Public Preferences for Protecting Working Landscapes

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Abstract

Throughout the world, communities are having parallel discussions, reflecting on the relative value of different characteristics of landscapes and pondering alternative future landscapes. Central to these discussions is the recognition of various externalities related to the use and management of lands and the design of policies to internalize these forces. Public policies designed to protect working landscapes are often justified as a means to maintain the provision of public services generated by private, "working" landowners that are not recognized by markets. This paper begins with a transatlantic comparison of programs developed to protect working landscapes in the European Union and the United States. There is notable heterogeneity across countries and regions in terms of how working landscapes and the services they generate are valued. These distinctions along with political and institutional differences help shape a diverse set of working lands protection policies. The second part of the paper presents an empirical analysis of public preferences for protecting working landscapes using data from the State of Maine, USA. This paper contrasts recent voting results on two 2005 ballot initiatives related to land management in Maine: (1) the protection of working waterfront via current use taxation and (2) a bond measure to support broader public land acquisition. Voting precinct data are aggregated to a community scale for the empirical analysis. A set of reduced form discrete choice models of the voting outcomes are estimated, where the outcome is explained as a function of community demographic, landscape, location, employment, and political characteristics. Drivers of variation in the support for these two programs differ, indicating systematic patterns in how voters respond to alternative land management programs. Some trends are consistent across both programs. Voter support is positively correlated with median income and membership in wildlife and habitat protection organizations. A negative association is found between program support and past (2004) voting in support of Republican presidential candidates. Some evidence of spatial patterns is revealed, with voter support dropping off with distance from the lands targeted by the programs.

Keywords: agri-environmental policies, land management, spatial analysis, voting behavior, working landscapes

Introduction

Throughout the world, communities are having parallel discussions, reflecting on the relative value of different characteristics of landscapes and pondering alternative future landscapes. Central to these discussions is the recognition of various externalities related to the use and management of lands and the design of policies to internalize these forces. Various programs designed to protect working landscapes (e.g., subsidies; direct payments; land acquisition; property tax relief) are justified as a means to compensate private, "working" landowners for public services they provide (e.g., biodiversity; habitat; scenic views) but are not compensated for by the market. In addition to these programs focused on positive externalities, a suite of policies exist to diminish the negative externalities (e.g., pollution; odors) of working lands and encourage private, "working" landowners to recognize the full costs of their actions.

This paper begins with a brief transatlantic comparison of approaches used and programs developed to protect working landscapes in the European Union and the United States. The objective of this comparison is to identify similarities and distinctions as well as to consider potential drivers of variation, such as landscape characteristics, land-ownership trends, land management regulations, and regional economic characteristics.

The remainder of the paper focuses on an empirical case study of public preferences for protecting working landscapes using data from the State of Maine, USA. This paper contrasts recent voting results on two ballot initiatives related to land management in Maine: (1) the protection of working waterfront via current use taxation and (2) a bond measure to support broader public land acquisition including the protection of working lands. The empirical analysis focuses on variation in support for these initiatives across 495 communities in Maine. A set of reduced form discrete choice models of the voting outcomes are derived, where the

outcome is explained as a function of community demographic, landscape, location, employment, and political characteristics.

Transatlantic Comparison

Discussion of preferences for the protection of working landscapes is complicated somewhat by the vagueness of the terminology working lands. A logical question involves what is meant by the phrase "working." In land use planning and land economics literatures, working lands are often synonymous with lands used for productive, resource-extraction activities. This definition of working lands is adopted here. An exhaustive review of policies and programs designed to protect working lands in the United States (US) and European Union (EU) is beyond the scope of this paper. The subsequent discussion focuses on agri-environmental programs. Because agri-environmental programs are the prominent means by which higher governments strive to protect working landscapes, a comparison of these programs is informative.

Cooper et al. (2005) offer an excellent overview of agri-environmental programs in the European Union (EU) and the United States (US). Several key findings emerge from this overview. First, increased emphasis is being given to non-agricultural commodity services provided by agricultural and forest lands in both the EU and US. This concomitantly includes recognition of positive and negative externalities associated with agricultural production. Both the EU and the US have modified requirements for traditional, direct producer support programs to address some of these external effects[1]. In addition, increased funding is being devoted to the protection of working lands in both the EU and the US. Much of this funding is dedicated to incentive-based policies. Second, policies designed to lessen the negative environmental impacts of agricultural production differ markedly in the EU and US. The United States programs tend to focus on reducing soil erosion and nutrient runoff and have promoted retirement of active

land. In contrast, the European Union programs have a much broader ecological focus, strive to prevent land abandonment, and view agriculture as an important component of natural environments. Third, the European Union promotes protection of rural landscape attributes in its agri-environmental policies. There is no parallel program in U.S. agricultural policy. EU programs more directly acknowledge the broad spectrum of services provided by working lands. A strong link between rural economic development and agri-environmental objectives is reflected in the 2003 reforms of the European's Union Common Agricultural Policy. Finally, there is considerable variation within regions in terms of implementation and participation in these programs. From an economics perspective, much of this variation makes sense, as the participation of entities in such programs varies with the costs of participation (e.g., opportunity costs of changing production practices) and the demands for non-commodity services (e.g., "green" movements). Cooper et al. (2005) provide a marvelous summary of ongoing trends in the EU and US and speak to a noticeable distinction between these entities in terms of how landscapes are viewed in relation to agriculture.

A broader recognition of working lands and the services they provide is evident in the policies of the EU relative to the US. The European Council's 2001 Landscape Convention offers further evidence of the distinct treatment of landscape management issues by the EU and the US. Text from the preamble is illustrative of these differences:

> The landscape has an important public interest role in the cultural, ecological, environmental and social fields, and constitutes a resource favourable to economic activity and whose protection, management and planning can contribute to job creation ; contributes to the formation of local cultures and is a basic component of the European natural and cultural heritage, contributing to human well-being and consolidation of the European identity ; is an important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as in areas of high quality, in areas recognised as being of outstanding beauty as well as everyday areas ; is a key element of individual and social well-being and its protection, management and planning entail rights and responsibilities for everyone (Preamble to the European Landscape Convention, Florence, 20 October 2000).

A fascinating report prepared for the European Council (Depoorter 2003) reveals the variation across its member states in terms of landscape definitions and legal and management considerations of landscape-scale objectives.

Hellerstein et al. 2002 offer a thoughtful summary of farmland protection programs in the US as well as the implications of research on public preferences in the design of these programs. Johansson (2006) focuses specifically on working-land conservation programs, noting the potential value of flexible, incentive-based programs in the US (e.g., EQIP and CSP). Johansson (2006) also discusses regional variation of program expenditures and geographical targeting of such initiatives. Lambert et al. (2006) examine the characteristics of farms and households that influence the adoption of conservation practices. Daniels (2001) provides an overview of state and local efforts targeting working lands in US, noting the tendency of these efforts to rely on voluntary programs and novel public-private partnerships.

Baylis et al. (2006) and Brouwer and Godeschalk (2004) offer interesting discussions and analysis of EU member state variation related to agri-environmental programs. Both studies analyze the motivations for past policies and speak to future trends, highlighting differences across member states. Baylis et al. (2006) notes the catalyst for environmental reforms arises from northern member states (Denmark, Germany, the Netherlands, UK, and northern Italy). Southern member states (France, Spain, Portugal, Southern Italy, the Alpine countries) are driven by concerns over rural depopulation and land abandonment. Brouwer and Godeschalk (2004) contrast policies in Netherlands, Denmark, Germany, and England. Results from a special poll of EU residents (European Commission 2007) reflect the variation in demand for agri-environmental services across member state populations. Interestingly, there is widespread

acknowledgement (88%) that agriculture and rural areas are key to the EU's future and support for CAP reforms aimed at agri-environmental objectives and rural economic development (49%).

Even this brief review suggests growing recognition of external impacts of working lands globally. In turn, there is considerable variation across the communities of the globe in terms of what they perceive as working landscapes and how they value the services generated from these lands. Further research on the potential drivers of this variation may inform the development of future policies. While some research has compared public preferences within member states of the EU and individual states of the US, little transatlantic comparative work of public preferences has been completed. Future research in this area may offer valuable insights and increase the chance of transfer and learning across countries.

Case Study - Maine, USA

The previous discussion emphasized the variation in programs and policies aimed to protect working landscape features in the United States and the European Union as well as within individual states of the US and the member states of the EU. This empirical analysis adopts a more local perspective, examining variation in support for working lands protection programs throughout communities in the State of Maine, USA.

Relevant Literature

Building on the approaches adopted by similar studies (e.g., Deacon and Shapiro 1975; Romer and Rosenthal 1982; Rothstein 1994; Kline and Wichelns 1994; Kahn and Matsusaka 1997; Kotchen and Powers 2006; Schlapfer and Hanley 2006), this paper combines voting data with demographic, economic, political, and environmental data to explore public support for the land protection programs. A set of reduced form discrete choice models of the voting outcomes is estimated, where the proportion of yes votes by community is explained as a function of

numerous community attributes that are intended to capture the variation in the perceived net benefits of these two land protection programs.

This analysis builds on the literature addressing voter support of land management and other natural resource and environmental management referenda. Early work completed by Deacon and Shapiro (1975) continues to provide the economic foundation of these studies and offers the basic economic intuition of this case study. In completing their analysis of two California referenda that respectively authorized a coastal zone conservation program and a rapid transit program (BART), these authors employed city-level data to explain voting outcomes as a function of demographic characteristics, regional economic characteristics, and community attributes. Voter participation and response are both modeled explicitly. Several explanatory variables were used to capture variation in tastes and preferences. They find that voters with higher levels of education, income, and more liberal political beliefs were more likely to support coastal zone conservation and rapid transit (BART). Employment in industries presumed to be negatively impacted by the public programs were used as approximate measures of income and employment effects. Lower levels of support for coastal conservation were found in areas with higher employment of laborers. Similarly, lower levels of support for rapid transit were found in areas with higher employment levels in the transport sector. Community attributes, such as location, area, and population density, were used to distinguish access to or level of the collective good provided by the two programs. Higher support for the coastal conservation program was found in southern areas with lower initial levels of environmental quality. Higher support for the rapid transit program was found in larger, more densely populated areas, where transit could be more efficient. The tradeoffs addressed in their analysis of the coastal conservation program closely relate to the working lands protection programs, stressing the potential variation in net benefits from public landscape conservation programs across individuals and communities.

Kline (2001) examines voter support for an Oregon ballot initiative designed to promote sustainable forestry practices and conserve forest ecosystems. Restrictions on clearcut logging and herbicide and pesticide use were linked with the championed sustainable forestry practices. He employs county-level data to examine variation in voter support for this referendum and its associated forest management policies. The results are generally consistent with the previous findings of Deacon and Shapiro (1975), with higher support in areas with higher population densities, income, and educational attainment and lower support in areas with higher forest employment. This research is partially motivated as an investigation of changing values related to forestlands and addresses the role of in-migration in diversifying attitudes towards forest management as well as the demand for services provided by forestlands. Similar trends are surfacing in Maine, reminding land managers of the dynamic nature of market and public preferences for services from forest lands. An important theme raised by this research is how demands for services from working lands evolve over time. These dynamics have strong implications for the design of public programs to protect working lands. In short, flexible programs may be more suitable.

Studies addressing voting responses to open space and farmland protection programs offer additional insights into public preferences for working landscapes. Kline and Wilchens (1994) examine voting responses to state-wide farmland preservation referenda in Pennsylvania and Rhode Island. Using county level data, the authors explain support for purchasable development right programs as a function of land use pattern (i.e., percent of county land in farmland, change in farmland acreage over last 5 years), agricultural profitability (reported change in market value of agricultural land over last 5 years), and growth pressures (percentage change in population over last 10 years; percentage change in housing values). Voting responses are explained using a reduced form model estimated by ordinary least squares. They determine

that support for such programs is greater in areas with higher rates of population growth and housing value appreciation. Loss of farmland acreage drives support for such programs in Rhode Island but not in Pennsylvania. These results suggest that voters living in higher growth areas with less farmland may be willing to pay more to protect farmland at the margin, *ceteris paribus*. An interesting advance promoted by these researchers is the incorporation of past changes in landscape and population attributes.

Schlapfer and Hanley (2003) extend the work of Kline and Wichelns (1994), giving emphasis to the potential importance of landscape characteristics in influencing voter response. Their research examines voter response to a referendum to increase public funding for local landscape amenities in Zurich, Switzerland. They find no support of a decreasing marginal utility effect related to open space, as municipalities with higher amounts of open space revealed higher levels of support for the increased funding. Municipalities with higher levels of landscape amenities on non-forest lands and historical heritage townscapes similarly expressed higher support. An insignificant correlation was found between voter support and the percentage change (reduction) in the level of these amenities over a 12-year period.

Solecki et al. (2004) employ municipal level data to explore voter support of a New Jersey referendum dedicating nearly a billion dollars for preservation of open space, farmland, wetlands, and historic sites. The authors employ principal components analyses to identify four factors based on demographic and landscape characteristics. Regression analysis is then completed to test the association between these factor scores and variation in voter support. An interesting conclusion of this study is the negative association between urban areas and voter support, suggesting these residents gain little from the collective goods provided by such land protection programs.

Kotchen and Powers (2006) employ a unique data set based on Trust for Public Land summaries of votes throughout the United States related to open-space conservation[2]. They conduct two types of empirical analysis - a national analysis, including state, county, and local votes, and local analysis of votes in New Jersey and Massachusetts. Unlike this paper which focuses on variation across communities in response to a single vote, Kotchen and Powers (2006) make use of data where communities are voting on distinct open space programs (e.g., multiple votes). This national-scale pooled analysis reveals a preference for open space protection programs that are funded by bonds rather than taxes and that are designed to preserve local farmlands. This latter finding suggests an interest in working lands protection. The preference for farmland preservation is also supported in their local analysis of votes in New Jersey. These authors strive to identify relationships between stock of open space lands and rate of open space loss and voter support for open space protection. The results of their Massachusetts analysis suggest higher support for protection programs when stocks of open space are higher. Interestingly, both local studies show increasing support for open space protection programs when modest open space loss has recently occurred but declining support once recent open space loss becomes large. The empirical work featured in this paper shares a similar goal to this study in improving understanding of the relationship between current landscape characteristics and support for land protection programs.

A growing number of stated-preference studies address themes of relevance to the protection of working lands (e.g., Kline and Wichelns 1994; Vossler et al. 2003; Schlapfer et al. 2004; Schlapfer and Hanley 2006). See Hellerstein et al. 2002 for a recent and thorough review of studies completed to address farmland protection in the United States. These studies often employ conjoint or contingent valuation methods to examine individual preferences for land

protection programs. These studies collectively offer important insights into preferences for landscape features and speak to the variation in preferences across communities.

This paper builds on the economic intuition and econometric methods of the aforementioned studies of elections data. The conceptual framework of this research and the details of the empirical analysis are presented in the subsequent sections.

Conceptual Framework

The conceptual framework adopted in this paper builds on the utility maximization framework employed by Deacon and Shapiro (1975) and Schlapfer and Hanley (2006). Voting behavior on funding for a land protection program is cast as a comparison of utility with and without the increased funding. Intuitively, a supporting vote indicates a higher level of expected utility with the increased funding. Utility for individual i is presumed to be a function of consumption of private goods, z^i, and consumption of public goods, G. Consumption of public goods is divided into classes - the overall level of the collective good, G, and an accessible level of this collective good, G^i ($Gi \leq G$). This second term allows for explicit consideration of variation in perceived net benefits across individuals. Distance measures will be used in the empirical analysis to capture some aspects of this variation. Utility maximizing behavior is assumed and presumed constrained by income, I^i. Different public programs (landscape protection programs), k, provide different levels of public goods (G) and impose distinct income (I), tax liabilities (T), and prices of private goods (p). An individual's maximization problem may be written as follows:

$$(1)\ \underset{z^i}{Max}\ \mathrm{U^i}(z^i, G_k, G_k^i) + \lambda(I_k^i - T_k^i - p_k z^i) = V_k^i(G_k, G_k^i, p_k, I_k^i - T_k^i),$$

where i references the individual and k references the public program.

Under this framework, an individual voter compares her utility with (V^i_1) and without the landscape protection program (V^i_0) and votes for the program only if a higher level utility is achieved ($V^i_1 > V^i_0$). An individual voter takes into account both the services received from the program and the cost of the program. Both of these attributes are expected to vary across individuals because of, among other factors, variations in perceived benefits and costs. This variation is reflected in the maximization problem shown in (1), as numerous variables change across individuals under different programs. Central to this conceptualization of voting choices is representation of the changes in disposable income, the overall level of the public good, and the accessible level of the public good.

Lacking individual-scale data, we cannot directly model this utility maximization problem. Instead, this problem serves as the intuitive basis of an empirical model based on aggregate, community-scale voting data. While this paper embraces the conceptual framework outlined in Deacon and Shapiro (1975), the empirical analysis is a simplified and does not model voter turnout. Voting data are aggregated to the community (U.S. Census Bureau county subdivision unit) scale to allow for demographic characteristics to be linked with the voting data. The intuition of tradeoffs driving voting choices extends to the community scale. The empirical model described in a subsequent section explains the level of support (proportion of YES votes) as a function of independent variables capturing variation in tastes and preferences that may influence evaluation of the benefits and costs of the public programs, income and tax liabilities, and the accessible level of the public goods conferred by the landscape protection program. The public goods of relevance to this case study include those services derived from protecting working (and non-working) lands.

Empirical Model

This paper contrasts recent (2005) voting results on two ballot initiatives related to land management in Maine: (1) the protection of "working" waterfront via current use taxation and (2) a bond measure to support broader public land acquisition (Land for Maine's Future (LMF) Program). Attributes of these two programs follow from the wording of the ballot questions shown on the next page:

> 2005 Working Waterfront - Constitutional Amendment
>
> Do you favor amending the Constitution of Maine to permit the Legislature to authorize waterfront land used for commercial fishing activities to be assessed based on the land's current use in a manner similar to treatment now available for farms, open space and forestland?

> 2005 LMF Bond Initiative
>
> Do you favor a $12,000,000 bond issue to purchase land and conservation easements statewide from willing sellers for conservation, water access, wildlife and fish habitat, outdoor recreation, including hunting and fishing, farmland preservation and working waterfront preservation to be matched by at least $7,000,000 in private and public contributions?

These programs share a common focus of impacting Maine's landscape and the services it provides to Maine's people. In doing so, they will concomitantly alter the provision of services (private and public goods) and influence the returns to land held in different uses and production opportunities. There is considerable diversity across the type of lands targeted by the programs (i.e. public recreation lands, working farm and forest lands, and working waterfront areas) and the means of implementation (i.e. land purchase; conservation easements; or tax policies). The working waterfront program is a more targeted public program, giving emphasis to the protection

of working coastal lands; whereas, the LMF program targets a broader set of lands, including both working and non-working lands. Voting patterns are expected to reflect these differences, as the perceived benefits and costs of the programs (e.g., the public goods; income and tax liabilities) will differ.

Election results data were obtained from the Maine Bureau of Corporations, Elections, and Commissions. Precinct data were aggregated to the county subdivision U.S. Census Bureau geographic unit, referred to in this paper as "community." Both ballot initiatives received high levels of support statewide, with 72% and 65% of voters approving the working waterfront and LMF programs respectively. Figures 1 and 2 display the spatial variation in support for these referenda by community. The left-side image shows the proportion of YES votes by community; the right-side image displays the absolute number of YES votes by community. The maps display the elections result data for 495 communities. Areas shown in white are not included in this analysis[3]. Figure 1 indicates high levels of support for the working waterfront program in coastal communities, with some evidence of distance decay moving away from the coast. Figure 2 reveals greater heterogeneity in proportional support for the LMF program relative to the working waterfront program. This finding is consistent with the broader targeting of lands (and services) by the LMF program. Both absolute images reflect the spatial distribution of population in Maine, with higher levels of population in the southern portion of the state. Southern and coastal areas of Maine have been experiencing higher rates of open space loss and land conversion, and generally have populations with higher income and educational attainment levels. Northern and downeast communities of Maine are more reliant on natural resource industries.

Tables 1 and 2 present descriptions and descriptive statistics of the independent and dependent variables employed in the empirical research. These statistics are based on county

subdivision or community-scale data (n=495). The PYES_WWF and PYES_LMF variables represent the proportions of supporting votes by community. Independent variables reflect community demographic, landscape, location, employment, and political characteristics. Measures of population density (LNPOPDEN), distance to Portland (LNPORT), Audubon membership (AUDUB), hunting and fishing licenses (HFISH), boating registrations (BOAT), and Republican political support (REPUB) strive to capture variation in tastes and preferences for the services provided by the public programs.

Following previous work that has identified variation in support in urban areas, LNPOPDEN and LNPORT distinguish communities by population density and proximity to Maine's largest and most urban center, Portland. Priors for the influence of these variables are unclear, as conflicting forces could support either sign. A positive influence may arise if more urban residents have higher values for the services offered by the programs. In contrast, a negative influence may reflect less accessibility to these services and hence lower perceived net benefits.

AUDUB, HFISH, and BOAT describe the variation in wildlife, hunting and fishing, and boating across communities and are expected to have a positive influence on support for landscape protection programs. Working lands in Maine serve as key recreational assets in a largely privately owned (95%) landscape. Accordingly, these variables are expected to have a positive influence on voter support.

REPUB is included to address potential differences in support for public landscape protection programs across political parties. Because this variable may capture preferences for less government involvement and recognition of externalities, REPUB is expected to have a negative influence on support.

Because of expectations that demand for landscape services are a normal good, communities with higher median income levels (LNMEDINC) may be expected to show greater support for both programs. Conversely, communities with higher incomes may also face higher tax liabilities to fund the programs. Accordingly, priors are mixed regarding the influence of median income (LNMEDINC).

Communities with higher levels of natural resource-based industry employment (NREMP) and higher reductions in employment in these industries (CHNREMP) are expected to show greater support for programs that enhance the "working" aspects of landscapes, though priors are also somewhat uncertain about the strength of this relationship. Communities with residents that rely on working lands are expected to support their protection. In particular, fishermen are expected to support the working waterfront program. It is not clear, however, how employees of the forest and agriculture industries will react to this waterfront current use taxation program[4]. Interaction terms between NREMP and CHNREMP and distance to the coast are introduced as independent variables in the working waterfront empirical models to try to proxy for variation in fishing employment. In the case of the LMF program, the broader purview of this program includes some actions that restrict natural resource extraction activities and may not necessarily protect working lands. As a result some communities with high natural resource based employment may view the LMF program as having negative net benefits due to the concentration of costs and income effects in these communities if and when lands are taken out of production to serve ecological or recreation interests.

Many of the independent variables discussed above address variation in the human aspects of landscapes. Additional sets of physical landscape attributes are used as independent variables to address variation in benefits, costs, and "accessibility" of the public goods delivered by these two land protection programs. At the present time, we do not have access to a GIS

coverage of existing working waterfront lands[5]. Accordingly, distance to the coast and fishing employment are used as proxies for capturing the variation in working waterfront lands and hence the variation in where the public goods may originate on the landscape. Because proximity to the coast may relate to overall perceived and accessible benefits, distance from the coastline (LNDCOAST) is expected to have a negative influence on voter support for the working waterfront program. Coastal communities with higher median housing values (CMEDVAL) may face greater property tax shifts and hence tax liabilities under the current use taxation plan of the working waterfront program. Accordingly, a negative influence is expected for CMEDVAL.

Gauging where voters expect the public goods to be generated from on the landscape is more troublesome in the case of the LMF program. At the time of the election, voters are not aware of where the increased funding will be used to conserve land or for what purpose (e.g., how much of the funding will be spend on working lands protection). In this analysis, we use proxies that characterize the landscape of the voter's community, assuming voters may believe the LMF dollars are likely to be spent in their community. In addition, proximity to existing conservation lands is also incorporated as an independent variable. One interpretation of this variable builds on the hypothesis that voters may believe the LMF funding is likely to be spent on lands near existing conservation lands.

Measures of the percentage of lands in agriculture and forest cover by community are based on analysis of the USGS NLCD data for Maine from 1992 and 2001. By combining these data with spatial data on the location of conservation lands, variables measuring stocks of conserved and non-conserved agricultural and forest lands are generated (AG_C; FOR_C; AG_PR; FOR_PR) for use in the analysis of the voting response to the Land for Maine's Future (LMF) ballot initiative. These variables are proxies for undeveloped lands and may capture the

variation across communities in terms of stocks of lands affected by the LMF program. A higher stock of unconserved lands (AG_PR and FOR_PR) could generate higher support for the LMF program because of greater access to the benefits of the programs supported by this program. Alternatively, a higher stock of these lands could generate lower support because of concentrated income and employment effects due to changes in land use or land management (e.g., discouragement of resource extraction or change in practices). Interaction terms between these unconserved land stocks and the percentage of natural resource employment are included in the LMF specification to allow for varied effects. Similar mixed expectations exist for the stocks of conserved agriculture and forest lands (AG_C and FOR_C). Decreasing marginal utility afforded by additional conservation may suggest a negative influence. In contrast, positive network externalities may support a positive influence, as additional conserved lands raise the value of existing lands in the conservation network. Communities experiencing a greater reduction in their stock of agriculture and forest lands (CHAG and CHFOR) may express higher support for the LMF program because of perceived scarcity as well as heightened awareness of landscape change.

Proximity to conservation land (LNDCLAND) serves as a proxy for familiarity and access to the public goods provided by the LMF program. If these information effects are significant, less support may be expected for the LMF program as distance to conservation land rises. Alternatively, one might expect higher support for the LMF program as distance to conservation land rises because of scarcity of access to these lands.

Separate regression analyses are completed for the two different votes. A binary logit model with grouped data is estimated using maximum likelihood methods (Greene 2003, pp. 686-689). The election data used in this analysis are grouped data, having been reported at the precinct scale and aggregated to the community scale. The election results analyzed here take

the form of proportions (PYES) and the number of voters (n_i) varies widely across communities. Weights of each observation are a function of the number of votes cast and the errors are adjusted for heteroskedasticity. The log-likelihood function corresponding with the empirical model used here is as follows:

$$(2)\ \ln L = \sum_{i=1}^{495} n_i \left\{ PYES_i \ln F(x_i'\beta) + (1 - PYES_i) \ln[1 - F(x_i'\beta)] \right\},$$

where n_i represents the number of votes cast in community i, $PYES_i$ is the number of votes cast in support of the ballot initiative, F is the logistic cumulative density function, x_i contains the vector of independent variables for community i, and β is a vector of parameters to be estimated.

Empirical Results

Tables 3 and 4 present the results of the regression analyses of voter response to the 2005 Working Waterfront and Land for Maine's Future ballot initiatives. Numerous specifications of these models were tested. Goodness of fit measures (shown at the bottom of Tables 3 and 4) guided the final selection of model specifications. All of the specifications shown in Tables 3 and 4 pass global tests of fit. The subsequent discussion of empirical results focuses on significant (at least 5%) parameter estimates.

Examination of the results shown in Table 3 reveals some interesting patterns in voter response to the Working Waterfront Ballot initiative. Less support for the initiative is found in areas located further from the coast (LNDCOAST), intimating that perceived, accessible benefits from this program may decline with distance from the coast. Conversely, higher levels of support are found in communities located further from Portland (LNPORT). A positive association is found between support for the ballot initiative and higher median incomes (LNMEDINC), suggesting the services provided by working waterfront lands may be normal goods. Higher median housing values in coastal communities (CMEDVAL) has a positive

influence on voter support. This unexpected result may suggest that the costs of the current use taxation program are relatively small compared to the perceived benefits in these communities. Coastal communities with higher median housing values may have working waterfront lands under the greatest threat from development and stand to gain more from the protection program. A negative association is found between reduced natural resource employment from 1990 to 2000 (CHNREMP) and voter support, implying communities that are losing employment in these industries are less likely to support working waterfront protections. This negative relationship dampens moving away from the coast (LNDCOAST*CHNREMP). A positive association is found in the second specification shown in Table 3 between the extent of natural resource employment (NREMP) and voter support for the working waterfront program, and this positive relationship dampens moving from away from the coast (LNDCOAST*NREMP), perhaps suggesting limited support of protections designed for the fishing industry by communities dependent on agriculture and forestry. A negative association is found between percentage of votes cast for Presidential Bush in 2004 (REPUB) and voter support for the working waterfront program. In contrast, higher support is found in communities with higher rates of membership with Maine Audubon (AUDUB), suggesting individuals concerned about wildlife recognize potential gains from protecting working waterfront lands. A positive association between voter support and boat registrations was found in the first specification shown in Table 3.

Patterns in voter response to the Land for Maine's Future Ballot are summarized in Table 4. Lower support for the initiative is found in areas with higher percentages of conserved and unconserved agricultural land cover (AG_PR and AG_C), intimating less perceived benefits from the LMF program in agricultural communities. Percentage of conserved forest cover (FOR_C) has a positive influence on voter support of the LMF program, giving some evidence

of positive network externalities - communities with some conservation land prefer to have more conservation. A positive association is also found between greater reductions in agricultural (CHAG) and forest (CHFOR) land cover from 1992 to 2001 and voter support for the LMF program. These results may imply greater awareness of landscape change as well as perceptions of scarcity of specific landscape attributes.

Distance from conservation land (LNDCLAND) has a negative influence on voter support of the LMF program. This relationship may be capturing increased familiarity with and appreciation of specific landscape services in communities with proximity to conservation lands. Lower levels of support are found in communities located further from Portland (LNPORT). This trend may be picking up differences in tastes and preferences for landscape attributes, bounding the "two Maines." A positive association is found between support for the ballot initiative and higher median incomes (LNMEDINC), suggesting the services provided by the LMF program are normal goods. A positive association is found between the extent of natural resource employment (NREMP) and voter support for the LMF program. This suggests some form of broad support by employees in these industries for land conservation. The second specification in Table 4 indicates this positive relationship may decline with the extent of non-conserved forestlands in a community. The latter effect is sensible, as these communities may be targeted by LMF and will experience both the benefits and costs of the LMF program in a concentrated fashion. As in the case with the Working Waterfront Ballot initiative, a negative association is found between percentage of votes cast for Presidential Bush in 2004 (REPUB) and voter support. Higher rates of membership with Maine Audubon (AUDUB) are positively associated with support of the LMF program; whereas higher rates of hunting and fishing licences (HFISH) are negatively associated with support of the LMF program. These results may reflect the relative magnitude of net benefits perceived by Maine Audubon members and

hunters and fishers, offering some evidence that non-consumptive services may be greater than consumptive services on LMF lands.

Conclusions

At the outset of this paper, emphasis was given to the parallel nature of discussions throughout the globe, reflecting on the relative value of different characteristics of landscapes and pondering alternative future landscapes. A parsimonious review of US and EU agri-environmental policies suggests these discussions have fed or are responding to broader and organized interests in the multi-functionality of working lands. EU policies are notably more encompassing, covering myriad aspects of working lands and their role in rural landscapes. Public preferences for working lands are heterogeneous, and future research examining the drivers of this variation has tremendous potential to inform future policies. The results of the Maine case study illustrate the complexities of understanding heterogeneous preferences at a local scale. Drivers of variation in voter support of the Working Waterfront and Land for Maine's Future programs exhibit similarities and differences, as would be expected given the distinct nature of these two land protection programs. The results displayed in this paper are preliminary. Future research is planned to refine the design and analysis of these empirical models, including modifying the empirical regression model to account for spatial dependence among the error terms and examining the potential implications of household sorting in response to landscape attributes[6].

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[1] A growing concern in the US relates to the impact of ethanol production on agri-environmental objectives. As farmers remove lands from existing support programs, cross-compliance measures will have no impact on practices.
[2] Visit the Trust for Public Land's website (www.tpl.org) and examine the Center for Conservation Finance's LandVote database and publications.
[3] The majority of the communities (county subdivisions) omitted from this analysis are unorganized territories, with very limited populations and unreliable U.S. Census of Population and Housing demographic data.
[4] Employment data on these industries is aggregated into 1 category.
[5] A non-government organization, the Island Institute, is developing such data. When these data are complete, they will be incorporated into this analysis.
[6] Schlapfer and Hanley (2003) present an excellent discussion of self-selection issues and raise potential concerns with using landscape attributes as independent variables, if they are the source of household sorting in terms of preferences. The issue of sorting merits further attention in this empirical literature.

Figure 1 Working Waterfront Voting Results:

Proportional and Absolute Measures of Voter Support by Community

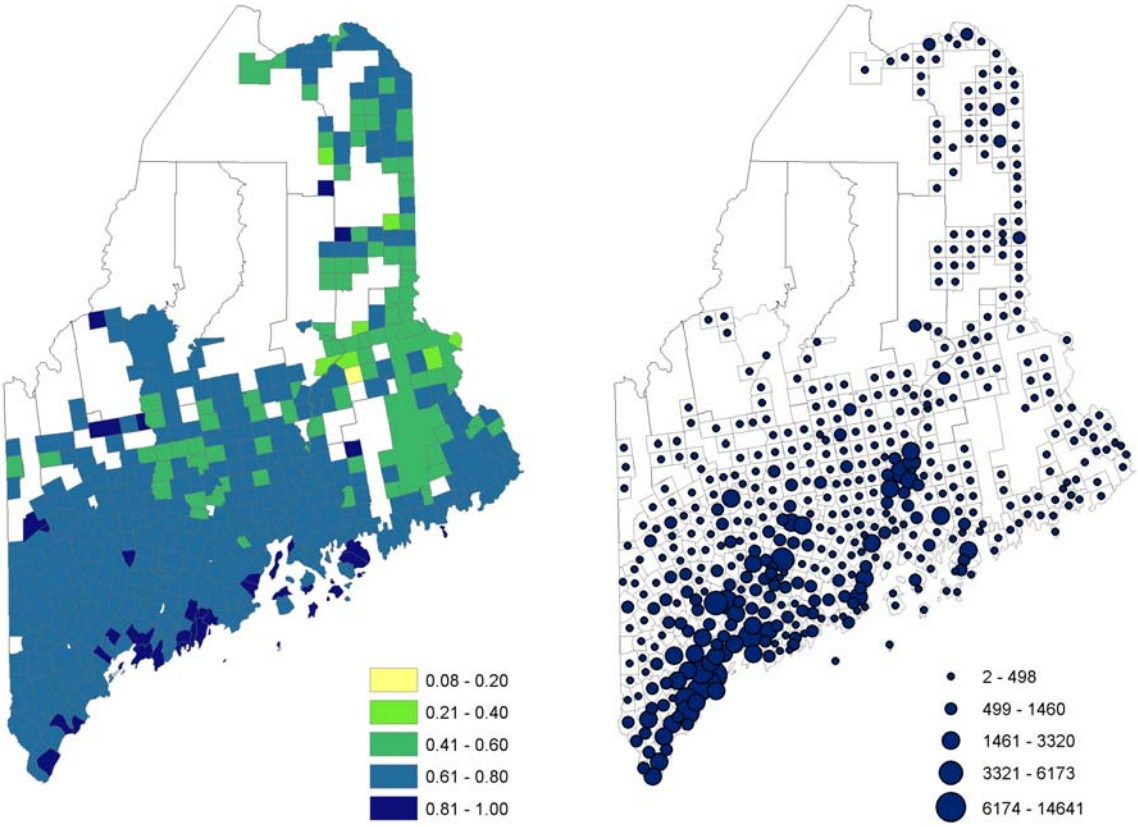

Figure 2 Land for Maine's Future Voting Results:

Proportional and Absolute Measures of Voter Support by Community

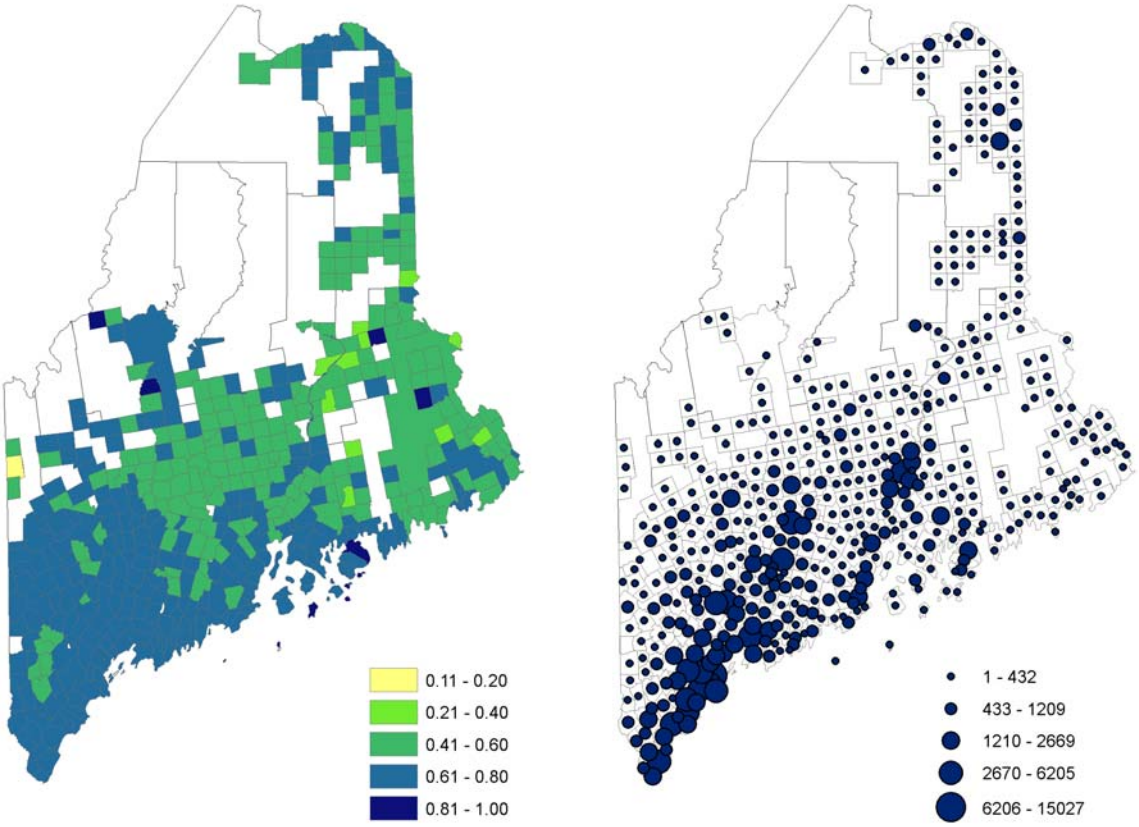

Table 1. Maine Case Study - Variable Descriptions

Variable	Description
PYES_WWF	Proportion of YES votes in support of the 2005 Working Waterfront Ballot Initiative
PYES_LMF	Proportion of YES votes in support of the 2005 Land for Maine's Future Ballot Initiative
LNPOPDEN	Natural logarithm of the population density (population per square mile)
LNPORT	Natural logarithm of the distance to Portland (measured in meters)
AUDUB	Percentage of residents that are members of Maine Audubon (Maine Audubon)
HFISH	Percentage of residents with Maine Hunting and Fishing Licenses (InformME; Department of Inland Fisheries and Wildlife)
BOAT	Percentage of residents with Boat Licenses/Registrations (InformME; Department of Inland Fisheries and Wildlife)
REPUB	Percentage of residents that cast votes in support of President Bush in the 2004 Presidential Election
LNMEDINC	Natural logarithm of the 1999 median income (measured in $10,000; 2000 U.S. Census of Population and Housing)

Variable	Description
NREMP	Percentage of 2000 employment in agriculture, forest, and fishing occupations (2000 U.S. Census of Population and Housing)
CHNREMP	Percentage change (reduction) of employment in agriculture, forest, and fishing occupations from 1990 to 2000 (2000 U.S. Census of Population and Housing)
CMEDVAL	Median 1999 Housing Value of coastal communities; 0 otherwise (U.S. Census of Population and Housing)
LNCOAST	Natural logarithm of the distance to Maine's coast (measured in meters)
LNCLAND	Natural logarithm of the distance to the nearest conservation land (measured in meters)
AG_PR	Percentage of community with non-conserved agricultural land cover (2001 USGS NLCD Data; Maine Office of GIS)
FOR_PR	Percentage of community with non-conserved forest land cover (2001 USGS NLCD Data; Maine Office of GIS)
AG_C	Percentage of community with conserved agricultural land cover (2001 USGS NLCD Data; Maine Office of GIS)
FOR_C	Percentage of community with conserved forest land cover (2001 USGS NLCD Data; Maine Office of GIS)

Variable	Description
CHAG	Percentage change (reduction) in agriculture cover from 1992 to 2001 (1992 USGS NLCD Data; 2001 USGS NLCD Data; Maine Office of GIS)
CHFOR	Percentage change (reduction) in forest cover from 1992 to 2001 (1992 USGS NLCD Data; 2001 USGS NLCD Data; Maine Office of GIS)

Table 2. Maine Case Study - Independent and Dependent Variable Descriptive Statistics

Variable	Mean	Standard Deviation
PYES_WWF	0.6764	0.0979
PYES_LMF	0.6074	0.0977
LNPOPDEN	3.3564	1.5431
LNPORT	11.6951	0.9997
AUDUB	0.4898	0.7703
HFISH	37.0113	25.8315
BOAT	12.7568	14.9438
REPUB	49.1961	10.5826
LNMEDINC	3.5148	0.2475
NREMP	6.7664	8.0994
CHNREMP	21.3740	71.4612
CMEDVAL	0.8180	1.8046
LNCOAST	7.6150	4.9480
LNCLAND	7.8070	1.6662
AG_PR	6.6293	7.9989
FOR_PR	65.0430	15.6229
AG_C	0.0360	0.1160
FOR_C	2.9955	7.2246
CHAG	1.4052	3.1584

Variable	Mean	Standard Deviation
CHFOR	6.0030	6.1721
NREMP*LNDCOAST	50.3483	75.1327
CHNREMP*LNDCOAST	133.4730	746.8076
AG_PR*NREMP	36.1153	77.9899
FOR_PR*NREMP	436.6333	531.4719

Table 3. Maine Case Study: Group Logit Regression Analysis of the Working Waterfront Ballot Initiative

	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Intercept	-0.6427	<0.0001	-0.5945	<0.0001
LNDCOAST	-0.0171	<0.0001	-0.0103	<0.0001
LNPOPDEN	0.00562	0.2525	-0.00754	0.1395
LNPORT	0.0136	<0.0001	0.0062	0.0016
LNMEDINC	0.5523	<0.0001	0.5707	<0.0001
CMEDVAL	0.0108	<0.0001	0.0130	<0.0001
NREMP	-0.0008	0.6020	0.0111	<0.0001
CHNREMP	-0.0003	0.0007	-0.0010	<0.0001
REPUB	-0.0128	<0.0001	-0.0120	<0.0001
BOAT	0.00351	<0.0001	0.0004	0.6443
AUDUB	0.0626	<0.0001	0.0681	<0.0001
LNDCOAST*CHNREMP			0.0007	<0.0001
LNDCOAST*NREMP			-0.0029	<0.0001
n=495				
-2 LnL (intercept only)	459194.63		459194.63	
-2 LnL (covariates)	454403.80		454119.78	
AIC	454425.80		454145.78	
LR Global Null	4790.8278	<0.0001	5074.8489	<0.0001

Table 4. Maine Case Study: Group Logit Regression Analysis of the Land for Maine's Future Ballot Initiative

	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Intercept	-0.1883	0.0289	-0.1805	0.0385
AG_PR	-0.0029	<0.0001	-0.0034	<0.0001
FOR_PR	-0.0002	0.6021	0.0006	0.1947
AG_C	-0.1241	0.0148	-0.1161	<0.0001
FOR_C	0.0080	<0.0001	0.0079	<0.0001
CHAG	0.0069	<0.0001	0.0061	<0.0001
CHFOR	0.0044	<0.0001	0.0037	<0.0001
LNDCLAND	-0.0082	0.0037	-0.0072	0.0114
LNPOPDEN	-0.0093	0.1156	-0.0064	0.2924
LNPORT	-0.0033	0.1039	-0.0054	0.0113
LNMEDINC	0.5182	<0.0001	0.5045	<0.0001
NREMP	0.0041	0.0036	0.0167	<0.0001
CHNREMP	0.0001	0.0811	0.0001	0.1735
REPUB	-0.0195	<0.0001	-0.0194	<0.0001
HFISH	-0.0044	<0.0001	-0.0043	<0.0001
AUDUB	0.0386	<0.0001	0.0389	<0.0001
AG_PR*NREMP			0.00007	0.5822
FOR_PR*NREMP			-0.0002	<0.0001
n=495				
-2 LnL (intercept only)	517374.27		517374.27	
-2 LnL (covariates)	5121363.61		512117.43	
AIC	512165.61		512153.43	
LR Global Null (β=0)	5240.658	<0.0001	5256.8393	<0.0001