**Support for Rural Land Use Controls: Preferences in Sublette County, Wyoming**

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## Abstract

Agricultural land is being converted into rural residences at historic rates. Landholders and residents of amenity rich Sublette County, Wyoming were surveyed concerning preferences for land use controls. Logit models are estimated for policy approval. Private choice variables rather than public choice variables are the primary determinants of policy approval.



## Keywords

RURAL, LAND USE CONTROL, AGRICULTURE, PUBLIC PREFERENCE, DICHOTOMOUS CHOICE, LOGIT, OPEN SPACE

The Rocky Mountain region of the United States is experiencing in-migration at historic levels. The rapidly developing counties in the West are those containing scenic national lands. These sites are not located within commuting distance of any major urban area (Rudzitis, 1993; Drabenstott and Smith, 1996). People are relocating to the West for amenities which include clean air and water, as well as outdoor life (Stegner, 1992). Rural counties with environmental amenities had population increases of 24%, six times that of the national average for non-metropolitan counties (Rudzitis, 1993). Sublette County, Wyoming has grown by 11% from 1990-95 and is forecast to grow by another 10% by 2002. This is a critical trend to consider in a county consisting of 85% public land.

Sublette County is updating its Master Land Use Plan to address the impending loss of agricultural land due to rural residential development. The primary focus of this study is to determine respondent characteristics which contribute to the support of land use controls such as zoning and purchase of development rights.

## ECONOMIC THEORY

The issue of whether an individual decision maker supports selected land use controls depends on both the policy itself as well as individual tastes and preferences. The public goods characteristics of private lands and the negative externalities associated with rural development are relevant to policy formation. Inherent in the individual choice is the ability of the decision maker to define and calculate the tradeoffs between different outcomes of policy. This involves individual choice both as consumer and as citizen.

**A Choice Model for Land Use Control:** An individual is assumed to display rational behavior, possess valid and self regarding preferences and is locally nonsatiated (Varian,

1984). The individual's utility maximization problem in response to a regulation is given as follows: $\max_{\mathbf{x}} U = U(X_j^i; X_a)$ subject to $P_j^i X_j^i + P_a X_a = Y$. **(1)**

The maximization of utility yields $V(P_j^i, Y)$ for the optimal bundle of $X$'s where $U(\cdot)$ = the utility function; $X_j^i$ = the goods of interest indexed on state i and class of good j; i = 0 as the initial state or pre policy or 1 as the new state or post policy; j = p as a composite of public goods attributes of private land; m as a composite of private goods attributes of private land; $X_a$ = all other goods whose provision is state inva-riant; $P_a$ = price of all other goods indexed to 1; $P_j^i$ = composite prices that are good (j) and state (i) dependent; and $V(\cdot)$ = indirect utility as a function of prices and income.

The relevant choice is between two bundles consisting of both private and public goods. The goods are composites of private and public attributes of land, respectively. These composites are assumed to be mutually exclusive, as given in equation 2.

$X_p + X_m = X_t$ where $X_t$ is the total amount of attributes and is fixed. **(2)**

The bundles are state dependent with respect to a public policy. The policy is designed to increase the availability of public goods attributes of land. The policy decreases the private attributes due to the assumed tradeoff between public and private attributes. This reduces the cost to the consumer of consuming the public goods ($X_P$) while increasing the cost to the consumer of consuming the private goods ($X_m$).

The following indicates the price and quantity relation:

$P^0 = (P_p^0, P_m^0)$; $P^1 = (P_p^1, P_m^1)$ where $P_p^1 < P_p^0$ as $X_p^1 > X_p^0$; $P_m^1 > P_m^0$ as $X_m^1 < X_m^0$. **(3)**

The above relationship presumes that land use regulation reduces the overall County supply of land available for development. This, in turn, drives up the prices for private attributes of land and consequently rural residential development.

A random utility model (RUM) can be constructed using the indirect utility functions, following Hanemann (1984). The indirect utility relationships can be rewritten for purposes of estimation as $v(P^i, Y; s) + \varepsilon^j$ ; **(4)**

Where $v(\cdot)$ = the systematic components of utility; $\varepsilon^i$ = the nonsystematic error components of utility; and $s$ = state invariant co-variates that might affect preferences.

The choice becomes whether or not to approve the offered policy. The probability of approval is based on the difference in state dependent utility. This will be estimated using a dichotomous choice model with the error having a logistic distribution. This research focuses on the importance of the $s$ set of co-variates as it explains the policy choice. The theoretical model presented above pertains to zoning as it is predominantly regulatory. The purchase of development choice implies the creation of a market for development rights. Market participation is voluntary.

**Public Choice Theory:** Public choice theory is a means to link the economic premise of self regarding utility to social decisions (Mueller, 1979; and Steven, 1993). Voters will choose initiatives which most successfully maximize their utility. Public choice theory does lend credibility to the idea of individuals displaying similar behavior in markets as well as political arenas (Reichelderfer and Kramer, 1993). Hence voting can take on characteristics of consumer choice (Buchanan and Tullock, 1974).

When voters react as citizens, certain elements of an individual's objective function may override the private consumption market benefits which normally determine an individual's decisions (Margolis,1982; Quiggin,1987). These elements may be a desire to express particular values, or judgments as to the desirability of the good for society (Blamey et al, 1995). Such motives play a minor role in market choice decisions.

Sen (1987) distinguishes between the types of preferences people possess. One type of preference is based on activities for personal advantage. The other preference is an "agency aspect," where an individual seeks benefits on behalf of family, community or future generations. Determining individual value for public goods may be akin to Sen's idea of agency preferences. People have numerous incentives for choosing to vote. It is unclear what incentives people follow when voting for land use controls.

A more inclusive model of individual choice is formulated from the theoretical constructs set forth above by Vote = f(public choices, individual choices) **(5)**

where Vote = decision on a public policy; public choices = choices representing societal interests; and individual choices = choices representing self-interests.

## DATA COLLECTION

A survey instrument was developed to query both county landowners, regardless of place of residence, and residents of Sublette County about land use issues. Focus groups were used to develop the survey questions. The nonresident landowners were surveyed because they pay property taxes and have investments to protect. The survey was administered according to the Total Design Method (Salant and Dillman, 1994). About 4200 surveys were deliverable and over 52 % were returned. Nonresponse bias was

checked by comparing respondents' income and age with 1990 U. S. Census data. No significant differences were detected

Two land use controls were defined without invoking the actual name of the particular control. This was done so as to avoid any bias associated with the name. Respondents considered each definition separately. The zoning control was given as "…Local governments have authority over land use. Land is typically divided into areas which have specific and differing requirements to regulate the land use, as well as building placement, size and use…." This is a command and control approach to land use planning. Costs and development impacts are minimized by placement of similar land uses in the same place. Some uses are reduced or prohibited in certain areas. It rations the available land. This is the most restrictive control depending on its implementation.

The purchase of development rights (PDR) control was given as "…Local governments allow land owners to separate their development rights from their other ownership rights. Those development rights can then be sold to any interested party (an individual or group). Thereafter, that land can not be developed. This strategy allows landowners to receive cash for their development rights, without actually developing their land…" This is a market approach similar to a permit system. A market is established for development rights which allows their withdrawal from potential development. The success of this approach depends on individuals agreeing on this redefined bundle of property rights and the ability of a market for development rights to function.

Photographs of an irrigated hay meadow and ranch, a sub-irrigated pasture, and a mountain pasture attempted to solicit a preferred land use. The land use choices given were agriculture, residential, or wildlife/recreation. Respondents were asked to choose the

use best suited for the landscape if the parcel was located somewhere in Sublette County. Recreational/wildlife and agriculture uses were most preferred.

## MODEL SPECIFICATION

The statistical model is in referendum format with two categories of choice determinants: public and private regarding preferences. The two models are as follows:

$RV_i = \beta_0 + \beta_1 PRVLND + \beta_2 DIRR2 + \beta_3 DIRR3 + \beta_4 DSUB2 + \beta_5 DSUB3 + \beta_6 DMTN2 + \beta_7 DMTN3 + \beta_8 LIVE + \beta_9 WORK + \beta_{10} QLIFE + \beta_{11} LENGTH + \beta_{12} RESIDE + \beta_{13} EDUC + \beta_{14} AGE + \beta_{15} INC + \varepsilon$ where the specific response variables $RV_i = 1$ if the respondent favors the policy, 0 otherwise for the land use control models.

*PRVLND* = attitude toward private land management, range 1-5;
*DIRR2* = dummy variable, 1 if the respondent preferred residential land use for an irrigated hay meadow, 0 otherwise, relative to agricultural use;
*DIRR3* = dummy variable, 1 if the respondent preferred recreation/wildlife land use for an irrigated hay meadow, 0 otherwise, relative to agricultural use;
*DSUB2* =dummy variable, 1 if the respondent preferred residential land use for a sub-irrigated hay meadow, 0 otherwise, relative to agricultural use;
*DSUB3* = dummy variable, 1 if the respondent preferred recreation/wildlife land use for a sub-irrigated hay meadow, 0 otherwise, relative to agricultural use;
*DMTN2* = dummy variable, 1 if the respondent preferred residential land use for a mountain meadow, 0 otherwise, relative to agricultural use; and
*DMTN3* = dummy variable, 1 if the respondent preferred recreation/wildlife land use for a mountain meadow, 0 otherwise, relative to agricultural use.
*LIVE* = 1 if the respondent plans to live in Sublette County in 10 years, 0 otherwise;
*WORK* = 1 if the respondent plans to be employed in the County in 10 years, 0 otherwise;
*QLIFE* = anticipated quality of life for the respondent's projected population, range 1-7;
*LENGTH* = length of residence in Sublette County;
*RESIDE* = 1 if respondent's primary residence is the County, 0 otherwise;

*EDUC* = 1 if respondent has a four-year college degree, 0 otherwise;

*AGE* = respondent's age;

*INC* = 1995 gross household annual income, range 1 to 14 (in $10,000 increments);

$\beta$ = estimated coefficients; and $\varepsilon$ = an error term.

Table 1 summarizes the hypothesized coefficient signs. These a priori relationships assume that the preferences for environmental regulation are consistent with the preferences for land use controls. The preference for land use controls can be viewed as a preference derived from the preference for environmental regulation.

**Table 1. Hypothesized Coefficient Signs for Growth Management Strategies**

| $RV_i$'s | PRVLND | DIRR2 | DIRR3 | DSUB2 | DSUB3 | DMTN2 | DMTN3 | LIVE | WORK | QLIFE | LENGTH | RESIDE | EDUC | AGE | INC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zoning | - | - | ? | - | ? | - | ? | + | - | ? | + | - | + | - | + |
| Purchase of Development Rights | - | - | + | - | + | - | + | + | - | ? | - | - | + | - | + |

Determining if private land management is a public or private matter (*PRVLND*) can be viewed as an attitude toward land management. Research by Blamey et al. (1995) found that citizens base decisions on political attitudes. All dummy variables on preferred land use (*DIRR2, DIRR3, DSUB2, DSUB3, DMTN2, DMTN3*) are proxy measures to compare agricultural use to recreation/wildlife use or residential use. As a citizen, an individual may be expressing preferences for nonrival, nonexclusive land uses such as those providing visual or wildlife habitat resources.

Determining the location of future residence (*LIVE*) and future employment (*WORK*) can be regarded as an indicator of future preferences for an individual. Assessing quality of life (*QLIFE*) is a variable which falls under agency preferences as defined by Sen (1987). This is tantamount to preferences for community, akin to Sen's agency preferences. It may also reflect pursuit of self-regarding well being. Socio-demographic factors including gender, age, education, location of primary residence, length of residence and income influence attitudes toward the environment and residential development (Buttel, 1987; Reading et al., 1994; Green, et al, 1996; Wilkin and Iams, 1988). These characteristics are assumed to reflect personal rather than public interests.

## ESTIMATION RESULTS

**Table 2. Preference for Zoning Estimates**

| Variable | Mean | Parameter Estimate | Standard Error | Range | PR>Chi-Square | X*B | Change in Probability |
|---|---|---|---|---|---|---|---|
| Intercept | | 2.8739 | 0.4427 | | 0.0001* | 2.8739 | |
| PRVLND | 2.1109 | -0.8358 | 0.0932 | 1 to 5 | 0.0001* | -1.7643 | -0.1886 |
| DIRR2 | 0.0483 | 0.5930 | 0.2845 | 0 to 1[a] | 0.0372* | 0.0286 | 0.1338 |
| DIRR3 | 0.2054 | -0.1854 | 0.1595 | 0 to 1[a] | 0.2451 | -0.0381 | -0.0418 |
| DSUB2 | 0.0739 | 0.3002 | 0.2652 | 0 to 1[a] | 0.2577 | 0.0222 | 0.0677 |
| DSUB3 | 0.6844 | -0.0293 | 0.1625 | 0 to 1[a] | 0.8568 | -0.0201 | -0.0066 |
| DMTN2 | 0.0583 | -0.1602 | 0.2775 | 0 to 1[a] | 0.5636 | -0.0093 | -0.0361 |
| DMTN3 | 0.5537 | -0.1369 | 0.1454 | 0 to 1[a] | 0.3463 | -0.0758 | -0.0309 |
| LIVE | 0.7868 | -0.2719 | 0.1568 | 0 to 1 | 0.0829* | -0.2139 | -0.0613 |
| WORK | 0.3760 | -0.2401 | 0.1582 | 0 to 1 | 0.1290 | -0.0903 | -0.0542 |
| QLIFE | 3.6660 | 0.0115 | 0.0400 | 1 to 7 | 0.7736 | 0.0422 | 0.0026 |
| LENGTH | 15.4302 | 0.00721 | 0.00546 | Continuous | 0.1863 | 0.1113 | 0.0016 |
| RESIDE | 0.4954 | -0.0378 | 0.1398 | 0 to 1 | 0.7867 | -0.0187 | -0.0085 |
| EDUC | 0.4748 | -0.4938 | 0.1260 | 0 to 1 | 0.0001* | -0.2345 | -0.1114 |
| AGE | 51.1741 | -0.0202 | 0.00586 | Continuous | 0.0006* | -1.0337 | -0.0046 |
| INC | 6.5153 | -0.0347 | 0.0189 | 1 to 14 | 0.0661* | -0.2261 | -0.0078 |

[a] denotes dummy variable, *denotes significance level of 0.10, At sample means, the density function value, 0.2256,N = 1407,Number of "YES" responses = 510; "NO" responses = 897, -2 LOG L score = 167.461, with 15 degrees of freedom, and Percentage concordant responses predicted by model = 69.9%.

Consistent with *a priori* expectations, the attitudes concerning the management of private lands (*PRVLND*) have an inverse relationship with zoning. Desirability of the growth management strategy had a reduced probability of -0.1886, *ceteris paribus*.

Unexpectedly, respondents who preferred that the irrigated hay meadow be used for residential development (*DIRR2*), relative to agriculture, were more inclined to favor zoning. The associated probability of such a situation is 0.1338.

People planning to live in Sublette County in 10 years (*LIVE*) were anticipated to support a zoning program implemented in the present. The latter is based on personal quality of life (demand for open space) considerations. Model results are inconsistent with *a priori* expectations. The probability of zoning being approved by respondents decreased when people planned to live in Sublette County (*LIVE*). This outcome may be consistent with individuals attempting to protect their property investment which may be diminished depending on the type and location of zoning. Holding all other effects constant, the probability decreased -0.0613 from future residence plans (*RESIDE*).

It was hypothesized that education (*EDUC*) and age (*AGE*) would both have direct relationships with the likelihood of zoning being accepted. The hypothesized outcomes would be consistent with quality of life considerations outweighing property investment interests. However, both variables had negative parameter estimate signs, thus lowering the associated probability. Each variable may connote an understanding by the respondents of the implications of zoning. If this is the case, then respondents may have been wary of the potential windfalls, gain in property values, for those located outside of a particular zoned area as well as the wipeouts, loss of property values, for those within a zoned area. Specifically, the probability was lowered -0.1114 by education (*EDUC*) and -

0.0046 by age (*AGE*). Income (*INC*) was assumed to have a direct relationship with zoning. The opposite sign was exhibited in the model estimation. This result reflects that property investment concerns outweigh fears of open space development. Income (*INC*) reduced the probability of a respondent choosing zoning by -0.0078, *ceteris paribus*.

**Table 3. Preference for Purchase of Development Rights Estimates**

| Variable | Mean | Parameter Estimate | Standard Error | Range | PR>Chi-Square | X*B | Change in Probability |
|---|---|---|---|---|---|---|---|
| Intercept | | -0.1603 | 0.4018 | | 0.6900 | -0.1603 | -0.0395 |
| PRVLND | 2.1084 | -0.0751 | 0.0792 | 1 to 5 | 0.3432 | -0.1583 | -0.0185 |
| DIRR2 | 0.0484 | 0.1169 | 0.2845 | 0 to 1[a] | 0.6810 | 0.0057 | 0.0288 |
| DIRR3 | 0.2059 | -0.00648 | 0.1459 | 0 to 1[a] | 0.9646 | -0.0013 | -0.0016 |
| DSUB2 | 0.0744 | 0.6375 | 0.2637 | 0 to 1[a] | 0.0156* | 0.0474 | 0.1571 |
| DSUB3 | 0.6842 | 0.1205 | 0.1546 | 0 to 1[a] | 0.4360 | 0.0824 | 0.0297 |
| DMTN2 | 0.0599 | 0.3948 | 0.2704 | 0 to 1[a] | 0.1442 | 0.0236 | 0.0973 |
| DMTN3 | 0.5520 | 0.2654 | 0.1374 | 0 to 1[a] | 0.0535* | 0.1465 | 0.0654 |
| LIVE | 0.7847 | 0.0814 | 0.1502 | 0 to 1 | 0.5879 | 0.0639 | 0.0201 |
| WORK | 0.3786 | -0.0118 | 0.1472 | 0 to 1 | 0.9359 | -0.0045 | -0.0029 |
| QLIFE | 3.6488 | 0.0774 | 0.0378 | 1 to 7 | 0.0404* | 0.2824 | 0.0191 |
| LENGTH | 15.5681 | -0.0005 | 0.00511 | Continuous | 0.9227 | -0.0078 | -0.0001 |
| RESIDE | 0.4986 | -0.1597 | 0.1313 | 0 to 1 | 0.2240 | -0.0796 | -0.0394 |
| EDUC | 0.4740 | -0.6433 | 0.1177 | 0 to 1 | 0.0001* | -0.3049 | -0.1586 |
| AGE | 51.1098 | 0.00983 | 0.00547 | Continuous | 0.0725* | 0.5024 | 0.0024 |
| INC | 6.4516 | -0.0312 | 0.0176 | 1 to 14 | 0.0761* | -0.2013 | -0.0077 |

[a] denotes dummy variable, *denotes significance level of 0.10, At sample means, the density function value, 0.2465, N = 1384, Number of "YES" responses = 769; "NO" responses = 615, -2 LOG L score = 72.995 with 15 degrees of freedom, and Percentage concordant responses predicted by model = 63.2%.

The management of private land (*PRVLND*) has no statistically significant link to support for purchase of development rights. Residential use of the sub-irrigated hay meadow, relative to agriculture (*DSUB2*) was a significant variable in explaining the probability of a respondent choosing PDR. Preferred residential use, relative to agriculture (*DSUB2*) increased the probability by 0.1571. The estimated positive association between preferred recreation/wildlife use of the mountain meadow, relative to

agriculture (*DMTN3*) and *PDR* is as hypothesized. The probability of a respondent selecting purchase of development rights, holding other effects constant, was increased by 0.0654 when the mountain meadow was used for recreation/wildlife purposes, relative to agriculture. No other dummy variables for land use were statistically significant.

Quality of life (*QLIFE*) and approval of *PDR* displayed a direct relationship. *A priori* effects on the dependent variable *PDR* caused by quality of life (*QLIFE*) were not known. Survey results indicated as the population of Sublette County increases, quality of life (*QLIFE*) either stayed the same or slightly decreased. A raised quality of life (*QLIFE*) positively increases the probability of the response variable by 0.0191.

Selected demographic variables were hypothesized to influence how a respondent would support *PDR* rights as a land use control. Contrary to *a priori* expectations, respondents with higher education (*EDUC*) levels were not more likely to select *PDR*. The associated probability was lowered by -0.1586, *ceteris paribus*. There was a positive relationship between older individuals (*AGE*) and the probability of a respondent endorsing purchase of development rights. As one's age rises, the probability increases by 0.0024. This may indicate that older respondents are willing to accept payment in exchange for not developing their land while still holding the title to the land. Income (*INC*) was contrary to *a priori* expectations. It may be that as respondents tend to be wealthy landowners they are increasingly uninterested in the program. The wealthier an individual is (*INC*), the probability of them supporting *PDR* decreases by -0.0077.

## CONCLUSIONS

The land use model results do not coincide well with the expectations derived from the environmental regulation literature. Several possibilities exist. Individual attitudes

toward land use may be different than toward environmental regulation. Environmental regulation is typically portrayed as mitigation of environmental degradation due to production practices. It may not be synonymous with the impact of rural residential development. Previous land use preference research is scant (Sullivan, 1994) and perhaps incompatible with this work due to site specific results.

This research found a lack of statistical significance with respect to public preference variables except for private land management attitudes. Private concerns may outweigh public concerns when private land use issues are under consideration. The proxies used for public preferences may be either inadequate or poorly measured. Even so, this research provides information relevant to Sublette County planning efforts.

The desire to live near rural open space leads to a contradiction. Rural in-migrants diminish the scenery, agricultural lands, presence of wildlife, and recreational access that initiated their arrival. Survey results indicate a preference for zoning which is a traditional form of land use planning. People favor traditional practices in that they are familiar. Purchase of development rights is not a familiar practice. This may have resulted in minority approval of this land use control (Stokes and Watson, 1989).

The analysis offers a possible scenario in which purchase of development rights might be acceptable. Supporters of land use controls tend to prefer residential use of hay meadows possibly to protect property values. Development rights could be purchased from the sub-irrigated hay meadow and mountain meadow to preserve open space and recreation/wildlife without wiping out the property investment.

The analysis demonstrates that decisions regarding support for land use controls are based primarily on an individual's demographic characteristics. Education, age, and

income characteristics appear to be the factors driving individual preference. Approval for zoning and purchase of development rights was negatively impacted by demographic factors. Attitudes toward private land management and quality of life assessments also exert influence on decisions, to a lesser extent. Planning officials could use these outcomes for both purposes of public education concerning what land use means to respondents and possible future support for land use controls based on survey responses.

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