The Political Economy of Downzoning

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"Substantial downzoning" is defined as the exercise of police power to *significantly reduce* the legally permitted density on undeveloped land in a community. This contentious practice is typically challenged by those who perceive the action to limit their market opportunities (e.g., farmers and developers), their sympathizers, and others who prefer the status quo. Supporters tend to be those who perceive positive benefits (e.g., environmentalists, conservationists, and homeowners) and those who see it as a supplement to other preservation techniques, based on concerns over such things as growing public costs of land acquisition, limited effectiveness of existing alternatives, or the perceived urgency to act to manage growth.

Given the complexity of the issue and the lack of previous research, this paper develops a conceptual model of the public choice to "substantially downzone" and presents specific hypotheses to be empirically tested, using New Jersey as a case study. The probability of implementing substantial downzoning is found to increase with (i) the amount of open space that remains to be protected, (ii) declining farm population, (iii) recent growth in non-farm population, (iv) recent growth in land values, and (v) the presence of alternative growth management tools. Results also suggest its use as a substitute for other preservation tools when the financial and/or political ability of communities to afford other approaches is limited. Hence, the likelihood of substantial downzoning may increase over time if alternatives become more difficult to implement.

Key Words: substantial downzoning, takings, land use, growth management, open space, political economy

The post-war period in the United States has generally been characterized by population growth in rural and suburban communities, coupled with declines in nearby central cities (Orfield 1997). The consequences of this trend include the loss of open space and farmland, higher property taxes due to added infrastructure and service costs, concerns about traffic congestion, and fears about declining school quality. Concerns about these consequences have led to greater desire to manage unfettered growth at the urban-rural fringe and combat what is popularly known as "urban sprawl" (Burchell et al. 1998, Daniels 1999, p. 44). Various growth management tools have emerged, including purchase of development rights (PDR) on agricultural or open land, transfer of development rights, infrastructure concurrency requirements, development impact fees, clustering requirements, urban growth boundaries, and combinations thereof (see Adelaja and Schilling 1998, Kelly 1993, SmartGrowth Network 2002).

As a growth management or preservation tool, communities have always used their police power to reduce the legal density allowed on undeveloped land (increasing minimum residential lot sizes) through zoning and rezoning. This move "down" the hierarchy of land uses toward those that are less intensive (see Alonso 1964) is typically referred to as "downzoning." Downzoning is not always controversial. However, "substantial downzoning," which occurs when the degree of downzoning is substantial, is highly controversial. The growing incidence of substantial downzoning in many highly urbanized U.S. states, especially New Jersey, has created significant concern among

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This paper is dedicated to the memory of Bruce Gardner (1941–2008), our long-term friend and mentor, leading agricultural economist, pioneer, and leader in this area of inquiry.

farmers and other major owners of undeveloped land (Etgen et al. 2003, Samuels 2004). They often argue that substantial downzoning amounts to "takings," is motivated largely by anti-growth and preservation sentiments, and is implemented as an unfair substitute for market-based options such as PDR. Because it is perceived to effectively reallocate property rights, "substantial downzoning" elicits strong proponents and opponents in communities where it is being considered or implemented (Fischel 1985).

Opponents of substantial downzoning typically include a subset of farmers and other owners of a substantial parcel of land who believe that the policy will lower the market value of their land. The concerns of these opponents appear to be validated by Vaillancourt and Monty (1985), who showed that exclusive agricultural zoning resulted in a 15–30 percent reduction in agricultural land values, and by Foley (2004), who showed an inverse relationship between minimum lot size and price per acre of undeveloped land. Opponents also often include sympathizers who do not see substantial downzoning as contributing to long-term open space preservation because it results in land use patterns that are not sustainable. Opponents have also tended to include those who do not own developable land in the community, but who worry about the lack of affordable housing or limited development opportunities. Their concerns appear to be validated by Glaeser and Gyourko (2003), who argue that zoning and other land use controls play the dominant role in making housing expensive (see also Katz and Rosen 1977, Pollakowski and Wachter 1977).

Proponents of substantial downzoning, however, typically include local residents who believe that it could potentially provide financial, environmental, amenity, and/or fiscal benefits to them and/or the community (Fischel 1985, Rudel 1989, Richardson 2003). For example, homeowners may expect increased property values as a result of the above-mentioned benefits. Gottlieb and Adelaja (2004) estimate an average increase in residential property values of 5.8 percent in communities where substantial downzoning has occurred. This suggests that non-farmers do realize pecuniary gains from downzoning, while farmers may experience losses.

The line between proponents and opponents of substantial downzoning is not that easy to draw. However, it is typically the case that opponents are almost exclusively farmers, while proponents are almost exclusively non-farmers. The criticisms by farmers of substantial downzoning at the urban fringe often centers on its constituting the wipeout of farmers' wealth ("takings"), to the benefit of other residents. Given the controversy surrounding substantial downzoning, the limited literature on the subject, and its potential effects on the relative wealth and welfare of various interest groups, it is important to clarify the political economy of the issue. Of particular importance are (i) how various interest groups align with respect to substantial downzoning, (ii) what their motivations are, and (iii) the complementarity of the action to other growth management tools. Understanding these can help to improve the ability to predict when, where, and how substantial downzoning would occur, and the ability to forecast land consumption and landscape change. Studies are beginning to recognize that a community's choice of zoning restrictiveness should be treated endogenously in land use analysis (Chressanthis 1986, Pogodzinski and Sass 1994, Wallace 1988, White 1988, Rolleston 1987). This study would add to the literature and provide a framework for endogenizing zoning in land use modeling.

This paper develops a conceptual public choice model designed to explain how proponents and opponents influence the elected leadership to implement substantial downzoning at the urban fringe. It hypothesizes that such downzoning will tend to be implemented when (i) development pressure is strong, (ii) land values are high and rising, and (iii) there remains significant open space to protect; but when (iv) it has become difficult to preserve using alternative mechanisms. Therefore, substantial downzoning is made necessary by the urgency of encroaching development and the rising cost of acquiring land or development rights through market-oriented approaches. These hypotheses are tested using New Jersey as a case study. For example, the effects of the number and proportion of farmers who vote in a community on the probability of substantial downzoning imposed by non-farmers is examined (Fischel 1985, Furuseth 1985a, Rudel 1989). Also examined is the notion that non-farmers support downzoning when they are concerned about open space or other fiscal issues related to unfettered growth.

New Jersey provides an excellent case study of political issues emerging at the urban-rural fringe, including the phenomenon of "substantial downzoning." In the survey of New Jersey municipalities conducted in 2003 as part of this study, some 86 of the 266 surveyed communities reported significant increase in substantial downzoning since 1994 (a sharp increase over the pre-1994 period). The entire state is contained within federally defined metropolitan areas, which means that virtually all agricultural areas are urban-influenced. While development pressure and land values in New Jersey have been unusually high (Plantinga, Lubowski, and Stavins 2002), the findings from this analysis may be applicable to other parts of the Northeast and the country that are experiencing growth at the edge of large contiguous areas of development, and where political traditions leave land use regulation largely in the hands of local governments. Furthermore, for these and other parts of the United States where suburban development is not as extensive as in New Jersey, the New Jersey case study provides a glimpse into *future* land use pressures and possible political/policy reactions.

Conceptual Framework

A distinction must be made between the motivations for "substantial downzoning" and the action itself. These motivations, their determinants, and various other social, economic, environmental, and landscape factors, are expected causes of the action itself and of other choices available to a community. Obviously, in urban fringe areas where the market value of farmland is significantly enhanced by development potential and speculation, it is understandable that substantial downzoning would be viewed as a "takings" by owners of affected property, while easement purchase and other market-oriented preservation methods might not be. This implies that communities view substantial downzoning as an alternative to other preservation tools.

In developing a conceptual framework to explain substantial downzoning, it is appropriate to start with those motivations for preservation, conservation, and growth management that have been explored in the literature. The literature, which was pioneered by Gardner (1977), provides an inventory of possible motivations and tools for farmland preservation. Where preservation is a goal of substantial downzoning, these motivations would apply.

With respect to initiation, although Furuseth (1985a, 1985b) finds that farmers often initiate rural preservation policies, including downzoning (see also Daniels 1999), anecdotal evidence suggests that most contentious cases of substantial downzoning are initiated by non-farmers (preservationists, the anti-growth movement, and others interested in conservation). Obviously, farmers are more likely to initiate preservation when it would be in their financial interest. This does not appear to be the case in highly urbanized areas where land values are high and substantial downzoning has been contentious because of its extraordinary pecuniary impacts.

With respect to how the public aligns around issues such as substantial downzoning, the literature suggests that various interest groups will either support or oppose farmland preservation based on their views about a complex set of socioeconomic, environmental, political, and other factors that vary according to the local context (Dye 1996, Hahn 1990, Rudel 1989, Knaap and Nelson 1992, Kline and Alig 1999, Kline 2006, Kotchen and Powers 2006). For example, Kline (2006) suggests that such socioeconomic trends as population growth, rising incomes, development, and increasing open space scarcity motivate preservation. Kotchen and Powers (2006) also suggest the importance of existing open space patterns and funding sources slated to pay for preservation in motivating preservation. The contexts found to produce differing motives and outcomes in preservation include differences due to (i) urban fringe versus more outlying locations (Henneberry and Barrows 1990), (ii) type of commodity or agricultural operation (Adelaja and Friedman 1999, Daniels 1999), (iii) degree of reliance on land-based speculative returns vis-à-vis farm income (Adelaja 2004, Barton 1998), and (iv) characteristics and preferences of non-farm resident-voters (Adelaja and Friedman 1999, Frieden 1979). Given the potential complementarity or substitutability of preservation tools and substantial downzoning, for analytical purposes these factors are considered to be relevant causes and motivations for substantial downzoning.

Extreme urban fringe environments, where land values are extremely high and where development values constitute the bulk of farmland market

values, create a political economy context where contentious downzoning would more likely occur and one where commercial farmers would be united against substantial downzoning. These are, in essence, places that have experienced the pressures of urbanization longer and more significantly and that have therefore evolved more in a temporal sense under such pressures. Because of the correlation between land values, undeveloped land, and time, these places would also tend to have the least amount of open space remaining.

Although urbanization creates opportunities for greater profitability for some farmers, Lopez, Adelaja, and Andrews (1988) indicated that the net effect is negative at the level of the overall local farm economy. According to Lopez, Adelaja, and Andrews (1988) and Adelaja, Miller, and Taslim (1998), over time (or as the amount of open space remaining falls) urbanization is expected to have a negative impact on current farm profitability, but increases the importance of expected returns to land so farmers may come to rely more on land appreciation for their long-term welfare. If large-lot zoning prohibits a set of development options, it could reduce the price of farmland, especially in a place such as New Jersey where, Plantinga, Lubowski, and Stavins (2002) report, over 80 percent of farmland values are attributable to development potential (see also Muth 1971, Wisand and Muth 1972, White 1988, and Fischel 1985). It is therefore understandable that farmers would fear the erosion of the value of their most important economic asset. Although the existence of a negative land value effect from downzoning remains controversial (see, e.g., Henneberry and Barrows 1990, Etgen et al. 2003, Samuels 2004, Spalatro and Provencher 2001), it is sufficient, for present purposes, to note that metropolitan farmers believe that significant downzoning hurts them and seek to avoid the effect of such restrictions on the value of their assets. The growing number of state-level Farm Bureaus adopting resolutions opposing downzoning provides evidence that these beliefs are widely shared.

The extreme urban fringe environment is also one where non-farm homeowners, conservationists, and the anti-growth movement would typically unite in favor of substantial downzoning. For example, non-farm homeowners in those New Jersey communities where such downzoning has been contentious have overwhelmingly expressed strong support for it. The literature on local growth and anti-growth politics supports this notion by suggesting that communities with a high proportion of educated professionals whose livelihood does not depend on local growth or the exercise of development options would support anti-growth strategies such as downzoning. That tends to be the case at the urban fringe. The literature also suggests that support for anti-growth strategies is directly related to high socioeconomic status and its attendant environmental consciousness, and to the strong anti-growth sentiment that follows rapid landscape change in places where wealthy and politically influential people reside (Logan and Molotch 1987, Bates and Santerre 1994, Ihlanfeldt 2004, Pogodzinski and Sass 1994). Fischel (1985) posits that such homeowners have interests in zoning restrictiveness that are diametrically opposed to those of farmers, large landowners, and developers. For these reasons, the interests of farmers and nonfarm homeowners are assumed to be diametrically opposed at the extreme urban fringe.

The incidence of substantial downzoning and its use as a strategy for growth management seems to be concentrated at extreme urban fringe environments. For example, this has been an issue of significant angst among farmers in New Jersey, Maryland, and other highly densely populated states. In evaluating the motivations for such downzoning, it makes sense to draw on observations from an environment where substantial downzoning has occurred, alongside environments where there is no downzoning. Our interest in this paper is *contentious* downzoning. In explaining it, it is important to account for the long list of factors that the literature suggests may explain preservation and downzoning. It is also important to account for factors that are unique to the contentious urban fringe environment. It also makes sense to integrate these factors into a coherent framework for conceptual purposes. Therefore, in this paper, the time frame (also a proxy for the depletion of open space) is used in developing a simplified conceptual framework for examining the motivations for substantial downzoning. Further below, the framework is expanded via a theoretical model of substantial downzoning.

The temporal framework in Figure 1 helps explain the relationship between motivations and action (Adelaja 2004). The horizontal axis is either time or the extent to which open space has

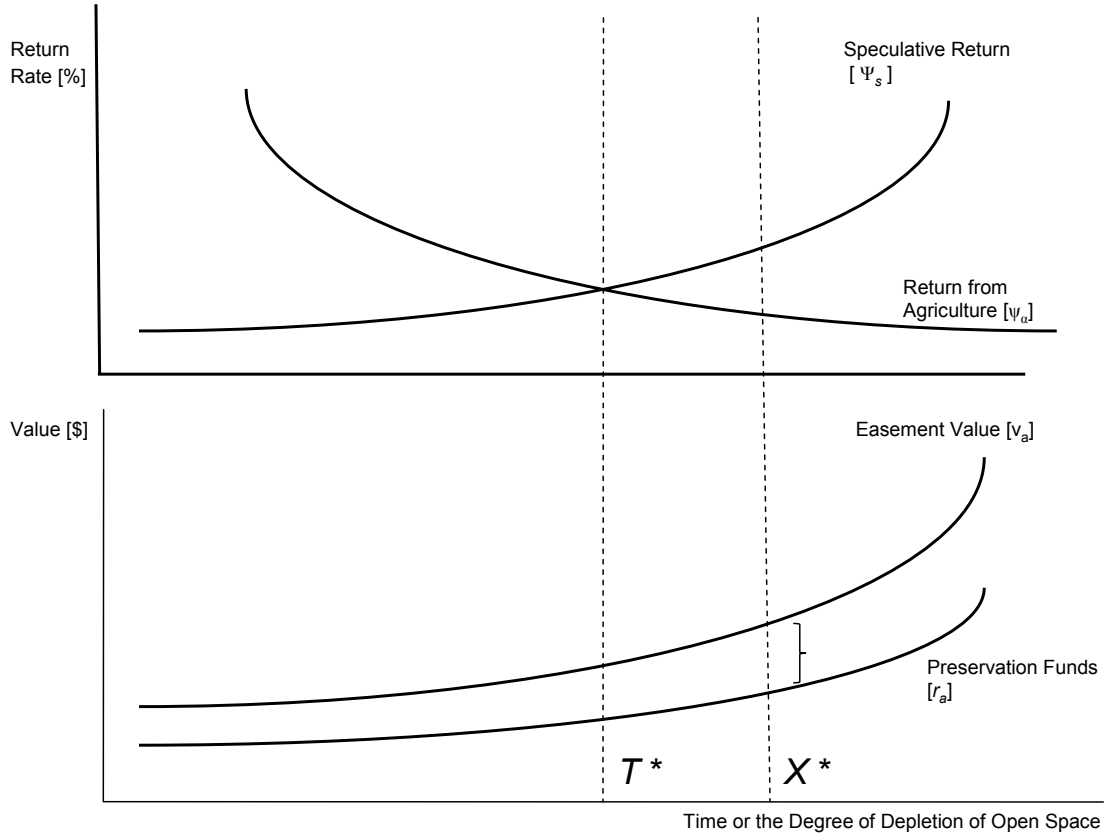

Figure 1. Preservation of Agricultural Land with Increasing Urbanization

been depleted (both obviously are positively correlated). The long-term adverse effect of the urban environment on current farm profitability is depicted by ψ_a, while the positive effect on unrealized "speculative" profits is depicted by ψ_S. The tipping point, where the primary motivation for farming ultimately shifts from reliance on farm returns to reliance on speculative returns, is depicted by T^* in the lower panel. To the right of T^*, farmers rely more on the development value of their land, which becomes a key justification for remaining in farming. The market value of the land (v_m) is the sum of the agricultural use value (v_f) and the additional value of the land due to development (v_a). The latter is typically referred to as the "easement" value, for preservation purposes. Given the non-renewable nature of open space and the inelastic demand for land in the development process, v_a should increase at an increasing rate over time or with the depletion of open space (see Muth 1971, and Wisand and Muth 1972). The shape of the speculative return curve (ψ_S) in the upper panel derives from that of the easement value curve (v_a).

Given the perceived negative effects of urbanization (on open space, air/water recharge, rural scenery, property values, and other public and private goods), the community may want to preserve the status quo. To do so at a point like X^*, it will need to have sufficient political and financial resources commensurate with v_a. However, since open space and its benefits are public goods, public resources available to preserve land (r_a) are expected to lag behind the growth of easement values. This "value gap" concept reflects the notion that $v_a - r_a$—which is also the proportion of open space desired but which cannot be preserved using market mechanisms—will become larger over time (or as open space is depleted) because preservation is a public good.

The "value gap" makes sense in the context of rapidly urbanizing areas where growth in ease-

ment value typically exceeds growth in what local taxpayers are willing to spend. One reason is that residential property value increases do not necessarily translate into a proportionate increase in property tax revenues available for preservation since the latter is based on assessed values, which are less flexible than appraised values. Also, property tax rates do not adjust systematically. Furthermore, affluent or not, local voters tend to base the amount of local services they are willing to buy on their incomes—not on their property values. Based on the concept depicted in Figure 1, it is hypothesized that the larger the value gap, the greater the desire of the public to supplement existing tools such as local open space taxes with a drastic regulatory strategy like substantial downzoning. Please note that Figure 1 makes implicit assumptions about the shapes of the speculative and agricultural returns and assumes that the value of development rights is related to the value of land in development (speculative returns).

Clearly, environments described by the zone to the right of X^* in Figure 1 would create the atmosphere of intense political conflict that usually accompanies substantial downzoning proposals. High and rising land values will worsen the gap between the market price of desired development easements and the ability of the local community to raise preservation funds through taxes, thereby increasing the likelihood of substantial downzoning. Unfortunately, the gap between perceived optimal zoning and current zoning is unobservable or unmeasurable in real life, but is reflected in the politician's decision to pursue substantial downzoning.

Based on the above, it is hypothesized that at a single point in time, at the urban fringe, differences would exist in the motivation and propensity to engage in substantial downzoning that are driven by variations in development pressure, land values, fiscal stress, remaining undeveloped open space, farm profitability, relative farm/nonfarm political clout, and other factors. It is also hypothesized that a community has the choice of whether to purchase open space, as in PDR or transfer of development rights (TDR) programs, or to "take" it, as with substantial downzoning, depending on the feasibilities of these alternatives. It is further hypothesized that proponents of substantial downzoning push for this option when v_a (see Figure 1) is high and (i) the gap between the perceived optimal zoning level to adequately manage growth and (ii) the current density on undeveloped land in the community gets sufficiently large, while alternatives to downzoning do not appear as feasible. The conceptual framework is expanded further by developing a theoretical political economy model of substantial downzoning, which operationalizes the diametrically opposed interests of farmers and non-farm homeowners based on the influence of different interest groups on political or regulatory outcomes (see Peltzman 1976, Hahn 1990, and Campos 1987).

A Theoretical Model of "Substantial Downzoning"

Two competing interest groups are assumed: (i) the farm community, who along with nonresident developers may be hurt by substantial downzoning, and (ii) homeowners, other conservationists, and anti-growth advocates who comprise the majority of non-farm residents who vote. The opposing interests of these groups must be balanced by the government (Fischel 1985).

Let φ be a zoning adjustment parameter that reflects the gap between (i) the desired zoning density (φ^+), defined as the optimal weighted-average minimum lot size on undeveloped land that is perceived by policymakers to achieve the community's growth management and preservation goals, and (ii) current zoning (φ^*), defined as current weighted-average minimum lot size on the undeveloped land in the community. That is, $\varphi = \varphi^+ - \varphi^*$. Note that φ^+ is greater than φ^* in an increasingly urbanizing area due to the view by local officials that larger lot sizes will slow down growth. Define $\alpha = 0$ when $\varphi = 0$ and the decision maker perceives that there is no need to substantially downzone. Further define $\alpha = 1$ when φ is sufficiently large enough to warrant substantial downzoning (the decision maker perceives that the value of $\varphi^+ - \varphi^*$ justifies taking the political risk to significantly downzone). Although these extremes are chosen to illustrate the dichotomy between significant downzoning and the status quo, they clearly demonstrate the nature and complexity of the choice faced by the political decision maker.

The farmer-landowner community believes that $\alpha = 0$, desires a low level of α, and wants the politician to share his or her belief. To the farmer-

landowner, a relatively large value of α is a threat that could lead to a "takings," which will reduce his or her development potential and future capital gains on land. On the other hand, homeowners and other proponents believe that α = 1 and want the politicians to take their side. This is especially so in the absence of the willingness or ability to meet the farmer in the marketplace (through PDR, for example). Subject to a set of conditions and preference factors, homeowners will lobby the governing body for α = 1, while farmer-landowners will lobby for α = 0. The political decision maker must endogenously consider the optimal level of α, the level that maximizes his or her own utility (0 or 1). The utility-maximizing behavior of this decision maker is expressed below.

Elected Officials' Choice of α

The government, which comprises elected representatives of the people, both farm and non-farm, behaves rationally in the sense that it decides only on such measures as it believes would raise its electoral prospects (see Hahn 1990). The utility function of the government may thus be regarded the same as the expected total vote function:

$$u^G = V = F\Pi^f(\mathbf{x},\alpha) + N\Pi^n(\mathbf{z},\alpha), \tag{1}$$

where F is the voting population of farm households, N is the voting population of non-farm households, f and n are superscripts for farmers and non-farmers, Π^i is the probability that the average ith group household will vote for the government, $i = f, n$, $\mathbf{x}$ is a vector of preference factors or other local conditions that affect Π^f (conditional on α), and $\mathbf{z}$ is a vector of preference and other factors that affect Π^n, conditional on α. Equation (1) suggests that a stakeholder's support for a candidate will depend on that candidate's implementation of policies favorable to his or her interest.

The following household vote probability functions capture voting preferences related to zoning restrictiveness as well as other factors:

$$\Pi^f(\mathbf{x},\alpha) = c - d(\mathbf{x})\alpha^\gamma \tag{2}$$

$$\Pi^n(\mathbf{x},\alpha) = g - h(\mathbf{z})(1-\alpha)^\gamma, \tag{3}$$

where $\gamma > 1$; c, g, $d(\mathbf{x})$, $h(\mathbf{z}) > 0$; c is the probability that the average farm household will vote for the politician if α = 0; and g is the probability that the average non-farm household will vote for the politician if α = 1. Thus, c and g are vote probabilities based on "all other" factors, which is what remains if the politician eliminates lot size as an issue by selecting either group's optimal choice (α = 0 for farmers, α = 1 for non-farmers).

With c and g as intercepts in the vote probability functions, contextual and preference factors $\mathbf{x}$ and $\mathbf{z}$ enter as arguments to non-negative slope functions $d(\mathbf{x})$ and $h(\mathbf{z})$ that reduce each household's utility as a result of choices of α that are less than optimal for each household type. In the context of a strictly theoretical model, one may assume that $d(\mathbf{x})$ and $h(\mathbf{z})$ are scaled so that the resulting probabilities Π can never be negative.

Equations (2) and (3) define the members of groups F and N such that $\Pi^f_\alpha < 0$ and $\Pi^n_\alpha > 0$. Following Fischel (1985), we assume diminishing marginal utility for additional increments of zoning restrictiveness/lack of restrictiveness. This is the reason for the positive exponent γ in equations (2) and (3). It can be shown, consistent with this assumption, that $\Pi^f_{\alpha\alpha} < 0$ and $\Pi^n_{\alpha\alpha} < 0$. For any element x in vector $\mathbf{x}$ that increases the intensity of farmers' existing zoning preferences with α fixed, $\Pi^f_x < 0$. The essential amplification role played by any element of $\mathbf{x}$ means that $\Pi^f_{\alpha x} < 0$. A reasonable behavioral assumption about diminishing marginal effects within function $g(\mathbf{x})$ suggests that $\Pi^f_{xx} > 0$. The partial derivatives for non-farm households may be found by analogy: $\Pi^n_z > 0$, $\Pi^n_{zz} < 0$, and $\Pi^n_{\alpha z} > 0$.

Returning to equation (1), the first-order condition for maximizing total votes is

$$\frac{dV}{d\alpha} = F\frac{\partial\Pi^f}{\partial\alpha} + N\frac{\partial\Pi^n}{\partial\alpha} = 0. \tag{4}$$

In order for equation (4) to define a maximum, the second-order condition must hold:

$$\frac{d^2V}{d\alpha^2} = F\Pi^f_{\alpha\alpha} + N\Pi^n_{\alpha\alpha}. \tag{5}$$

Given the assumptions, this expression is negative such that the condition in equation (4) unambiguously defines a maximum. Although the choice variable is restricted to the range 0 to 1, there can be no corner solution to the vote-maximization problem as long as the community contains at

least one farmer and one non-farmer—thus justifying our use of the first-order condition in equation (4). This is proven next.

The condition in equation (5) shows that the expected vote function is strictly concave. To demonstrate that the optimum will occur away from the constraints in the domain, at a place where condition (4) holds, it is therefore sufficient to show that the expected vote function has a positive slope in the immediate vicinity of $\alpha = 0$ and a negative slope in the immediate vicinity of $\alpha = 1$. Let ε be an infinitesimally small increment. Then, for the left-hand side of the restricted domain, this condition is equivalent to saying that $V(\alpha = 0) < V(\alpha = \varepsilon)$. For the right-hand side of the restricted domain, it is equivalent to saying that $V(\alpha = 1 - \varepsilon) > V(\alpha = 1)$.

Now, consider first the right-hand-side constraint, which is probably the more important one in the context of non-farm majorities. The condition for a negative slope in the vicinity of $\alpha = 1$ may be expressed using the full specification of V in equation (1) and substituting the vote probabilities in equations (2) and (3):

$$(6)\quad F[c - d(1-\varepsilon)^{\gamma}] + N(g - h\varepsilon^{\gamma}) > F(c-d) + Ng\,.$$

The arguments to functions d and h are omitted for legibility. This inequality simplifies to

$$(7)\qquad Fd/Nh > \frac{\varepsilon^{\gamma}}{1-(1-\varepsilon)^{\gamma}}\,.$$

Because

$$\lim_{\varepsilon \to 0} \frac{\varepsilon^{\gamma}}{1-(1-\varepsilon)^{\gamma}} = 0$$

and Fd/Nh is always positive when there is at least one farmer, and cannot be infinitesimally small, there will always be a value of ε for which the inequality holds. A similar proof, not shown here, exists for α in the vicinity of 0.

If there are no farmers, then $Fd/Nh = 0$ and a corner solution will occur, reflecting the intuition that there is no political downside to adopting the non-farmers' zoning program. The complete absence of farmers is unlikely in communities actively considering substantial downzoning, which makes sense only for land that is developable: for the most part, farmland. When farmers do exist, the logic above suggests that even solutions that meet the first-order condition can be extremely close to the constraints on α—an "almost" corner solution. Given our sample of communities that mostly contain farmers, using a Lagrangean to account for these four cases would complicate the model without adding explanatory value. In samples where one or the other interest group is completely missing, the possibility of a corner solution must obviously be taken more seriously.

The optimal level of α (α^*) selected by elected officials to maximize votes can be defined as a function of the exogenous variables. To accomplish this, totally differentiate equation (4):

$$(8)\qquad dV_{\alpha} = \Pi^{f}_{\alpha} dF + \phi d\alpha + F\Big(\sum_{i=1}^{k} \Pi^{f}_{\alpha x^{i}} dx^{i}\Big) + N\Big(\sum_{i=1}^{m} \Pi^{n}_{\alpha z^{i}} dz^{i}\Big) + \Pi^{n}_{\alpha} dN,$$

where $\phi = F\Pi^{f}_{\alpha\alpha} + N\Pi^{n}_{\alpha\alpha} < 0$ and k and m are the number of exogenous variables in $\mathbf{x}$ and $\mathbf{z}$ respectively. Examining changes in one variable at a time, one obtains from equation (8) the following:

$$(9)\qquad \frac{d\alpha^*}{dF} = -\frac{\Pi^{f}_{\alpha}}{\phi} < 0\,,$$

$$(10)\qquad \frac{d\alpha^*}{dN} = -\frac{\Pi^{n}_{\alpha}}{\phi} > 0\,,$$

$$(11)\qquad \frac{d\alpha^*}{dx^{i}} = -\frac{F\Pi^{f}_{\alpha x^{i}}}{\phi} < 0\,,$$

$$(12)\qquad \frac{d\alpha^*}{dz^{i}} = -\frac{N\Pi^{n}_{\alpha z^{i}}}{\phi} > 0\,.$$

The signs on equations (9) and (10) confirm the basic political intuition that the higher the ratio of homeowners to farmers in the community, the greater the likelihood of substantial downzoning. Furthermore, an increase in any exogenous variable x^i reduces the vote-maximizing level of α^* chosen by the politician, while an increase in any exogenous variable z^i increases the vote-maximizing level of α^*. Note that vectors $\mathbf{x}$ and $\mathbf{z}$ could conceivably share a common element, in

which case the total effect of that factor on α* will be the sum of the expressions in (11) and (12), with the sign of the combined expression determined by the number of farmers and non-farmers, and by the nature of functions $d(\mathbf{x})$ and $h(\mathbf{z})$.

Minimum average lot size of undeveloped land in a community at a single point in time is difficult to observe and requires detailed map work and the examination of ordinances for particular zones. Because the process of urbanization in New Jersey's communities is uni-directional, the typical rezoning case is one in which farmers are slowly replaced by non-farmers, with the result that the pre-existing zoning regime, which satisfied equation (1), is no longer optimal from the politician's point of view. Thus any empirical study of substantial downzoning is actually a study of the politics of *re-equilibrating* zoning regulations so that they accord with equation (1), effectively "catching up" to the community's changed demography and political preferences. When land prices rise rapidly, the "value gap hypothesis" helps explain the choice of downzoning over less controversial growth management tools. Elements of the **x** and **z** vectors are anticipated by the two opposing groups and help explain the levels of enthusiasm (or anger) captured in the vote probability functions (2) and (3). The outcome variable is *substantial downzoning* (yes or no), a variable which can be collected at the municipal level if one can determine the difference between downzoning that is typical for a community and *substantial* downzoning, which is more controversial.

Data and Estimation

The zoning adjustment parameter, α, was treated above as a continuous variable. However, in real life, α is observable only as a binary choice variable. In the case of New Jersey, communities routinely adjusted their zoning over time. However, these zoning adjustments became quite substantial and controversial after 1995 when a favorable New Jersey Supreme Court ruling in *Kirby v. Bedminster* appeared to make municipalities bolder in their use of the downzoning tool. Communities typically change their zoning as part of a master plan update, which involves more than mere tinkering. Also, in New Jersey the typical minimum lot size on agricultural land varies widely by community. At one extreme are communities that already maintain low minimum lot size restrictions. At the other extreme are communities that maintain large minimum lot size restrictions. What might be considered a significant enough downzoning for a community depends on the current minimum lot size. Therefore, a decision had to be arbitrarily made about the level of downzoning that was significant enough to be considered a major change in municipal policy.

The authors sought the input of a number of farmers and planners actively involved in controversial downzoning incidents regarding the level of downzoning that was significant enough to constitute substantial downzoning. Given the variations in minimum lot size prior to zoning change, this standardization allowed the construction of the *substantial downzoning* variable.

An increase in minimum lot size of at least 50 percent, at least 1 acre, and extending over at least 1 percent or more of a municipality's land area was considered to be significant enough to constitute "substantial" downzoning. While this combination appears somewhat arbitrary, anecdotally it mirrors the communities that experienced significant angst among various interest groups involved in the downzoning process. To obtain primary municipal-level data on the *substantial downzoning* variable and other causal factors, the authors conducted the New Jersey Municipal Zoning Survey (NJMZS) in the spring of 2004. It was administered to the 278 municipal governments in the state that reported the presence of agricultural activity and that were located outside of fully urbanized areas. Appropriate representatives of the 278 municipalities (mostly zoning and planning officials) were surveyed by telephone, 266 of whom provided full responses to our survey questions (a response rate of 96 percent). Respondents were asked whether they had passed a downzoning ordinance that significantly increased minimum lot sizes in the undeveloped portion of the community at any time since 1995. (The year 1995 was the time frame that experts have indicated they began to notice a sharp upswing in the practice of downzoning.) None disagreed with the definition of "substantial downzoning" conveyed to them.

Survey respondents, who were generally zoning administrators, answered yes or no to the sub-

stantial downzoning question based on the definition we provided. When the answer was *yes*, they provided the date of the substantial downzoning and the lot sizes before and after, when such information was available. Most communities that identified themselves as experiencing substantial downzoning exceeded the tripartite thresholds easily. The overwhelming majority of communities had actually downzoned to levels above 20 acres.

Information was also obtained about minimum residential lot sizes before and after any significant downzoning. When municipalities provided this information, it was often in the form of multiple lot sizes for different zoning classifications. Therefore, the decision to downzone was evaluated via a dichotomous variable: *yes* = 1 and *no* = 0. Independent variables had to be constructed from data available from a number of sources, based on guidance provided by our theoretical framework and some past studies. The proxies used for the independent variables are shown in Table 1, along with the mean values for each.

Given the absence of data directly reflecting the strength of the "anti-growth" lobby (a clear unobservable), the best available proxy (relative strength) was used. Following Gottlieb and Adelaja (2004), who showed that non-farmers benefit from substantial downzoning through enhanced property values (amenity benefits argument), a simplifying assumption was made that non-farmers will lobby for substantial downzoning. Given the cross-sectional nature of the data, one would expect a continuum from a high relative strength of the non-farm community to a high relative strength of the farm community. So, the anti-growth movement is simply defined to include all non-farm residents. This is consistent with Adelaja and Friedman's (1999) work on the right-to-farm issue, which proxied the political strength of the farm community by the farmers' share of the total population. Like the anti-growth movement, the rest of the non-farm community is assumed to have a vested interest in substantial downzoning.

We acknowledge the fact that non-farmers may be neutral and may not lobby for downzoning. However, there is no reason to believe that the percentage of the non-farm public that is neutral will systematically vary across jurisdiction. Therefore, the relative size of the farm community was chosen as a proxy for the strength of the farm community or the inverse of the strength of the anti-growth movement. This may explain why in many communities, substantial downzoning essentially degenerates into a conflict between farmers, who typically own the vast majority of farmland in their community, and the non-farm public, which will typically be led by environmentalists and other anti-growth activists.

This simplifying assumption implies that farmers are essentially the opposition and their strength is inverse to that of the proponents. Therefore, farmers as a percentage of all occupations in a community in 1990 (*%FARMERS*) was used as a proxy for the *voter head count* variable. The fact that the places where substantial downzoning occurred tended to be those places where the farm population was minimal or where it had significantly declined, lends credence to our choice of *%FARMERS*. *%FARMERS* is expected to have a negative impact on the probability of substantial downzoning, other things equal. *%NON-FARMERS* is not included, of course, because of its perfect collinearity with *%FARMERS*. Equations (9) and (10) suggest that *%FARMERS* should be used as an interaction term with various contextual or preference factors. However, experiments with such interaction terms did not produce significant results and were not included in the results section.

Farmers' preference variables (**x**) include average farm size (*FARMSIZE*) and percentage change in the value of vacant land ($\Delta VACANTVAL$). It is hypothesized that the larger the farm size, the higher the cost of downzoning to the farm public and the higher the degree of opposition by farmers. With respect to $\Delta VACANTVAL$, which is defined as change in the value of all undeveloped land other than farmland and associated woodlands, this variable should reflect greater cost of downzoning to the farmer. In other words, the value of undeveloped land reflects the development value of farmland, which when compared with the agricultural value reflects the easement value. Therefore, it is hypothesized that the probability of the farmer voting against substantial downzoning would increase with $\Delta VACANTVAL$, leading to a reduced likelihood that substantial downzoning would pass.

A number of *intensity of preference* variables (**z**) are specified for non-farmers. Given the stated inequality in equation (10), per-capita income

Table 1. Means and Descriptions of Independent Variables

Variable	Acronym	Predicted Effect [see equations (7)–(9)]	Subst. Downzoning = 0 N	Subst. Downzoning = 0 Mean	Subst. Downzoning = 1 N	Subst. Downzoning = 1 Mean
VOTER HEAD-COUNT VARIABLES						
Farmers as % of all occupations in 1990 (F)	*%FARMER*	$d\alpha^*/dF < 0$	180	1.83	86	2.21
Non-farmers as % of all occupations in 1990 (N) [= 100% minus previous var]						
VARIABLES IN THE X VECTOR (FARMER PREFERENCE INTENSITY)						
Stake in land value effects						
Average farm size in 1992	*FARMSIZE*	$d\alpha^*/dx < 0$	180	302.17	86	302.17
Percentage change in average valuation of vacant land, 1980–1990	Δ*VACANTVAL*	$d\alpha^*/dx < 0$	180	200.79	86	270.05
VARIABLES IN THE Z VECTOR (HOMEOWNER PREFERENCE INTENSITY)						
Growth, urgency, environmental resources to protect						
Open land as % total buildable acreage 1995	*OPENSPACE*	$d\alpha^*/dz > 0$	180	46.98	86	68.52
(Open land %)^2	*OPENSPACE2*	$d\alpha^*/dz < 0$	180	3049.15	86	5039.08
Woods and wetlands as % of undeveloped land in 1995	*WETWOOD*	$d\alpha^*/dz > 0$	180	72.55	86	64.46
Percentage change in county population, 1990–1997	Δ*POP*	$d\alpha^*/dz > 0$	180	5.95	86	8.02
Percentage of open, developable land in 1986 that had been developed by 1995	*%DEVELOPED*	$d\alpha^*/dz > 0$	180	13.40	86	7.90
Percentage change in per parcel valuation of vacant land, 1980–1990	Δ*VACANTVAL*	$d\alpha^*/dz > 0$	180	200.79	86	270.05
Percentage change in per parcel valuation of residential land, 1980–1990	Δ*RESIDVAL*	$d\alpha^*/dz > 0$	180	176.47	86	176.38
Preferences of the non-farm majority	*INCOME*	$d\alpha^*/dz > 0$	180	19788.81	86	21902.12
Per capita personal income in 1989	*OWNEROC*	$d\alpha^*/dz > 0$	180	77.44	86	82.23
Percent residents who were owner-occupiers in 1990	*DEMOCRAT*	$d\alpha^*/dz > 0$	180	29.09	86	17.80
Percentage of municipal governing body Democrat in 1994	*TAX*	$d\alpha^*/dz > 0$	180	2.24	86	2.08
Equalized property tax rate in 1995	*WCOLLAR*	$d\alpha^*/dz > 0$	180	0.29	86	0.31
Managers and professionals as fraction of residents with occupations in 1990	*DEBT*	$d\alpha^*/dz > 0$	180	43.54	86	40.04
Per-capita public debt in 1990	*SENIOR*	$d\alpha^*/dz > 0$	180	12.78	86	10.82
Percentage of residents over 65 years of age in 1990	*INCOME*	$d\alpha^*/dz > 0$	180	19788.81	86	21902.12
EXISTENCE OF OTHER PRESERVATION PROGRAMS	*OWNEROC*	$d\alpha^*/dz > 0$	180	77.44	86	82.23
Right to farm law (0 = none, 1 = weak, 2 = strong)	*RTFTYPE*	[> 0]	180	0.30	86	0.69
Acres of farmland preserved or pending, 1994	*PRESACRES*	[> 0]	180	66.77	86	192.37
Open space tax (0 = none, 1 = some)	*OPENTAX*	[> 0]	180	0.47	86	0.78

Sources: Occupational counts, housing tenure, age, and income are from the U.S. Decennial Census. Farm size and PDR acres are from reports of the New Jersey Department of Agriculture. Right-to-farm data are from Adelaja and Friedman (1999). Data for 1986 and 1995 land cover are from the New Jersey Office of Smartgrowth. Data on municipal budgets, land value, and political parties are from New Jersey Legislative district data books and from the New Jersey Department of Community Affairs. Open space tax data is from Schilling, Marxen, and Onyango (2004).

(*INCOME*) is expected to have a positive impact on the probability of substantial downzoning, reflecting the notion that preservation of rural character and other environmental amenities is a luxury good (Baldassare 1981).

The proportion of residents who hold white collar (managerial and professional) jobs (*WCOLLAR*) is expected to increase the probability of substantial downzoning because of the political skills required to mobilize an anti-growth coalition (Logan 1976, Protash and Baldassare 1983). This variable has the same predicted sign as median household income, and is understandably correlated with it. Finally, the higher the percentage of voters who are owner-occupiers (*OWNEROC*), the larger the number of non-farmers with a housing asset they wish to protect using the substantial downzoning tool. The hypothesized sign on this variable is positive.

The percentage of the governing body that belongs to the Democratic Party (*DEMOCRAT*) is hypothesized to increase with the probability of substantial downzoning, suggesting that Democrats will be less hampered than Republicans by a property rights ideology, will value the environment more heavily than concerns about regulatory "takings," and are more likely to support the non-farm majority. Therefore, *DEMOCRAT* is classified under the **z** vector. The use of this variable assumes considerable stability in party control, since the substantial downzoning could have occurred any time between 1995 and 2004.

Variables related to municipal fiscal stress could affect the selection of substantial downzoning over other tools. Such variables selected include the equalized tax rate in 1995 (*TAX*) and per capita debt burden in 1990 (*DEBT*). Both variables should therefore be positively related to the choice of substantial downzoning. Senior citizens are expected to be more conservative when it comes to fiscal matters, so the proportion of residents over 65 (*SENIOR*) is also included as a fiscal stress factor, with the expectation of a positive relationship.

The final set of variables in the **z** vector measure *urgency* and *environmental resources at risk.* These variables are hypothesized to motivate the non-farm majority to act. One would expect the hypothesized coefficients of these variables to be positive.

If most of the community's open space is already gone, one might expect there is nothing left to protect and therefore limited interest in substantial downzoning. Furthermore, communities with more open space may have more anti-growth advocates that lobby for substantial downzoning, as such people are likely to reside in areas with more open space. Therefore, a positive coefficient is anticipated for open space as a proportion of the community's total land area in 1995 (*OPENSPACE*). A squared term for this variable (*OPENSPACE2*) is included to account for the following possibilities: (i) when there is a great deal of open space, it is not viewed as being at risk and so the decision might be to do nothing; (ii) when there is very little open space left, preserving it may be regarded as a lost cause; and (iii) between these two extremes, homeowners are more likely to decide to take action.

Δ*VACANTVAL* is included as a farmers' preference variable to reflect the conflict between farmers and non-farmers. It was hypothesized that increased Δ*VACANTVAL* leads to greater opposition to substantial downzoning by farmers. However, increased Δ*VACANTVAL* could reflect higher potential benefit from substantial downzoning to the non-farm public, and therefore greater advocacy by non-farmers for substantial downzoning. The net effect of this struggle itself reflects relative political clout. If it is negative, then farmers are either more sensitive to or are better motivated by this variable.

The variables Δ*POP*, *%DEVELOPED*, Δ*VACANTVAL*, and Δ*RESIDVAL* all represent different aspects of growth pressure and urgency. Δ*POP*, which measures population growth in the county in which the municipality sits, captures whether or not communities substantially downzone in response to population growth outside their own borders. Δ*VACANTVAL* has been previously discussed. Δ*RESIDVAL*, which is the average price of residential parcels, should have an effect similar to that of Δ*VACANTVAL* as it reflects development value of farmland. Following the logic in Figure 1, the hypothesized sign of Δ*RESIDVAL* is positive.

%DEVELOPED captures the psychological effect of rapid open space loss on non-farm residents. Its hypothesized sign is positive. It is essentially a dynamic version of *OPENSPACE*. The percentage of woodlands and wetlands (*WETWOOD*) is intended to capture environmental motivations that differ from other growth control motivations (as in Adelaja and Friedman 1999).

Three variables describe *alternative preservation programs* in each municipality. *RTFTYPE* captures the existing agricultural nuisance protection mechanisms in place. The variable is specified to have three levels: 0 for no right-to-farm law, 1 for a weak right-to-farm law, and 2 for a strong right-to-farm law at the local level (Adelaja and Friedman 1999). Data available on two types of open space acquisition programs were used to construct related variables: (i) acres enrolled in the state's purchase of development rights program (*PRESACRES*), and (ii) the existence of a local open space tax (*OPENTAX*).

Alternative preservation programs could be complements or substitutes for substantial downzoning. Because farmers tend to support these programs, their presence in the community could reflect unmeasured political clout of farmers. Such existence would be expected to decrease the likelihood of substantial downzoning, suggesting that these programs are substitutes for it. Similarly, non-farmers may regard alternative growth management policies as substitutes (they bring about the same outcome, and so not all are needed). Alternatively, prior existence of these alternative programs may mollify farmers to some extent, meaning that they will be more likely to accept substantial downzoning. This latter interpretation, which implies complementarity, is most likely in the case of *PRESACRES*. The reason is that substantial downzoning should be a less significant issue for farmers who have already sold their development rights. Similarly, municipalities that choose one growth management tool may be more likely to also choose others (complementarity), reflecting particularly aggressive preservation motives on the part of the non-farm majority.

Figure 1 tells a story of complementarity: when preservation needs become urgent, the non-farm majority turns to substantial downzoning to make up the gap in its acquisition program if the "value gap" is significant. Having observed the debates surrounding downzoning conflicts, the authors strongly suspect that farmers are not mollified by right-to-farm ordinances or PDR programs to the point where they are willing to accede to substantial downzoning. Many farmers regard this action as the "taking" of a fundamental right, and tend to oppose it even if it does not affect them personally. In addition, the idea that various preservation tools are substitutes sounds a bit arcane for environmentalists and other activists mounting a full-court press against growth. The matter of funds available for outright acquisition, a logical determinant of why one policy might be substituted for the other, is modeled using separate variables such as debt and taxes. For these reasons, we hypothesize that alternative preservation programs are *complements* to substantial downzoning, to the extent that non-farmers dominate the political process. This hypothesis is indicated in Table 1 in brackets because it is a complex aggregate that captures preferences, clouts, and the sizes of the two opposing groups.

One potential approach is to estimate a nested logit model, with one set of covariates determining the choice to mount any preservation effort, and a second set determining the choice to substantially downzone. This was not feasible, for three reasons: (i) the four preservation tools on which data is available do not represent a comprehensive list of all such tools, (ii) the tools are not disjoint, and (iii) anecdotal evidence suggests huge variations across communities in the timing between the decision to do something and when the appropriate tool is chosen. Instead, the following two-stage approach is used in estimating the model. First, a set of logit models of the probability of downzoning is estimated, with both socioeconomic variables and alternative tools as covariates (this addresses the complement/substitute question). Second, the alternative preservation tools are omitted from among the covariates in a model of the probability of the use of *any* of the three local growth management tools, using only socioeconomic, preference, and contextual factors as regressors.

The first set of logit models, which relate to the probability of substantial downzoning, were specified as follows:

$$\log \frac{P(DOWNZONE_{yes})}{1 - P(DOWNZONE_{yes})} = \sum\nolimits_k b_k r_k + \varepsilon , \tag{13}$$

where $P(DOWNZONE_{yes})$ is the probability that a municipality has substantially downzoned, $\Sigma_k b_k r_k$ is a linear combination of k regressors and coefficients, and ε is an independent and normally distributed random error term with a mean of zero and a constant variance.

Empirical Results

Table 2 presents the estimated coefficients and standard errors for the three full models of the probability that New Jersey communities adopted substantial downzoning between 1995 and 2004. The marginal effect of each causal variable on the probability of substantial downzoning over one standard deviation of each covariate is also included. The first specification contains all of the covariates, the second is the result of a stepwise procedure, and the third, marked "preferred," is essentially the full model minus a small number of covariates regarded as collinear/redundant. A specific example of the difference between the full and preferred specification is the dropping of *FARMSIZE*. As a marker for rural character, *FARMSIZE* can be expected to exhibit a three-way collinearity with *OPENSPACE* and *%FARMER*, potentially masking the impact of those two important variables. The results section is based on the findings of the "preferred" model.

All of the statistically significant coefficients have the expected signs. *OPENSPACE* has a positive coefficient, as well as the largest measured impact on the probability of substantial downzoning. This confirms two possible hypotheses: (i) communities tend to act when there is something significant to protect, and (ii) communities with more open space are more likely to have a stronger anti-growth movement that lobbies for substantial downzoning because people with such preferences are likely to reside in areas with more open space. Although it was significant and negative in the stepwise model, *OPENSPACE2* was dropped in the final model to reduce collinearity.

The coefficient of *%FARMER* was negative, as expected, and supports the *farmer political clout* argument. The incidence of substantial downzoning is therefore expected to grow as the number of farmer-dominated places dwindles, leading to declines in farmers' political clout. This is consistent with Adelaja and Friedman (1999), who predict a systematic weakening of protective mechanisms for farming. The positive coefficient of *OPENSPACE* combined with the negative coefficient on *%FARMER* suggests that those communities with extensive farmland base but declining farm population are particularly vulnerable. The possibility of the farm community implementing strong advance protective mechanisms while they still have sufficient clout was discussed by Adelaja and Friedman (1999). Such advance approaches might also be appropriate in the case of substantial downzoning.

Recall that both $\Delta VACANTVAL$ and $\Delta RESIDVAL$ somewhat reflect the opportunity cost of farmland in development (development value). The difference between the development value and the agricultural value of farmland is the easement value. Recall also that the easement value minus the funding available for farmland preservation is the value gap. Therefore, holding the agricultural value and farmland preservation funding available constant, both $\Delta VACANTVAL$ and $\Delta RESIDVAL$ should reflect a value-gap increase. The significant and positive coefficient of $\Delta VACANTVAL$ supports the value-gap hypothesis. However, the insignificance of the coefficient of $\Delta RESIDVAL$ (the residential equivalent of $\Delta VACANTVAL$) suggests that land affordability, not housing affordability, drives the choice to substantially downzone. $\Delta RESIDVAL$ is likely more affected by housing demand and supply, while $\Delta VACANTVAL$ is likely more affected by land supply and demand. The latter is more relevant to the hypothesis of substantial downzoning. Interestingly, while the cost of land acquisition is found to drive the choice to downzone, fiscal capacity variables (*DEBT*, *TAX*) are not found to be significant drivers.

The coefficients of *OPENTAX* and *RTFTYPE* variables are positive and significant at the 10 percent level, suggesting that the non-farm majority uses the many preservation tools as complements. As Figure 1 suggests, the non-farm majority is not anti-farmer, but pro-open–space. They do not actively prefer downzoning to such farmer-friendly tools as right-to-farm and open space acquisition. Taken together, the results appear to suggest that they use substantial downzoning as a supplementary tool when prices move out of reach and the urgency of the situation leaves them with fewer alternatives. As suggested above, with the open space tax variable, these results may also reflect the fact that the anti-growth movement self-select to live in such communities where the propensity to fund farmland preservation through open space taxes is higher. The significant and positive coefficient of ΔPOP reflects the positive influence of growth pressure in the larger region on the local prospects for substantial downzoning.

Table 2. Results of Logit Model of Probability That Municipality Will Have "Substantially Downzoned" Since 1995

	FULL SPECIFICATION		STEPWISE SPECIFICATION		PREFERRED SPECIFICATION	
Observations	266		266		266	
-2 LOG L	241.621		252.4		246.592	
Parameter	Estimate (s.e.)	Change in Probability	Estimate (s.e.)	Change in Probability	Estimate (s.e.)	Change in Probability
INTERCEPT	-6.029**		-7.1735**		-2.9651	
	(2.9356)		(1.2818)		(2.3462)	
%FARMER	-0.1509	-5.2			-0.2908**	-10.9
	(0.1345)				(0.1235)	
FARMSIZE	0.00111	5.3	0.00136**	6.5		
	(0.000775)		(0.000682)			
INCOME	-0.00002	-2.7			-0.00001	-1.5
	(0.000039)				(0.000029)	
WCOLLAR	0.5614	0.8				
	(3.9694)					
RTFTYPE	0.4026*	5.2			0.4402*	6.3
	(0.2415)				(0.2397)	
OWNEROC	0.00727	1.6			0.00801	1.9
	(0.0168)				(0.0163)	
OPENSPACE	0.1258**	60.8	0.1607**	78.2	0.0366**	19.3
	(0.052)		(0.0449)		(0.0122)	
OPENSPACE2	-0.00087	-43.8	-0.00118**	-59.8		
	(0.000454)		(0.000382)			
WETWOOD	-0.0031	-1.1			-0.0128	-4.8
	(0.0111)				(0.00995)	
PRESACRES	0.00022	1.4			0.000235	1.6
	(0.000496)				(0.000506)	
OPENTAX	0.7438*	6.4	1.0758**	9.3	0.7927*	7.4
	(0.4254)		(0.3417)		(0.397)	
DEMOCRAT	-0.00144	-0.8			-0.00103	-0.6
	(0.00618)				(0.00597)	
TAX	-0.3242	-2.2			-0.3629	-2.7
	(0.5268)				(0.5194)	
DEBT	0.00547	3.8			0.0063	4.8
	(0.00532)				(0.005)	
SENIOR	-0.043	-3.7			-0.0447	-4.2
	(0.0353)				(0.0346)	
%DEVELOPED	-0.00562	-1.3			-0.0151	-3.9
	(0.0317)				(0.0266)	
Δ*POP*	0.084*	5.6			0.0927*	6.8
	(0.0508)				(0.0487)	
Δ*VACANTVAL*	0.00272**	7.1	0.00332**	8.7	0.00274**	7.8
	(0.00119)		(0.00109)		(0.00119)	
Δ*RESIDVAL*	0.00275	1.8			0.0018	1.3
	(0.00477)				(0.00477)	

Note: ** is significant at the 5 percent level. * is significant at the 10 percent level.

As shown in Table 2, the large list of political (e.g., *DEMOCRAT*), socioeconomic (e.g., *INCOME*, *WCOLLAR*, and *OWNEROC*), and other preference factors (e.g., Δ*RESIDVAL*) are generally not significant. As mentioned above, these variables may be insignificant because of the presence of alternative preservation programs among the covariates (Table 2 effectively models the choice of downzoning conditional on the existence of a set of tools that have similar motivations and objectives). As part of our second stage analysis, we specified the presence of "any preservation program" as the dependent variable and eliminated the alternative growth management programs as independent variables (Logan 1976, Baldassare 1981, Protash and Baldassare 1983, Kline and Wichelns 1994). Two models that omit alternative growth management tools as regressors are therefore estimated, and the results are presented in Table 3.

Model 1 in Table 3 shows the probability of substantial downzoning as a function of preference factors, but not of alternative tools. Model 2 contains the same regressors, but it models the probability that a town will select either downzoning, open space tax, or a right-to-farm ordinance. The models in Table 3 allow a focus on the decision to "do anything" in pursuit of preservation (acres in the state PDR program are omitted because this is an interval variable that is also less likely to be a matter of local political choice).

The results in Table 3 support the notion that the alternative tools are related. When all preservation policies are lumped together, community per capita income becomes a significant variable with the predicted positive effect on the decision to "do anything," but not on the decision to "substantially downzone." Conversely, growing per capita municipal debt increases the likelihood of adopting any preservation policy, but not the likelihood of adopting substantial downzoning. This suggests that its role is not related to the extra cost of buying land, but rather to the decision to stop growth by whatever means in order to forestall future infrastructure spending. This result is consistent with that reported in Ihlanfeldt (2004), but the distinction between the fiscal motivations underlying downzoning and other preservation tools represents a new finding.

In contrast to downzoning, preservation in the aggregate does not seem to respond to either of the included urgency factors (Δ*POP*, Δ*VACANTVAL*). This stands to reason when one considers the fact that substantial downzoning can lead to politically bruising battles, even if the outcome of those battles is pre-ordained by majority rule. The contentiousness of substantial downzoning is one of the things that make it a last resort, to be used when conditions are urgent. An intriguing finding presented in Table 3 is that communities with more farmers are less likely to adopt preservation tools in the aggregate. This is a sharp contrast to Furuseth (1985a, 1985b), who found that communities with more farmers are more likely to adopt preservation. We explain the difference based on the urban fringe focus of the present study.

The finding that *WETWOOD* is inversely related to the probability of downzoning or adopting any preservation tool suggests that none of the policies are seen as remedies to concerns about these environmental amenities. The fact that the *WETWOOD* variable inversely measures the percentage of farmland that is arable suggests, however, that this variable may in fact bring urgency in through the back door, since agricultural land is more suited to housing developments than to steep wooded slopes or wetlands.

Conclusion

Anecdotal evidence suggests that "substantial downzoning" is more prevalent at the urban fringe than elsewhere at the moment. However, the growing incidence of its use, and the set of factors that appear to be present in communities that have used this regulatory approach, suggest the emergence of a tool that will be used more frequently in the future. Although substantial downzoning is controversial, better understanding of the dynamics of its implementation would be of great value to both its proponents and opponents.

This study makes several unique contributions to the literature on land use. First, it identifies and analyzes the political determinants of a possible emerging growth management tool that is relatively easy to implement, albeit contentious. Second, it advances understanding of the motivations and political-economic dynamics behind this tool by developing and estimating theoretical and empirical public choice models that explicitly incorporate matters of money, power, conflict, timing, and sustainability. Third, it presents empirical

Table 3. Logit Models with Alternative Preservation Programs Omitted from Regressors

	MODEL 1 DEPENDENT VARIABLE = 1 IF DOWNZONED		MODEL 2 DEPENDENT VARIABLE = 1 IF ANY PRESERVATION PROGRAM	
Observations	266		266	
-2 LOG L	255.45		224.25	
Parameter	Estimate	Change in Probability	Estimate	Change in Probability
INTERCEPT	-2.3613 (2.2026)		-2.9171 (2.4043)	
%FARMER	-0.2627** (0.1074)	-9.9	-0.2408** (0.1074)	-7.9
INCOME	-6.89E-06 (0.000028)	-1.0	0.000142** (0.000046)	18.0
OWNEROC	0.0146 (0.0153)	3.5	0.0222 (0.016)	4.6
OPENSPACE	0.043** (0.0115)	22.8	0.0504** (0.0107)	23.2
WETWOOD	-0.0208** (0.00902)	-7.8	-0.027** (0.0102)	-8.8
DEMOCRAT	-0.00229 (0.00588)	-1.4	0.0037 (0.00574)	2.0
TAX	-0.4963 (0.5017)	-3.7	-0.8257 (0.5243)	-5.4
DEBT	0.00782 (0.00487)	6.0	0.0136** (0.00588)	9.1
SENIOR	-0.0526 (0.0357)	-4.9	-0.0071 (0.036)	-0.6
%DEVELOPED	-0.00342 (0.0218)	-0.9	0.00838 (0.0146)	1.9
Δ*POP*	0.0847* (0.0465)	6.2	-0.0356 (0.0508)	-2.3
Δ*VACANTVAL*	0.00305** (0.00116)	8.7	0.000916 (0.00133)	2.3
Δ*RESIDVAL*	0.00092 (0.00457)	0.7	0.00224 (0.00473)	1.4

Notes: Standard errors in parentheses. ** is significant at the 5 percent level. * is significant at the 10 percent level.

tests of the substitutability or complementarity of alternative growth management tools in a local setting, including substantial downzoning. Fourth, it brings substantial downzoning into the mainstream of known policy tools for dealing with growth management at the urban fringe, such as farmland preservation (Furuseth 1985a, 1985b) and right-to-farm (Adelaja and Friedman 1999).

The study's main findings suggest that substantial downzoning is, at least in part, a response to a "value gap." Politicians count votes when they decide whether or not to substantially downzone, although Democrats are no more likely to engage in substantial downzoning than Republicans. Overall, preservation activities tend to appear in affluent places with somewhat fewer working farmers and with plenty of open space to protect. While virtually every New Jersey community can be said to be at some risk for development, substantial downzoning was the only tool that responded directly to growth in population and land values.

In 57 percent of the communities involved in this study, open space taxes are the most widely

used tool, followed by downzoning, at 32 percent, and right-to-farm ordinances, at 26 percent. Open space taxes likely involve the least political conflict of the three, especially to the extent to which they are merely authorized and not always fully used. As growth pressures continue to spread and urban residents move into rural areas, displacing farm and traditional rural communities, the incidence of substantial downzoning is expected to increase throughout the United States. That is, while many communities might consider it an unlikely tool now, the dynamics of suburbanization suggest its emergence as a more frequently used growth management tool in the future.

One policy-relevant implication is noteworthy for New Jersey, where the State Development and Redevelopment Plan (SDRP) designates various areas for specific land uses. Whether the vision of the SDRP can be achieved in a state with such a strong Home Rule tradition is now a matter for concern. It is possible that widespread downzoning could lead to a fringe landscape with densities that are too uniform, neither wholly rural nor properly mixed (Evans 2004). The widespread local NIMBY-ism, in the guise of "substantial downzoning," may therefore produce a residential landscape that even "smart growth" advocates would dislike. The local backlash to growth using the police power has surprised many in New Jersey, causing state officials to revise downward their projections of residential densities going forward. In this case, as in so many others: where New Jersey goes, other states will surely follow.

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