and
2. development tax rates should not be increasing functions of time so that early conversion is not encouraged.

The problem of premature conversion in response to the imposition of a development taxation program could be attenuated in some applications by setting tax rates high initially and announcing that there will be significant tax rate reductions in the future.[3] Such a policy has the advantage of dampening landowner net land price expectations without prompting early conversion.

Efficiency and Differentiated Development Taxes

Nonmarket allocation schemes for land use planning are justifiably criticized for being inefficient. For example, suppose there are two regions and that the

[2] This is an application of Hotelling's fundamental principle of the economics of exhaustible resources [5]. For a discussion of this principle and its applicability to land-use policy, see [6] and [7], respectively.
[3] An alternative proposal might be to fix the development tax rates throughout the conversion period. As will be discussed in more detail subsequently, the policy of invariant tax rates over time or space makes incentive control strategies subject to the efficiency criticisms associated with regulatory approaches.

NET MARGINAL BENEFITS

NMB_1^H

NMB^A

G

NMB_2^H

E

F H

J

0 U_2 A_2^* U_1 A_1^*

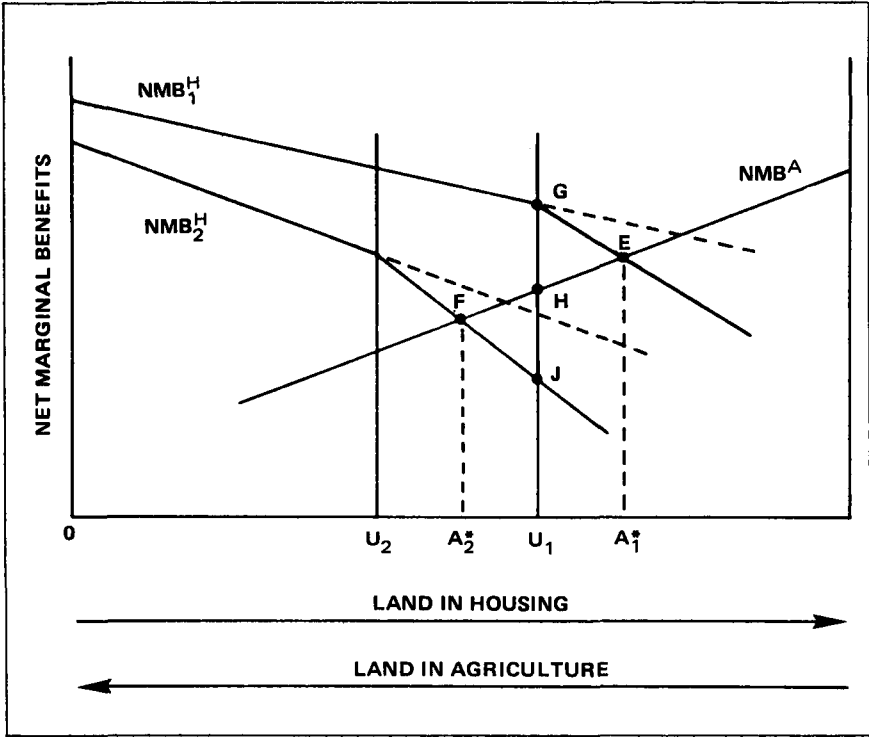**LAND IN HOUSING**

LAND IN AGRICULTURE

Figure 2. The allocation of land to alternative uses.

policy board is trying to provide an optimal intertemporal allocation of the land in each region for two uses, housing and agriculture.[4] For simplicity, assume that the net marginal benefits of using land for agriculture (NMB^A) are the same for both regions, and that the total acreage in each region is given by OT. Figure 2 illustrates the allocative situation confronting decision makers.

In Region One, user costs are incurred when land is allocated to housing beyond OU_1. That is, discounted net marginal benefits from housing (NMB^H) and agriculture are equated in the future period when OU_1 acres are allocated to housing and TU_1 acres to agriculture. Thus, any additional allocation of land to housing beyond OU_1 in the current period implies a loss of net benefits in the future. From society's point of view, then, this loss of future net benefits must be subtracted from NMB^H for allocative decision-making purposes, with the optimal current allocation occurring at E where the sum of the net marginal benefits from using land for housing in both periods equals the sum of the net marginal benefits from using land for agriculture in both periods. Similarly, for

[4] For a discussion of intertemporal allocation of stock resources, see [8].

Region Two, user costs are incurred when land is allocated to housing beyond OU_2 with the optimal current allocation occurring at F.

Of the total land available in these regions, society desires to utilize TA_1^* and TA_2^* for agricultural purposes in Regions One and Two respectively. In the interest of expediency or for purposes of political feasibility, the land use policy board could adopt a simple nonmarket allocation scheme; namely, a uniform preservation percentage might be imposed in both regions. This is clearly inefficient since a preservation rate that is optimal for Region One will, in general, be nonoptimal for Region Two. In this example, a uniform preservation rate of TU_1/OT results in a loss of net benefits given by EGH in Region One and a loss of FHJ in Region Two if housing development proceeds to the allowable maximum. Efficiency requires that two preservation rates be used to obtain two preservation objectives.[5]

Similarly, two development tax rates would be required to achieve the preservation objectives in each region. The response of landowners in both regions to the imposition or changing of the development tax rate will depend upon the offer-price function for development land. Since this relationship, as well as the marginal profitabilities of alternative uses of the land and preservation objectives, will typically vary among regions, development taxes must be varied accordingly to be effective.[6] If the tax is adjusted to reflect differences in conversion pressures and land quality, the inefficiencies inherent in primitive nonmarket controls can be circumvented.[7]

To effectively utilize a program of development taxation, regionally differentiated taxes should be levied. Several important policy implications can be inferred from this conclusion. First, taxing advantage of the increased efficiency that such a program offers will not be costless. Accurately differentiating development taxes among regions will incur additional information and administration costs. Second, assuming these increased program costs are not prohibitive, additional expense will be incurred since the policy board does not have perfect information about the relationship between adjustments in the tax and changes in the amount of land sold for development. That is, taxes will have to be adjusted over time on a learning-by-doing basis. Third, the costs borne by society as this adjustment process proceeds may be high since conversion of land from low to high intensity use tends to be irreversible. Thus, a necessary condition for the applicability of a development

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[5] This is in accord with Tinbergen's argument that it is necessary to have at least as many policy instruments as policy goals [9]. For a similar application of this principle in the context of effluent charges, see [10].

[6] In this regard, it is worth noting that programs of use-value assessment have been largely ineffectual on the urban fringe due primarily to property tax savings being inadequately differentiated between landowners of this type of property and owners of more rural lands.

[7] The argument is strengthened by incorporating landowner expectations into the discussion since the net land price expectations of landowners in the two regions could differ even when the offer-price functions are identical.
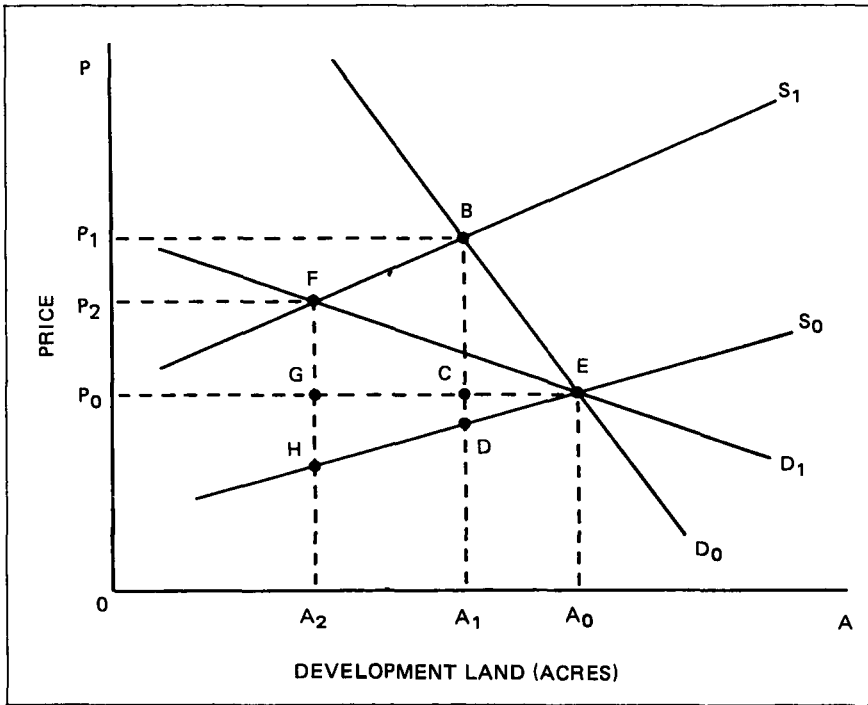
Figure 3. Taxation incidence, political feasibility, and
programs of development taxation.

taxation program as a land use control tool is that potential adjustment costs
(i.e., costs incurred as a result of inappropriately set development taxes
misallocating land irreversibly) be of a socially acceptable magnitude. Finally,
varying development tax rates among locations raises political feasibility and
equity issues, the resolution of which may markedly affect the efficiency of the
program.

Institutional Constraints

Characteristics of the development land market in a region can establish
institutional bounds within which a viable program of development taxation
must operate. This is illustrated in Figure 3.

The market is assumed to be initially in equilibrium at E with OA_0 acres
being sold for development at a price per acre of OP_0. A development tax is
imposed shifting market supply upward from S_0 to S_1. If the demand for
development land is relatively inelastic, then significant increases in the
development tax rate will be required to appreciably delay conversion
$(A_0A_1 < A_0A_2)$. The problem facing the policy board is whether such increases

are politically feasible. On the other hand, if the demand for development land is relatively elastic, then the burden of the tax falls heavily on landowners in the form of capital losses rather than on future residents in the form of higher land prices. For demand given by D_0, residents pay an increased land price of $BC = P_1P_0$ while landowners absorb capital losses of CD, whereas the taxation incidence increases to GH for landowners and decreases to $FG = P_2P_0$ for new residents when demand is D_1. The problem facing the policy board is whether such a taxation incidence is equitable.[8]

Political feasibility and equity limitations will be placed on the administration of a development taxation program by the regional constituency it is designed to serve. Having established an acceptable range within which development taxes may be varied, efficacious implementation must attempt to maximize program efficiency within these constraints.

Development Taxation Programs and Land Conversion on the Urban Fringe

Theoretical and administrative considerations suggest that as a land-use policy tool for halting premature conversion of low intensity lands on the urban fringe, a program of development taxation is not viable. The effectiveness of such a program can be increased by:

1. minimizing the uncertainty surrounding future rates of development taxation so that landowners can formulate realistic net land price expectations;
2. setting development tax rates high initially and announcing that there will be significant reductions in these rates over the conversion period; and
3. differentiating development taxes among regions to reflect differences in conversion pressures and preservation objectives.

The efficiency advantages that this indirect control program offers, however, are offset by administration complexities arising in application. First, developing a program that does not exacerbate premature conversion problems by adversely affecting net land price expectations requires sophisticated administration. Second, significant increases in information and administration costs may be incurred in differentiating development taxes among regions. Third, for critical areas and unique lands on the urban fringe, potential adjustment costs, resulting from inappropriately set taxes misallocating land irreversible, may be unacceptably high. Finally, in some applications, institutional constraints arising from equity and political feasibility considerations may obviate program effectiveness.[9]

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[8] For a discussion of the expected incidence of a development taxation program, see [11, 12].

[9] Another complication of some theoretical interest is tax manipulation by landowners due to imperfect competition in the development land market. For a discussion in the context of pollution, see [13].

Development taxation cannot realistically be expected to meet preservation objectives on the urban fringe. Although such a program may justifiably be included in a comprehensive program of low intensity land-use management, sole reliance on this policy tool is likely to produce disappointing results.

INTEGRATED PROGRAMS OF LOW INTENSITY LAND USE MANAGEMENT

In attempting to provide a socially acceptable quantity, quality, and distribution of land for low intensity uses, policy should be adaptable to differing conversion pressures, potential adjustment costs, regional preservation objectives, and institutional environments. Moreover, policy tools adopted to promote these ends should be mutually reinforcing as well as supportive of other socioeconomic goals. This flexibility is provided by a program utilizing a mixture of incentive and regulatory controls.

Development taxation is a multiobjective land-use program. In addition to delaying the premature conversion of low intensity land uses, this tool of land use policy enables society to partially recapture scarcity rents created by urbanization, to make decision makers aware of the social costs of converting land to high intensity use, and to provide funds for the purchase of lands for public use as open areas. These characteristics can serve as a basis for justifying the inclusion of development taxation in a comprehensive land management program. To make incentive control programs effective in curtailing premature conversion of low intensity land uses, however, taxation tools should be coupled with direct controls. Taxation strategies have two important limitations to their applicability. First, the response to a given level of charges is difficult to predict accurately. Second, the period of adjustment to changes in the level of these fees is typically uncertain. These problems may not be very serious for a long-run policy designed to achieve management objectives in rural areas where conversion pressures are less intense. On the urban fringe, however, where potential adjustment costs may be quite high, these caveats pose a serious obstacle to justifying sole reliance on indirect control programs. If enforced effectively, direct controls can reduce the uncertainty inherent in market control programs, and can frequently be imposed cheaply and quickly.[10]

An integrated program of agricultural land preservation, for example, might utilize the following two part policy. First, for urban fringe lands, the land conversion process can be guided temporally and spatially by using declining differentiated development taxes for regions where potential adjustment costs are socially acceptable and institutional constraints do not neutralize their effectiveness. For critical areas and unique lands under significant conversion pressures as well as for regions characterized by confining institutional

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[10] The economic and political drawbacks of using direct controls extensively for land-use policy are well known. For a discussion, see [1].

environments, zoning property into socially desirable uses will give policy makers the additional flexibility required to make preservation programs effective on urban fringes. Second, for rural agricultural lands, use-value assessment could be tied to agricultural districts encompassing blocks of land large enough to affect development [14]. Such a policy has the advantage of simultaneously promoting a viable agricultural sector, shielding farming activities from the disruptive activities of land speculation, and discouraging leapfrogging and scatteration.

This two part program could add flexibility, stability, and predictability to the land use planning process. Moreover, such a program can be expected to generate synergistic effects. By forming agricultural districts beyond urban fringes, development taxation programs will not be easily circumvented by moving development to unaffected areas. Similarly, a well-administered program of development taxation could help minimize unsystematic and discontiguous urban development, making the formation of agricultural districts in rural areas near urban fringes more attractive by dampening unrealistic speculation interests.

Other combinations of incentive and regulatory controls are certainly conceivable. The important implication for land-use policy aimed at managing low intensity land uses is that direct and indirect control strategies should not be thought of as mutually exclusive policy alternatives. Programs comprised of both sets of tools may offer policy makers the most promise in achieving regional management objectives.

REFERENCES

1. B. Siegan II, *Other People's Property*, Lexington Books, Lexington, Massachusetts, 1976.
2. M. L. McMillan, Open Space Preservation in Developing Areas: An Alternative Policy, *Land Economics, 50*, pp. 410-418, November 1975.
3. P. Crosson and R. B. Hass, Agricultural Land, in *Current Issues in Natural Resources Policy*, P. R. Portney (ed.), Johns Hopkins University Press, Baltimore, Maryland, 1982.
4. C. A. M. Santana and R. M. Adams, Projected Cropland Requirements and Land Availability for Major U. S. Production Regions, *Western Journal of Agricultural Economics, 6:*1, pp. 69-82, July 1981.
5. H. Hotelling, The Economics of Exhaustible Resources, *Journal of Political Economy*, pp. 137-175, April 1931.
6. R. M. Solow, The Economics of Resources, or Resources of Economics, *American Economic Review, Paper & Proceedings, LXIV*, pp. 1-14, May 1974.
7. G. C. Bjork, Property Rights, Scarcity, and Economic Rent: Some Considerations for Land Use Planning, in *Economic Issues in Land Use Planning*, D. M. Sorensen and H. H. Stoevener (eds.), Oregon State University Agricultural Experiment Station, Special Report 469, 1977.

8. J. McInerney, The Simple Analytics of Natural Resource Economics, *Journal of Agricultural Economics*, pp. 31-52, January 1975.

9. J. Tinbergen, Four Alternative Policies to Restore Balance of Payments Equilibrium, *Econometrica, 20*, pp. 372-390, July 1952.

10. S. Rose-Ackerman, Effluent Charges: A Critique, *Canadian Journal of Economics, VI*, pp. 512-528, November 1973.

11. M. L. McMillan, Open Space Preservation in Developing Areas: An Alternative Policy, Reply, *Land Economics, 51*, pp. 385-393, November 1975.

12. E. C. Pasour, Jr., "Open Space Preservation in Developing Areas: An Alternative Policy," Comment, *Land Economics, 51*, pp. 382-384, November 1975.

13. P. Bohm, Pollution, Purification, and the Theory of External Effects, *Swedish Journal of Economics, LXXII:2*, pp. 153-166, 1970.

14. H. E. Conklin and W. R. Bryant, Agricultural Districts: A Compromise Approach to Agricultural Preservation, *American Journal of Agricultural Economics, 56*, pp. 607-613, August 1974.

15. A. F. Ramsey and F. L. Corty, Conversion of Prime Agricultural Land to Nonagricultural Uses on One Area of the Sunbelt, *Southern Journal of Agricultural Economics, 14:2*, pp. 23-29, December 1982.

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