

C I N T R A F O R

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A Meta Analysis of Willingness to Pay Studies

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Executive Summary

This study is a meta-analysis of contingent valuation studies of rare and endangered species. The study seeks to measure non-market benefits in order to inform the limits and allowances of environmental policies. It follows a similar analysis performed by Loomis and White (1996) and employs methods developed in Layton and Lee (2006) and Buckland et al. (1997). We estimated 38 different reasonably likely models using linear and loglinear specifications. The models were then weighted according to their relative statistical fits using two criteria: the small sample size corrected Akaike's Information Criterion (AICc) developed by Hurvich and Tsai (1989, 1995), and the Bayes Information Criterion (BIC). The models reflect how well they explain the variation in willingness to pay both WTP and model economy. Use of the model-averaging approach reflects the considerable uncertainty regarding which specific model to choose. The model-averaging approach effectively broadens and makes explicit the implicit model testing process that researchers commonly pursue when determining their final models for reporting. Monte Carlo simulations were used to simulate the confidence interval for the model-averaged expected willingness to pay (EWTP).

Overall, the two criteria using the linear specification allocate weight quite similarly. Both criteria place the majority of the weight on one model. All models selected by either criterion include a variable indicating whether the survey was administered in person, by mail or by phone. With the loglinear models, the AICc and BIC criteria again allocate model weight similarly, and both allocate the most weight to a single, but different model than under the linear specification. As was the case in the linear WTP models, the loglinear models selected by the AICc are essentially a subset of the models selected by the BIC. The R-squared results for the loglinear models are higher than those of their linear counterparts. Both specifications suggest a change in the values for WTP over time. Both specifications exhibit a positive and large coefficient for phone surveys. Both specifications resulted in a significant indicator of using taxes as a payment vehicle rather than a donation or membership.

The overall results of the models revealed a consistently significant positive effect on WTP for the linear model that conducted the survey by phone, used taxes as a payment vehicle, and included protection of multiple species. Conducting the survey by phone, focusing on charismatic megafauna, maintaining current land protections, using taxes as a payment vehicle, asking for a one time payment and protecting multiple species generally had a significant positive effect on WTP for the loglinear models. The most prominent difference between model classes is that the loglinear models consistently returned the fish species indicator as negatively significant and the megafauna indicator as positively significant, whereas none of the linear models found these variables to be significant.

Three scenarios were created in order to simulate a distribution of observations from which we can obtain an estimate and confidence interval for WTP. The 3 scenarios analyzed were: an increasing the population of Chinook salmon, preventing the extinction of Orca whales and preserving old-growth forest for the Northern Spotted owl. There was considerable variability in the estimates of WTP both within scenarios and between them for the linear models. The loglinear models also displayed considerable variability in the estimates of WTP both within and between scenarios. The AICc weighted confidence interval was tighter than that of the BIC in five of the six scenarios across the two model classes.

A comparison of WTP estimates with original study estimates revealed that the salmon estimate of the loglinear AICc was higher, the marine mammal estimate was very similar, and the spotted owl estimate was considerably lower than the results of their corresponding valuation studies. Overall the meta-analysis model results confirmed earlier findings that endangered species CV studies can provide estimates that are sensitive to frequency of

payments and insensitive to WTP question format, and that respondents' value protection of multiple species more than that of a single species.

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