Agency Perceptions of Alternative Salinity Policies:
The Role of Fairness

Laura M. J. McCann, Department of Agricultural Economics, University of Missouri

and

Adam R. Hafdahl, Department of Psychological Sciences, University of Missouri

For presentation at the American Agricultural Economics Association Annual Meeting, July 27-30, 2003, Montreal, Canada.

Abstract

Economics has looked at the decision process of politicians but the decision process of agency staff has primarily been the purview of sociologists. Agencies affect the final form of regulations, they may enforce or ignore regulations that exist, and they provide information to the political process. Policies recommended by economists for nonpoint source pollution control are seldom supported by government agencies.

This study examined the relationship between preferences for a particular policy and perceptions of farmer cost, farmer resistance, efficiency in salinity reduction, fairness, and administrative costs. A survey of people working on the salinity issue in Western Australia was conducted and structural equation modelling was used to examine the relationships between perceived policy attributes. As expected, fairness had a direct and significant effect on policy preference and also affected farmer resistance and administrative cost. Administrative cost was also positively affected by farmer cost and farmer resistance and had a direct effect on policy preference. Interestingly, analyses showed there was no direct effect between farmer cost and policy preference or between effectiveness and farmer resistance.

Key words: Fairness, salinity policies, regulatory agencies

Introduction

In economic theory, the social planner chooses the action that maximizes the difference between benefits and costs. Political economy examines the decision process of politicians who are assumed to make decisions that maximize the probability of reelection rather than maximizing welfare. Economics has largely neglected the decision process of government agency staff. This is unfortunate because they, as well as politicians, significantly affect environmental and natural resource policy in a variety of ways. Politicians are generally not trained scientists and often rely on agency staff for information regarding environmental problems and policies. Agencies may either thwart the intentions of politicians or go beyond them. While politicians enact legislation, the agencies write the final regulations. In addition, agency staff may choose to ignore or enforce regulations that currently exist; and if laws and regulations aren't enforced, they have little effect.

The enforcement issue seems to be particularly true in the case of nonpoint source pollution. The State of California passed strict pesticide regulations but they were not enforced because agency staff felt they were unreasonable (Sandra Archibald, personal communication). In Minnesota, there is a perception among farmers that feedlot regulations are not enforced (McCann and Easter, 1999a). In Western Australia, a permit is required to clear native bush but a variety of sources have indicated that enforcement is not high.

In the case of agricultural nonpoint source pollution, we typically observe programs or policies based on education, cost sharing, technical assistance, land retirement, mandatory land use practices, and conservation compliance. Policies proposed by economists such as input taxes, emission charges based on estimates, and marketable permits are not generally observed in practice. An examination of the determinants of policy preferences is needed for three reasons: 1) to identify factors that have hindered the "adoption" of recommended policies by politicians and agency staff, 2) to potentially uncover factors that should be included in economic analyses, and 3) to design methods to promote adoption of economically efficient policies.

Model of policy preference

Liekert-scale questions are commonly used by economists to examine the policy preferences of the general public or of specific groups that would be impacted by the policies (Bateman et al. 2002). In those cases, the characteristics of individuals, such as age and income, are used to explain policy preferences and thus predict support or opposition to a particular policy based on demographic information. In this study, the attributes or characteristics of the policies themselves are of interest since the objective is to examine the policy evaluation process of agency staff. The preference for, or utility of, policies was modeled as a function of the perceived characteristics of policies.

In this study, a number of factors were hypothesized to affect the preference by agency staff for alternative policy instruments to control dryland salinity. These include perceived farmer cost, administrative or transaction costs, effectiveness, fairness and farmer resistance. The effect of these factors on policy preference, and the interactions between the factors is discussed in this section.

From economic theory, compliance or abatement costs of an environmental policy instrument would be expected to have a negative effect on the preference for that instrument. Wilen and Homans (1998) found that regulators of a fishery appeared to take into account both the fish population and the cost of regulations to fishers. In the case of agri-environmental policies, these costs would be expected to fall primarily on farmers. These costs are affected by the current state of technology as well as the bio-physical situation. Contradictory studies are cited by Dietz and Vollebergh (1999), who indicate that bureaucrats show little interest in the cost-efficiency of environmental policies.

Another hypothesis is that perceived high administrative or transaction costs associated with enacting and enforcing policies recommended by economists has hindered adoption. A negative relationship between administrative costs and preference for policies by agency staff would be evidence that they were taking transaction costs as well as compliance costs into account, whereas a positive relationship would lend credence to the theory of bureaucrats as budget maximizers. McCann and Easter (1999a) found that while administrative costs were a factor negatively affecting agency preferences for phosphorous policies, the effect was small compared to perceived farmer resistance. Farmer resistance would be expected to increase administrative costs associated with a policy since it would increase monitoring and enforcement costs. McCann and Easter (2000) found a positive relationship between farmer costs and transaction costs in NRCS programs. Administrative costs would also be affected by the general institutional environment and the monitoring technologies available. Luft (1997) found that the perceived fairness of actions by companies may decrease transaction costs. Fairness would thus be expected to be negatively related to administrative costs in this model.

Theory would suggest that there would be a positive relationship between effectiveness, or environmental benefits, and agency preference. Effectiveness of a policy instrument would be related to the technologies available, the bio-physical situation, and the response of farmers to the instrument. We would thus also expect a positive relationship between effectiveness and farmer cost, similar to the standard pollution abatement diagram. McCann and Easter (1999a) hypothesized that perceived efficacy of the policies in addressing the phosphorous problem may have accounted for some of the effect of the farmer resistance variable since it was possible that both farmers and agency staff perceived some policies as ineffective. A less benign explanation is that the relationship between farmer resistance and agency preference for policies may be linked to the extensive literature on capture which stemmed from Stigler (1971). According to Stigler "…as a rule, regulation is designed and operated primarily for its [the industry's] benefit" (p. 3) rather than being designed to benefit the public. We thus would expect a negative relationship between effectivenss and farmer resistance, and between farmer resistance and agency preference.

One would also expect farmer resistance to environmental policies to be a function of farmer compliance costs. This linkage is implicit in the literature on the political economy of environmental policy (for example see Dietz and Vollebergh 1999). Resistance to policies may also stem from a perceived change in property rights, for example, restrictions on management practices. If similar farmers are not treated similarly, or if the allocation of costs and benefits between farmers and urban communities is inequitable, this would tend to increase farmer resistance. Farmers may consider these policies to be unfair so a negative relationship between fairness and farmer resistance is expected.

Fairness may also have a direct effect on the policy preferences of agency staff. In the 1970's and 80's welfare economists and philosophers debated what constitutes a fair distribution of wealth and opportunities in society (Rawls 1985, Varian 1975, Nozick 1973, Sen 1990) but this has not been incorporated into standard environmental policy analysis. Clark (1998) used experimental economics to examine preferences for two components of fairness, equality and proportionality of benefits received to costs paid. He found evidence that subjects' utility functions deviated from strict self-interest and that this could be separated from other motivations such as altruism. In other experimental studies, Blount (1995) found that the perception of how a situation of unequal payoffs came about matters to subjects. Barrett (1996) and Howarth (1997) have discussed fairness (defined as absence of envy) with respect to intergenerational equity and sustainability issues. The sub-discipline of ecological economics has efficiency, sustainable scale, and fairness as goals (Costanza et al. 1997). Some economists (Oberholzer-Gee et al. 1997, Suranovic 1997, Zajac 1995) suggest that we need to study fairness because it is important to the general public and to policy makers. The importance of fairness of environmental policies was highlighted by agency staff during interviews according to McCann and Easter (1999b). Tietenberg (1998), examining air quality policy, suggests that a cost effectiveness framework is often used in environmental policy because economics is not seen as an appropriate way to set goals. Social psychologists (Syme et al. 1999, Kals 1996) have studied the issue of fairness or justice with respect to individual decisions that affect the environment. They found that appeals to change behavior were considered unfair compared to taxes and prohibitive laws since those who didn't change their behavior benefited from the actions of others.

In a Swiss survey of opinions on rules for locating nuclear waste facilities, Oberholzer-Gee et al. (1997) found that willingness to pay/accept and lotteries were considered unfair.

Zajac (1995), develops six principles of fairness, sometimes contradictory, that seem to occur in the regulatory process: 1) while life is unfair, everyone should receive some minimum amount, 2) unequal treatment should only be based on pertinent similarities and differences, otherwise, equals should be treated equally, 3) wealth or property fairly acquired should not be confiscated, or more broadly, rights in the status quo should be honored, 4) this wealth should not be lost due to factors beyond one’s control, 5) economic inefficiency is unfair, particularly if it is perceived that it is a result of an unfair advantage for a specific group, and 6) due process mechanisms should be followed. Principle three implies that notions of fairness are affected by the current institutional arrangements including property rights. Since nonpoint source pollution relates to the rights of individuals we hypothesize that fairness will be an important issue and will be positively related to policy preference by agency staff.

Equations summarizing the hypothesized relationships discussed in this section are shown below. Perceived effectiveness (E), farmer cost (FC), and fairness (F) are exogenous variables in this model but are functions of technology, the biophysical environment and the current institutional framework. These factors affect farmer resistance (FR), administrative costs (AC), and ultimately, policy preference (P).

$$FR = f(\underset{(-)}{F}, \underset{(+)}{FC}, \underset{(-)}{E}) \tag{1}$$

$$AC = g(\underset{(-)}{F}, \underset{(+)}{FC}, \underset{(+)}{FR}) \tag{2}$$

$$P = h(F, FC, E, FR, AC) \tag{3}$$

(+) (-) (+) (-) (-)

To examine the importance of fairness and to test the other hypothesized relationships among policy attributes, a mail survey of people working on the salinity issue was conducted. An overview of the salinity problem in Western Australia provides justification for the various policies that were included in the survey.

Salinity in Western Australia

Problems caused by dryland salinity include reduced crop yields, damage to native bushland and wetlands, damage to rural infrastructure such as roads and buildings, and increasing salinity of water resources. According to the National Land and Water Resources Audit (2001), dryland salinity currently affects 5.7 million hectares of land in Australia and is expected to almost triple by 2050. Western Australia accounts for 70% of Australia's dryland salinity (AgWA et al., 1996a).

The area of Western Australia that is the most affected by dryland salinity is the southwestern portion of the state. Land use in the coastal areas includes forestry, dairy, and horticultural enterprises while further inland, where there is less rainfall, the dominant land use is grain, primarily wheat, and sheep. The primary cause of dryland salinity in Western Australia is the removal of the deep-rooted native vegetation (AgWA et al., 1996a). Annual crops aren't able to use as much of the rainfall as the native trees and bush so groundwater levels are rising. The rising groundwater comes in contact with salt deposits in the subsoil and mobilizes them. It is estimated that when groundwater levels eventually reach a new equilibrium, 30% of land may be salt affected (AgWA et al., 1996a).

As early as the 1920's it was hypothesized that clearing of native vegetation was the cause of increased stream salinity. The problem has become more severe and, especially in the last 20 years, research has been conducted to understand the problem and try to find solutions. It will be necessary to reverse the processes that caused the problem, i.e. increase water use and decrease recharge. Potential water management practices proposed in "Salinity: A Situation Statement for Western Australia" (AgWA et al., 1996a) include: increasing the range and proportion of perennial plant species used, increasing water use by annual crops and pastures, collection, reuse and disposal of surface water, drainage or pumping of groundwater, and increased protection of remnant vegetation. Clearing control legislation was enacted in the 1970's for some watersheds that were major water resources.

The Salinity Action Plan (AgWA et al., 1996b) outlined strategies to deal with the situation. The major strategy was to encourage the planting of trees and shrubs with a goal of planting 3 million ha in agricultural areas. Cost of planting is expected to equal 2% of gross production from Western Australian agriculture. Because of the wide variation in climate and hydrology in the affected region, the mix of strategies will differ from one area to the next. The plan recommends salinity targets being set with stakeholders within a catchment. More recently, a workshop was held to identify salinity research and development priorities in Western Australia. The results of the prioritization activities indicated that more work was needed in 1) increasing the range and potential of perennial plant species available, 2) understanding the biophysical processes, 3) assessing the impacts of salinity, and 4) understanding the social impacts and the effects of institutional arrangements and policies.

Survey Methodology

The 17 policies included in the survey come from the research prioritization workshop, the salinity action plan, and the economic literature. The agency survey consisted of a four page questionnaire that was sent to staff of government agencies, environmental groups, and other individuals that had attended state sponsored meetings on the salinity issue as well as selected individuals involved with water catchment groups. The response rate was 79 percent after three mailings using the system developed by Dillman (1978). A preliminary survey also resulted in high response rates. Comments on the preliminary survey from respondents and attendees at a seminar were incorporated in the final design of the survey. Because the survey method was not random, the results cannot be validly extrapolated to a larger population. However, the individuals surveyed represented the majority of the relevant population of agency staff involved with salinity. Survey data was used to examine the relation between policy preferences and perceptions about other factors such as farmer costs, farmer resistance, administrative costs, effectiveness in reducing the spread of salinity, and fairness. In the survey, the term “administrative costs” was used since this was considered to be more understandable to the surveyed population than “transaction costs”. Respondents were asked to rate each policy from 1 (very low) to 9 (very high) on the range of factors considered.

Before conducting primary analyses, missing data were handled by omitting certain cases and imputing values for others. All data from four respondents were omitted because of either excessive missingness (one respondent) or a constant rating on one or more attributes across all 17 policies (three respondents); constant ratings may indicate careless responding, and they create computational problems with analyses that require positive variance for each respondent's ratings on each quality. Of the 7,650 potential ratings from the remaining 75 respondents, only 56 (0.7%) were missing, and these were distributed over 17 respondents, 10 policies, and all 6 attributes. These missing ratings were handled using multiple imputation (Shafer, 1997): for each quality the SAS procedure MI was used to generate five separate data sets, in each of which missing values were replaced using Markov Chain Monte Carlo imputation.

Results

The mean ratings for the 17 policies on the attributes examined are given in Tables 1-3. Having the state of Western Australia plant trees in affected areas, increasing water use of annual plants through research, providing subsidies for tree planting by farmers, and making tree planting tax deductible were seen as having low costs to farmers. High cost options were a requirement for 30% tree cover, requiring protection of remnant vegetation, and allowing community based groups to require specific land management practices. Low farmer resistance was expected for making tree planting tax deductible, funding research on productive uses for saline land and providing subsidies for tree planting by farmers. The most resistance was expected for a requirement for 30% tree cover, allowing community based groups to require specific land management practices, and prohibiting subsurface drainage. A requirement for 30% tree cover is therefore expected to be both costly and unpopular.

Administrative costs were expected to be fairly high for all the alternatives since no policy had a mean rating less than 4. The lowest cost policies were making tree planting tax deductible, developing extension programs on saline aquaculture, and conducting research to increase water use by annual plants. Administrative costs were perceived to be highest for having the state plant trees in affected areas, requiring 30% tree cover in affected areas, and subsidizing drainage of waterlogged land. The most effective policies were perceived to be conducting research on perennial pasture species, requiring 30% tree cover in affected areas, and developing catchment management plans. The least effective policies were developing extension programs on saline aquaculture, prohibiting subsurface drainage, and increasing water use by annual plants.

The most fair policies, according to the respondents, were developing catchment management plans, conducting research on perennial species, and providing subsidies for protecting remnant vegetation. The least fair policies were perceived to be requiring 30% tree cover in affected areas, providing subsidies for drainage, and allowing community based groups to require specific land management practices. The preferred policy was conducting research on perennial species, followed by development of catchment management plans and making tree planting tax deductible for farmers. While making tree planting tax deductible and subsidizing tree planting are very similar policies, the subsidy was less preferred and also seen as less fair.

While information on the attributes of various salinity policies represents useful information for policy makers, the primary goal of the research was to examine the relationships among policy attributes. Structural equation modeling, such as path modeling, is used to examine relationships among variables (MacCallum and Austin 2000). In particular, explanatory variables can be modeled as functions of other explanatory variables and thus this technique is well suited to our research question. In addition, structural equation modeling has been used to elicit attribute weights (Harte and

Koele 1995). Path analysis is also more useful for model testing than the usual multiple linear regression model which is just-identified, meaning there are exactly as many parameters as correlations among variables. With path analysis, there are generally fewer paths than correlations so the zero-order correlations cannot be reproduced exactly and the difference between the predicted and observed correlations can be used to assess the model's adequacy.

Using each reduced data set with imputed ratings, we first computed descriptive statistics across respondents and policies simultaneously for each attribute and conducted univariate generalizability analyses to determine the relative contributions of respondents and policies to variance on each attribute (Shavelson & Webb, 1991). Next, we estimated the correlation matrix among attributes by a method to be described below, then used these correlations to estimate a series of path models with variables (Bollen, 1989). For all analyses, the five sets of results were combined using standard multiple-imputation methods to obtain final estimates and tests adjusted for the missing data.

Generalizability Analyses

Table 4 displays for each attribute descriptive statistics as well as estimated variance-component percentages from the generalizability analyses. About 30% to 50% of the variance in ratings on most attributes was attributable to variation among respondents, policies, or both, and respondents and policies each typically contributed between 10% and 30% of the total variance. That is, respondents varied notably in their ratings on each attribute (averaged across policies) and policies varied notably in their rated values on each attribute (averaged across respondents). Farmer resistance is unique in that over 50% of its variance was attributable to variation among respondents and policies; it was also the most positively skewed attribute. For effectiveness and administrative cost, respondents accounted for over twice as much variance as did policies, whereas for farmer resistance policies accounted for over four times as much variance as did respondents; for the remaining three attributes, respondents and policies contributed similar proportions of variance.

Path Analyses

Correlation matrix. The basic input for a conventional standardized path analysis of relationships among the six attributes is the matrix of zero-order Pearson correlations among the attributes. With the present three-mode data, in which both respondents and policies may be treated as random sources of (co)variation among attributes, several different methods could be used to estimate these correlations. For our purposes, the most defensible approach was to compute correlations with the effects of both respondents and policies removed. We first residualized the data by subtracting from each rating the effect for that respondent (i.e., his or her mean across policies minus the grand mean) and the effect for that policy (i.e., its mean across respondents minus the grand mean) then computed the usual Pearson correlation between each attribute using the residualized data. This procedure amounts to pooling each correlation across both respondents and policies, so that each resulting correlation (see Table 5) reflects covariation between two attributes for a given respondent and policy. Had we not removed these effects, the resulting correlations would have also reflected covariation among respondent means and policy means, which was not of interest for our purposes.

Initial path model. The correlation matrix described above was used to estimate an initial path model that was derived from hypothesized relationships among the six attributes. Analyses were conducted with the SAS procedure CALIS. The first row of Table 6 shows the standardized coefficients—interpretable as standardized regression coefficients—for the paths in this initial model. For example, preference was hypothesized to relate directly to all five other attributes, and of these five paths only three differed statistically significantly from zero: Effectiveness and fairness exhibited rather strong positive relationships with preference, and administrative cost exhibited a weak negative relationship. (In this and both subsequent models, fairness, farmer cost, and effectiveness are exogenous variables, so the zero-order correlations among them were included in the model but not shown in Table 6.)

This initial model's fit to the data was equivocal. As shown in Table 7, the chi-square test of exact fit—whose null hypothesis is that the (population) correlation matrix implied by the path model matches the (population) zero-order correlation matrix—was significant, suggesting some degree of model misspecification. Because many experts consider the chi-square test an overly strict criterion for assessing model fit, other indices of model fit were examined (Browne & Cudeck, 1993; Hu & Bentler, 1999). A 90% confidence interval for the root mean square error of approximation (RMSEA)—for which values below .06 are considered to indicate acceptable fit—suggests that the model's fit is mediocre: fair at best and poor at worst (Table 7). In contrast, the comparative fit index (CFI) and McDonald's centrality index (McCI)—for which values above .95 and .90, respectively, are considered indicative of acceptable fit—suggest excellent fit.

Simplified model. To obtain a more parsimonious system of relationships, the initial model was simplified by removing (i.e., constraining to zero) the three nonsignificant paths. As shown in the second row of Table 6, the remaining paths did not change in the first two decimal places with these modifications. Although the chi-square test of exact fit remained significant and the CFI and McCI did not change appreciably, the RMSEA improved somewhat (see Table 7).

Final model. An examination of residuals and modification indices based on the simpler model suggested that adding two of several previously omitted paths would improve the model's fit substantially. Because these paths—from both farmer cost and fairness to administrative cost—were justifiable according to the literature, they were included in our final model. As the third row of Table 6 indicates, adding these paths influenced only one of the previously estimated paths: The path from farmer resistance to administrative cost was previously the (indirect) conduit for the latter's relationship with farmer cost and fairness, and adding direct paths from these two exogenous attributes reduced the variation in administrative cost attributable to farmer resistance. As indicated in Table 7, this model fit the data extremely well: not only was the chi-square test clearly nonsignificant, suggesting that exact fit was tenable, but also the entire RMSEA confidence interval was well within the range of small values considered indicative of close fit.

Figure 1 depicts standardized coefficients for the final model in a path diagram. The importance of the perceived fairness of the policies is obvious. The direct effect on preference is important; if the rating for fairness increases by one standard deviation, the preference rating will increase by 0.53 standard deviations, ceteris paribus. Fairness also affects both farmer resistance and administrative cost. As expected, perceived effectiveness in reducing salinity is also an important predictor of policy preference with a standardized coefficient of 0.31. The relationships between farmer cost and fairness on farmer resistance are also as predicted by the model. The effect of administrative cost is small but statistically significant which is similar to the findings of McCann and Easter (1999a). Administrative cost is a function of farmer resistance, as well as being directly affected by fairness and farmer cost. Interestingly, there is no direct effect of farmer cost on policy preference and no relationship between farmer cost and effectiveness.

Discussion:

This survey had two objectives, to provide information on potential policies to reduce the spread of salinity, and to examine the attributes that affect staff members' preferences over policies. The use of this type of survey for policy decision-making is limited by a number of factors. In particular, the fact that the policies are not described in detail means that different people may understand them differently or assume different types of implementation. On the other hand, it is useful as a screening tool so that more in-depth studies may be conducted by policy makers or researchers. The policy asked questions that elicited perceived farmer costs, farmer resistance, effectiveness, etc. so it is quite possible that the actual values would differ from the perceived ones. However, it could be argued that, given bounded rationality, people act on their perceptions of reality rather than on reality. Another issue is that some of the policies, such as tax deductibility for tree planting, are already in place while other policies, such as subsidies for meeting shire-wide salinity targets, are highly hypothetical. A number of the policies were clearly not politically viable. It is also the case that some policies were designed to slow or reduce salinity while others, such as research on saline aquaculture, were designed to reduce the negative social and economic effects of salinity. While the survey was not a random sample of the target population, the sample does represent a large proportion of agency staff working in this area.

While the actual ratings for various attributes are subject to the limitations cited above, the relationships between the various attributes, with policy and respondent effects removed, should reflect the underlying decision process of agency staff. The results clearly indicate that fairness is key to understanding the policy preferences of agency staff and is more important to them than effectiveness or farmer cost. In fact, farmer cost only affected policy preference through its effect on administrative cost, directly and through farmer resistance. For example, agency staff may have suspected that costly management practices would require more input from them as far as technical support. Fairness had a direct positive effect on policy preference which would indicate that agency staff intrinsically value fairness. As expected, perceptions of increased fairness reduced perceived farmer resistance, which may be related to changes in property rights, and also reduced administrative cost.

Underlying many of the policies are implicit changes in property rights. Providing subsidies or tax breaks to farmers who plant trees in affected areas were popular policies on a variety of fronts. This option does not represent a deviation from the implicit status quo property rights structure. A requirement for 30% tree cover was perceived negatively except with respect to effectiveness. A policy of allowing communities to require specific land management practices was not well received. This latter policy represents a realignment of property rights from individuals to communities, while others, such as a prohibition on drainage or a requirement for 30% tree cover, represent transferring property rights from the individual to the state. The fact that the effect of farmer resistance is indirect and small would indicate that agency staff are more inclined to adopt policies that benefit the public than would be expected from capture theory. The lack of a relationship between effectiveness and farmer cost could be due to the fact that many of the policies were subsidized by the government so taxpayers, rather than farmers, were shouldering the burden.

The results show that while fairness is not an issue that is incorporated in economic analyses of policy options, it is a very important issue for other members of society including farmers and agency staff. If policies recommended by economists are perceived as unfair, they are unlikely to be adopted, thus foregoing potential Pareto improvements. The study also suggests that fairness affects costs by its influence on administrative costs and thus could be fruitfully studied by economists. Fairness is probably more important in the case of nonpoint pollution than it has been for point source pollution since environmental policies may affect individual liberties to a greater extent in the nonpoint pollution case.

Administrative or transaction costs is another factor that is typically not included in economic evaluations of environmental and natural resource policies. The results indicate that these costs are included in agency staff decision-making, though less important than efficacy or fairness, and economists should also include them for economic efficiency reasons (McCann and Easter, 1999b). Since the effect is rather small, administrative or transaction costs do little to explain the lack of adoption of policies recommended by economists. While most of these staff were not heads of their respective organizations, the fact that the relationship between administrative cost and preference is negative does not support the idea that bureaucrats are budget maximizers.

Similar to the findings of McCann and Easter (1999a, 2000), administrative or transaction costs were an increasing function of farmer costs. The positive relationship between farmer resistance and administrative costs may be due to expected increases in monitoring and enforcement costs.

Perceived effectiveness was an important factor affecting policy preference. This is a factor that economists generally incorporate in their analyses and it is encouraging to find that it is also incorporated in agency decision-making. Farmer costs however, had no direct effect on policy preference, which is contrary to the assumptions of the social planner's decision process.

Conclusions:

A survey of agency staff was used to analyze the factors affecting their preference for various salinity policies. We found that perceived effectiveness, fairness, and administrative costs had a significant effect on policy preferences. The magnitude of the effect of fairness, and the multiple effects it had on other attributes indicate that policy recommendations that ignore fairness are unlikely to be supported by agency staff.

An understanding of the factors that agency staff incorporate in their decision-making will enable economists to design policies that are effective, efficient, and implementable and thus more likely to be adopted. An understanding of the decision-making process will also enable economists to better communicate with agency staff regarding policy evaluation.

For economists, incorporating fairness into policy evaluation is in its infancy or even gestation. Further research could examine more precisely which factors, such as current property rights institutions, affect whether a policy is considered to be "fair". Luft (1997) indicates that while self-interest does do a good job of predicting behavior in empirical research, that fact does not preclude other motivations such as fairness and the tests are seldom designed to distinguish between the two. Therefore, additional research designed to test whether inclusion of fairness improves on the self-interest model of bureaucracy in the nonpoint pollution context is needed. In addition, an examination of the actual salinity policies implemented and the level of enforcement could shed light on whether agency staff preferences matter as far as the design and implementation of policies.

References:

Agriculture Western Australia, CALM, Dept. of Environmental Protection, and Waters and Rivers Commission. 1996. Salinity Action Plan.

Agriculture Western Australia, CALM, Dept. of Environmental Protection, and Waters and Rivers Commission. 1996. Salinity: A Situation Statement for Western Australia.

Archibald, Sandra. 1997. Associate Dean of the Humphrey Institute of Public Affairs, University of Minnesota. Personal communication.

Barrett, Christopher B. 1996. "Fairness, stewardship and sustainable development" *Ecological Economics* Vol. 19(1): 11-17.

Bateman I.J., R.T. Carson, B. Day, M. Hanemann, N. Hanley, T. Hett, M. Jones-Lee, G. Loomes, S. Mourato, E. Ozdemiroglu, D.W. Pierce, R. Sugden, and J. Swanson. 2002. *Economic Valuation with Stated Preference Surveys.* Northhampton, MA: Edward Elgar.

Blount, Sally. 1995. "When Social Outcomes Aren't Fair: The Effect of Causal Attributions on Preferences". *Organizational Behavior and Human Decision Processes.* Vol. 63(2): 131-144.

Bollen, K. A. (1989). *Structural equations with latent variables.* New York: Wiley.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.

Clark, Jeremy. 1998. "Fairness in public good provision: an investigation of preferences for equality and proportionality" *Canadian J. of Economics* Vol. 31(3): 708-729.

Costanza, Robert, John Cumberland, Herman Daly, Robert Goodland, and Richard Norgaard. 1997. An Introduction to Ecological Economics, Boca Raton, FL: St. Lucie Press.

Dietz, Frank J. and Herman R.J. Vollebergh. 1999. "Chapter 23: Explaining Instrument Choice in Environmental Policies," in: Jeroen C.J.M. van den Bergh (ed.), Handbook of Environmental and Resource Economics, Northhampton, MA Edward Elgar

Dillman, Don A. 1978. Mail and Telephone Surveys - The Total Design Method John Wiley and Sons, New York.

Harte, Johanna M. and Pieter Koele. 1995. "A Comparison of Different Methods for the Elicitation of Attribute Weights: Structural Modeling, Process Tracing, and Self-Reports". *Organizational Behavior and Human Decision Processes.* Vol. 64(1) pp. 49-64.

Holtman, Charles B. 1997. "An Architecture of Public Decision Making: An Organization Theory Approach to Improving the Quality of Government Decisions". M.A. Thesis, University of Minnesota.

Howarth, Richard B. 1997. "Sustainability as Opportunity" *Land Economics* Vol. 73(4): 569-79.

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

Kals, Elizabeth. 1996. "Are proenvironmental commitments motivated by health concerns or by perceived justice?" pp. 231-258 In: L. Montada and M. Lerner (Eds) Current Societal Concerns About Justice New York: Plenum Press.

Kennedy, Peter. 1992. Chapter 15. "Qualitative and Limited Dependent Variables" In: A Guide to Econometrics Third Edition. The MIT Press, Cambridge, Massachusetts.

Long, J. Scott. 1997. Chapter 5. "Ordinal Outcomes: Ordered Logit and Ordered Probit Analysis" Regression Models for Categorical and Limited Dependent Variables Sage Publications, Thousand Oaks, California.

Luft, Joan. 1997. "Fairness, Ethics, and the Effect of Management Accounting on Transaction Costs". *J. of Management Accounting Research*. Vol. 9, pp. 199-216.

MacCallum, Robert C. and James T. Austin. 2000. "Applications of Structural Equation Modeling in Psychological Research". *Annu. Rev. Psychol.* Vol. 51:201-226.

McCann, Laura and K.W. Easter 1999a. Farmer versus Agency Attitudes Regarding Policies to Reduce Agricultural Phosphorus Pollution in the Minnesota River. *Review of Agricultural Economics*. Vol. 21(1) Spring/Summer 1999.

McCann, Laura and K. William Easter. 1999b. Evaluating Transaction Costs of Nonpoint Source Pollution Policies. *Land Economics*. August 1999, Vol. 75(3).

McCann, L and K.W. Easter. 2000 Estimates of Public Sector Transaction Costs in NRCS Programs. *Journal of Agricultural and Applied Economics.* December 2000, Vol. 32(3).

Montada, Leo. 1998. "Justice: Just a Rational Choice?" *Social Justice Research* Vol. 11(2): 81-101.

National Land and Water Resources Audit. 2001. *Australian Dryland Salinity Assessment 2000.* National Land and Water Resources Audit, Canberra, Australia.

Oberholzer-Gee, Felix, Iris Bohnet and Bruno S. Frey. "Fairness and competence in democratic decisions". *Public Choice* Vol. 91(1): 89-105.

Rawls, John. 1985. "Justice as Fairness: Political not Metaphysical" *Philosophy and Public Affairs* Vol. 14(3): 223-251.

Salinity R&D Working Group. 1998. Draft Review of Salinity Research and Development in Western Australia.

Sen,Amartya. 1990. "Justice: Means Versus Freedoms" *Philosophy and Public Affairs* Vol. 19(2): 111-121.

Schafer, J. L. (1997). *Analysis of incomplete multivariate data.* Boca Raton, FL: Chapman & Hall/CRC.

Shavelson, R. J., & Webb, N. M. (1991). *Generalizability theory: A primer.* Newbury Park, CA: Sage.

Stigler, George. 1971. "The Theory of Economic Regulation", *Bell Journal of Economics* Vol. 5: 3-21.

Suranovic, Steven. 1997. "Why economists should study fairness" *Challenge* Vol. 40(5): 109-124.

Syme, Geoffrey J., Elizabeth Kals, Blair E. Nancarrow, and Leo Montada. In Press. "Ecological Risks and Community Perceptions of Fairness and Justice: A cross-cultural model" *Risk Analysis*

Tietenberg, Tom. 1998. "Ethical Influences on the Evolution of the US Tradable Permit Approach of Air Pollution Control". *Ecological Economics* Vol. 24: 241-257.

Varian, Hal R. 1975 "Distributive Justice, Welfare Economics, and the Theory of Fairness" *Philosophy and Public Affairs* Vol. 4(3): 223-247.

Wilen, James E. and Frances R. Homans. 1998. "What do Regulators Do? Dynamic Behavior of Resource Managers in the North Pacific Halibut Fishery 1935-1978". *Ecological Economics* Vol. 24: 289-298.

Zajac, Edward E. 1995. Chapter 11. "Positive Theories II: Perceived Economic Justice in Public Utility Regulation" Political Economy of Fairness. Cambridge, MA: The MIT Press.

Table 1. Perceived farmer costs and farmer resistance of alternative salinity policies.

Policy	Farmer Costs		Farmer Resistance	
	Mean	S.D.	Mean	S.D.
Conduct more research on increasing water use by annual plants	3.41	1.72	3.11	2.05
Provide installation cost subsidies to promote drainage of waterlogged land	4.59	2.17	3.35	2.17
Provide subsidies of fencing to protect remnant vegetation	4.31	1.92	3.51	1.93
Have the State plant trees in affected areas	2.68	1.86	4.12	2.44
Conduct more research to improve the economic potential of tree production	3.83	2.11	3.67	2.36
Require protection of remnant vegetation	5.44	2.13	6.48	2.06
Fund research to find productive uses for saline land	3.68	2.10	2.73	1.95
Develop extension programs on saline aquaculture	3.91	2.24	3.72	1.94
Make tree planting tax deductible for farmers	3.49	2.33	2.26	1.86
Expand extension activities on tree production	3.59	1.91	3.72	1.91
Require 30% tree cover in affected areas	7.61	1.51	7.99	1.70
Conduct more research to develop viable perennial pasture species and shrubs	3.59	1.89	3.07	1.83
Provide a subsidy, to be used within the community, if shirewide salinity targets are reached	4.32	2.38	4.14	2.42
Provide a subsidy for tree planting by farmers	3.47	1.80	2.83	1.72
Prohibit subsurface drainage due to the offsite effects of this practice	4.03	2.30	6.59	2.26
Increase powers of community based efforts to require specific land management practices	5.03	2.03	7.00	1.88
Continue development of catchment management plans and provide support for catchment groups	3.77	1.61	3.05	1.58

Table 2. Perceived administrative costs and effectiveness of salinity policies.

Policy	Administrative Costs		Effectiveness	
	Mean	S.D.	Mean	S.D.
Conduct more research on increasing water use by annual plants	5.09	1.93	3.76	2.34
Provide installation cost subsidies to promote drainage of waterlogged land	6.48	1.68	3.89	2.16
Provide subsidies of fencing to protect remnant vegetation	5.19	1.75	4.71	2.24
Have the State plant trees in affected areas	7.04	1.86	5.23	2.28
Conduct more research to improve the economic potential of tree production	5.69	1.82	5.63	2.12
Require protection of remnant vegetation	5.67	2.15	4.55	2.23
Fund research to find productive uses for saline land	5.33	2.06	4.81	2.41
Develop extension programs on saline aquaculture	5.05	1.86	3.65	2.31
Make tree planting tax deductible for farmers	4.33	2.31	5.53	2.37
Expand extension activities on tree production	5.12	1.88	4.64	1.96
Require 30% tree cover in affected areas	6.85	2.23	5.85	2.64
Conduct more research to develop viable perennial pasture species and shrubs	5.37	1.78	6.44	1.83
Provide a subsidy, to be used within the community, if shirewide salinity targets are reached	6.24	1.80	4.77	2.12
Provide a subsidy for tree planting by farmers	5.71	1.83	5.44	2.22
Prohibit subsurface drainage due to the offsite effects of this practice	5.28	2.53	3.68	2.29
Increase powers of community based efforts to require specific land management practices	5.42	2.15	4.56	2.09
Continue development of catchment management plans and provide support for catchment groups	5.28	1.79	5.75	2.33

Table 3. Policy preference and perceived fairness of salinity policies.

Policy	Fairness		Preference	
	Mean	S.D.	Mean	S.D.
Conduct more research on increasing water use by annual plants	5.72	2.32	4.31	2.72
Provide installation cost subsidies to promote drainage of waterlogged land	3.93	2.12	3.51	2.44
Provide subsidies of fencing to protect remnant vegetation	6.41	1.71	6.03	2.03
Have the State plant trees in affected areas	4.67	2.31	4.32	2.38
Conduct more research to improve the economic potential of tree production	6.48	1.77	6.28	2.09
Require protection of remnant vegetation	5.37	2.21	6.16	2.19
Fund research to find productive uses for saline land	6.15	1.96	5.95	2.30
Develop extension programs on saline aquaculture	5.17	1.94	4.19	2.19
Make tree planting tax deductible for farmers	6.44	2.31	6.37	2.12
Expand extension activities on tree production	5.99	2.08	5.84	2.02
Require 30% tree cover in affected areas	3.91	2.43	4.49	2.84
Conduct more research to develop viable perennial pasture species and shrubs	6.96	1.76	7.08	1.92
Provide a subsidy, to be used within the community, if shirewide salinity targets are reached	5.04	2.32	4.59	2.28
Provide a subsidy for tree planting by farmers	5.73	2.24	5.80	2.17
Prohibit subsurface drainage due to the offsite effects of this practice	4.83	2.68	5.00	2.84
Increase powers of community based efforts to require specific land management practices	4.62	2.22	4.40	2.38
Continue development of catchment management plans and provide support for catchment groups	7.05	1.73	6.91	2.01

Table 4. Univariate Descriptive Statistics and Variance-Component Percentages, by Attribute

				Variance-component %		
Attribute	*Mean*	*S.D.*	*Median*	Respondent	Policy	Error
Farmer cost	4.16	2.27	4.04	23.2	22.5	54.2
Effectiveness	4.88	2.37	5.00	28.9	11.4	59.7
Fairness	5.56	2.33	6.01	16.0	16.4	67.6
Farmer resistance	4.20	2.60	3.57	9.8	41.3	48.9
Administrative cost	5.60	2.08	5.97	28.1	10.3	61.6
Preference	5.37	2.52	5.39	20.8	17.2	62.0

Note. Variance components were estimated by treating both respondents and policies as random and using the VARCOMP procedure of SAS 8.2 with the MIVQUE(0) method.

Table 5. Zero-Order Correlations Between Attributes, with Respondent and Policy Effects Removed

	Attribute					
Attribute	FC	E	F	FR	AC	P
Farmer cost	100	0	-8	33	15	-6
Effectiveness	0	100	33	-3	-2	49
Fairness	-8	33	100	-14	-13	64
Farmer resistance	33	-3	-14	100	12	-10
Administrative cost	15	-2	-13	12	100	-14
Preference	-6	49	64	-10	-14	100

Note. Tabled value is 100 × correlation.

Table 6. Standardized Path Coefficients for Three Models

	→FR			→AC			→P				
Model	FC	E	F	FC	F	FR	FC	E	F	FR	AC
Initial	32	0	-11	—	—	12	-1	31	53	-0	-7
Simpler	32	—	-11	—	—	12	—	31	53	—	-7
Final	32	—	-11	11	-11	7	—	31	53	—	-7

Note. Tabled value is 100 × standardized path coefficient. Attributes: FC = farmer cost, E = effectiveness, F = fairness, FR = farmer resistance, AC = administrative cost, P = preference. For all models $r_{E,FC} = .00$, $r_{F,FC} = -.08$, $r_{F,E} = .33$. Underlining indicates a significant difference from zero, $p < 0.05$; effective sample size was computed as $N = 1275 - 75 - 17 = 1183$.

Table 7. Path Analysis Summary of Fit for Three Models

	Chi-square			RMSEA 90% CI				
Model	X^2	df	*p*	Lower	Point	Upper	CFI	McCI
Initial	30.65	3	<.0001	.062	.088	.118	.976	.988
Simpler	30.99	6	<.0001	.040	.059	.081	.978	.990
Final	1.07	4	.899	—	.000	.018	1.000	1.001

Note. RMSEA = root mean squared error of approximation, CFI = comparative fit index, McCI = McDonald's centrality index.

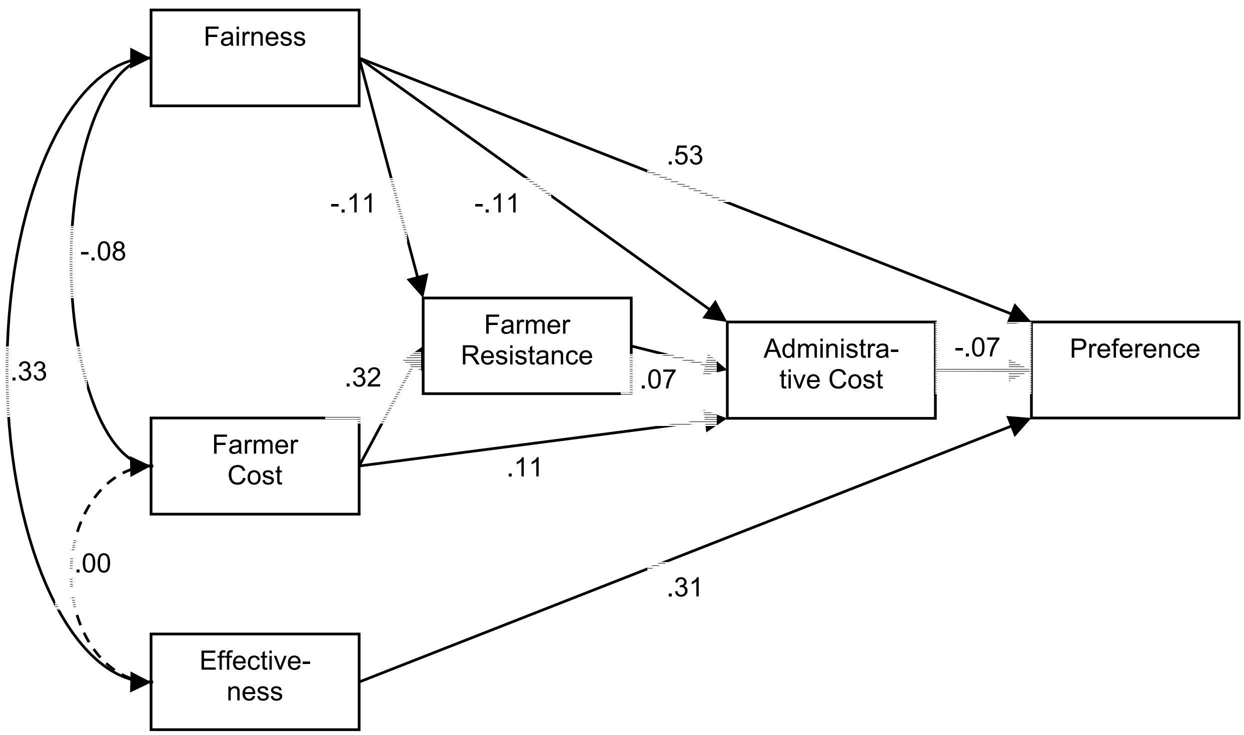

Figure 1. Final path model with standardized coefficients. Solid paths differed statistically significantly from zero, $p < .05$, whereas dashed lines did not.