Non-use Values of Marine Protected Areas in the South–West Marine Region

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Gillespie Economics
Introduction

- Govt commitment to expansion of MPA
- Very little economics of MPAs
- Robust policy analysis requires BCA
- New proposal in the SWMR – with preliminary BCA
- Primary NMV study of establishing MPAs in SWMR – demonstration of method
South-West Marine Region

Values
- Lots of species – many significant and protected under conservation laws
- Breeding or feeding ground for threatened marine mammals – sea lions, whales
- Number of identified ecological features
- 5 historic shipwrecks

Uses
- Fishing, tourism, shipping, oil and gas, defence, aquaculture

• Impacts
- Reduction in fish stocks, loss of habitat, capture entanglement of mammals, collisions
- Main threat is fishing

• Establishment new MPAs is proposed
## Economics of MPAs

- Potential cost and benefits

<table>
<thead>
<tr>
<th>Costs</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 Foregone producers’ surplus to any commercial activity that is restricted e.g. commercial fishing, charter boats, dive boats, etc.</td>
<td>B1 Additional producers’ surplus to any commercial use that gains from enhanced Marine Protection e.g. spillover benefits to commercial fishers outside no take zones, or benefits to non-consumptive commercial uses within no-take zones e.g. diving charters</td>
</tr>
<tr>
<td>C2 Foregone consumers’ surplus to any non commercial activity that is restricted e.g. recreational fishing.</td>
<td>B2 Any additional consumers’ surplus to any non commercial activity that may gain from MPAs.</td>
</tr>
<tr>
<td>C3 Any additional planning, compliance and monitoring costs.</td>
<td>B3 Any additional consumers’ surplus to non-users.</td>
</tr>
</tbody>
</table>

- Indicative BCA shows displacement costs in the $10Ms with non-use values in $100Ms
Non-market Valuation

- CV and CM – proposal was to do a CM

- Literature on benefits of MPA identifies
  - Increased fish no.s and size in MPA
  - Improvements in habitat in MPA
  - Potential spillovers to adjoining areas

- Benefit depends on previous intensity of fishing

- Fishing already managed – MPAs provide “second line of defence” if fisheries management fails
Non-market Valuation, cont

- Potentially relevant CM attributes from bioregion profile and other CM studies
  - Marine area in good health (km²)
  - Ecological features protected (no.)
  - Size of the threatened mammal population

- No biophysical information on existing or future levels of these attributes

- Study collapsed to a CV – WTP for establishment of MPA over a representative area to protect biodiversity
CV Study Design

- Questionnaire
  - Used DC, rotating 7 bid levels – $20 to $400 – with OE follow-up
  - DC included five alternatives to explain the no vote
  - 3 splits – 10%, 20% and 30% MPAs
  - Follow-up problem detection questions
  - Attitudinal and socio-economic data

- 2 focus groups

- Sample was Australians aged 18+ – PureProfile
Results – DC Bid Curves

![Graph showing the relationship between bid and % Yes for 10%, 20%, and 30% protection levels. The graph indicates a decrease in % Yes as the bid increases. Different colors represent different protection levels.]
## Results – RUM Model with Linear Utility Function

<table>
<thead>
<tr>
<th>Variables</th>
<th>10% MP Protection</th>
<th>20% MP Protection</th>
<th>30% MP Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid</td>
<td>-0.004*</td>
<td>-0.005*</td>
<td>-0.004*</td>
</tr>
<tr>
<td>Locat2</td>
<td></td>
<td>0.481**</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>-0.333***</td>
<td></td>
<td>-0.511*</td>
</tr>
<tr>
<td>Houseown</td>
<td></td>
<td>0.341***</td>
<td></td>
</tr>
<tr>
<td>Edu2</td>
<td>0.126**</td>
<td>0.184*</td>
<td>0.114**</td>
</tr>
<tr>
<td>Envdev</td>
<td>0.520*</td>
<td>0.626*</td>
<td>0.577*</td>
</tr>
<tr>
<td>Envorg</td>
<td>0.712**</td>
<td></td>
<td>0.943*</td>
</tr>
<tr>
<td>Inter</td>
<td></td>
<td>1.661*</td>
<td>0.744**</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.193**</td>
<td>-3.199*</td>
<td>-2.081*</td>
</tr>
<tr>
<td>N</td>
<td>726</td>
<td>729</td>
<td>718</td>
</tr>
<tr>
<td>LL</td>
<td>-416</td>
<td>-413</td>
<td>-405</td>
</tr>
<tr>
<td>McFaddens Pseudo R-squared</td>
<td>0.074</td>
<td>0.110</td>
<td>0.10</td>
</tr>
</tbody>
</table>
Results Mean WTP

- WTP estimation simple with OE
- Complex with DC
- RUM has logistic or normal distribution from plus to minus infinity
- Unconstrained RUM includes -ve values and so does calculation of the mean or median WTP

Alternatives are:
- Unconstrained model and truncate calculation when estimating WTP e.g. Zero and $\text{Bid}^{\text{max}}$ or income – but truncation of tails impacts WTP estimates
- Log transformation of bid variable truncates RUM model at zero but still requires truncation of upper tail
- Constrained model with upper and lower bounds and calculation of WTP using these bounds
- Non-parametric approach – Turnbull Distribution Free estimator – based on raw data
Figure 2 – Linear Logistic Functional Form for Modelling DC Data
## Results – WTP

Table 7 – Mean WTP Per Household (One-off Payment)

<table>
<thead>
<tr>
<th></th>
<th>10% MPA Protection</th>
<th>20% MPA Protection</th>
<th>30% MPA Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open-ended</strong></td>
<td>$62</td>
<td>$60</td>
<td>$57</td>
</tr>
<tr>
<td></td>
<td>($53 to $70)</td>
<td>($52 to $69)</td>
<td>($48 to $66)</td>
</tr>
<tr>
<td><strong>RUM Linear in bid, truncated mean between zero and max bid</strong></td>
<td>$119</td>
<td>$117</td>
<td>$115</td>
</tr>
<tr>
<td></td>
<td>($87 to $122)</td>
<td>($93 to $128)</td>
<td>($90 to $130)</td>
</tr>
<tr>
<td><strong>Turnbull Estimator</strong></td>
<td>$104</td>
<td>$110</td>
<td>$110</td>
</tr>
<tr>
<td></td>
<td>($87 to $122)</td>
<td>($93 to $128)</td>
<td>($90 to $130)</td>
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Discussion

- Positive and significant WTP

- DC values greater than OE values – common in literature – 1.1 to 5.0

- Anchoring of OE follow-up
  - OLS regression of OE data shows bid level as significant – $0.20 WTP for each $1 bid of DC
  - Mean of OE response increases with the bid amount offered
  - Bid curves
Figure 5 – Mean OE WTP Relative to DC Bid Levels
Figure 6 – DC and OE Bid Curves

Bid Curve - 10% MPA

% Yes

Bid

$0 $100 $200 $300 $400 $500

Figure 6 – DC and OE Bid Curves

Bid Curve - 10% MPA

% Yes

Bid

$0 $100 $200 $300 $400 $500
Discussion, cont

- Scope insensitivity – long running issue in CV

- Kahneman 1986 – scope insensitivity an issue with CV generally – ideological rather than economic values elicited

- But lots of evidence scope sensitivity in CV generally

- But can occur in individual studies
  - Part whole bias
  - Symbolic bias
  - Metric bias
  - Probability of provision bias

- Alternative explanation? Scope insensitivity represents consumer preferences!!!
Figure 4 – Position of MPA Scenarios on Total and Marginal WTP Curves

![Diagram showing Total and Marginal WTP curves. The total WTP curve starts low and rises steeply, then levels off. The marginal WTP curve is below the total WTP curve and decreases as the quantity increases. A vertical dashed line indicates 130,000 km².](image-url)
Conclusion

- Positive WTP
- Consistent with literature on DC vs OE
- Scope insensitivity? – additional splits?
- Need for better biophysical information and predictions – env and economic justification
- Supports findings of Allens
- Some unresolved issues with CV