Testing for Benefit Transfer in Valuation of Ecosystem Services in New Zealand Winegrowing regions

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Objectives of this study

- Estimate average Willingness-to-Pay (WTP) of Marlborough (MARL) and Hawke's Bay (HB) households for reductions in environmental impacts caused by winegrowing practices
- Choice Modeling Method – Random Parameter Logit (RPL) Model
  - MARL Model
  - HB Model
  - HBMARLSE Model
  - MARLHBSE Model
- Benefit Transfer (BT) Tests
  - The Models are Equivalent
  - The Mean WTP are Equivalent
  - Calculate Transfer Errors

Problem Statement

- Adverse environmental impacts from intensification of winegrowing
  - Residues in wine
  - Risk of toxic chemicals reaching groundwater
  - Greenhouse gas emissions
  - Removal of indigenous biodiversity

Winegrowing ES Attributes

1. Residues in wine
   - Current, organic and zero levels
2. Risk of toxic chemicals reaching groundwater
   - High, low and no risk levels
3. Greenhouse gas emissions per ha
   - Current, 30% reduction and zero net levels
4. Native wildlife populations
   - Current, 10% increase and 30% increase
5. Cost to household per year for next 5 years
   - NZ$0, $15, $30, $45, $60, $75, $90

Attributes	Alt. 1	Alt. 2	Alt. 3
Residue in wine	Less residue with organic	Zero residue	No change
Risk of toxic chemicals reaching groundwater	No	Low	High
GHG emissions per hectare per year	Zero net	30% reduction	No change
Native wildlife populations	30% increase	10% increase	No change
Cost ($ per year for the next 5 years)	$45	$15	$0

Data Collection

- D-efficient fractional factorial design, using Street et al. (2005) procedure, created 18 choice sets
  - 6 choice sets with 3 subversion questionnaires
- 2196 respondents selected from NZ electoral roll in MARL and HB regions using a random sampling design
  - Survey questionnaires sent to both regions in April 2008
  - 1098 respondents selected for each region
  - Completed surveys received: 330 (30%) and 218 (20%) from MARL and HB, respectively
  - Total effective response rate 25%

- Choice data
  - analyzed using NLOGIT 4.0

Mean annual WTP per household for the attributes

Attributes	HB	MARL	HBMARLSE	MARLHBSE
RESZERO	7.89	19.79	9.39	23.51
	(-25, 41)	(-60, 99)	(-38, 57)	(-95, 142)
WATLOW	30.32	55.83	30.30	79.48
	(-43, 104)	(-53, 165)	(-43, 103)	(-32, 191)
WATNO	30.38	73.99	28.78	94.29
	(-30, 90)	(-119, 267)	(-41, 98)	(-206, 394)
GHG30	10.21	15.99	12.96	26.02
	(-46, 66)	(-68, 100)	(-45, 71)	(-59, 111)
GHGZERO	6.16	31.51	6.92	46.37
	(-32, 44)	(-64, 127)	(-38, 51)	(-79, 172)
NAT10	-	33.56	-	53.29
		(-50, 117)		(-49, 156)
NAT30	16.80	16.17	15.26	22.77
	(-30, 64)	(-92, 125)	(-43, 74)	(-138, 184)

Note: The mean CS and CIs (95% level) are calculated using the unconditional parameter distribution estimates.

Mean annual CS estimates per household associated with different policy options

Attribute	Current *	Policy 1**	Policy 2 ***	Policy 3	Policy 4
Wine residue	0	Organic	Zero	Organic	Zero
Water quality	0	Low risk	No risk	Low risk	No risk
GHG reduction	0	30%	Zero	30%	0
Native increase	0	10%	30%	0	0
HB CS ($)		43.86 (-49, 137)	119.32 (-65, 303)	42.97 (-50, 136)	73.73 (-68, 215)
MARL CS ($)		101.90 (-70, 274)	278.78 (-223, 781)	69.48 (-77, 216)	189.17 (-217, 595)
HBMARLSE CS ($)		45.56 (-59, 150)	120.19 (-105, 345)	43.79 (-48, 135)	77.92 (-92, 248)
MARLHBSE CS ($)		146.97 (-28, 322)	397.29 (-369, 1164)	97.92 (-46, 242)	248.65 (-399, 896)

Note: * Current levels coded as 0, ** medium levels coded as 1, and *** best level coded as 2.The mean CS and CIs (95% level) are calculated using the unconditional parameter distribution estimates.

Transfer Errors for mean WTP and CS

	Unadjusted Value Transfer (%)		Adjusted Value Transfer (%)	
	HB^s vs $MARL^p$	$HBMARLSE^s$ vs $MARLHBSE^p$	$HBMARLSE^s$ vs $MARL^p$	$MARLHBSE^s$ vs HB^p
Average WTPs	-46.25	-59.94	-43.67	235.60
Average CS 1- 4	-53.33	-65.67	-51.99	208.29

Note: *s* and *p* identifying study sites and policy sites, respectively. Negative values indicate cases where $WTP^s > WTP^p$ (and vice versa for positive values).

Conclusion

- WTP estimation
  - HB and MARL respondents have greater marginal utilities for improving these ES attributes:
    - Total reduction in wine residue content
    - Reduction in risk of toxic chemicals reaching groundwater
    - Reduction in greenhouse gas emission
    - Increase in natural environmental and native wildlife populations

Conclusion

- BT Analysis
  - Reject the HB and MARL models parameters are equivalent
  - Do not reject the equivalent of mean WTPs for BT
  - Transfer error is smaller (average 50%) if use HB site as study site instead of MARL
  - Adjusted value transfer method performs slightly better than unadjusted value transfer