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Attribute selection and variation in a choice modelling experiment

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Attribute selection – discretionary decision

No set rules about attribute selection

- Attributes should be
 o demand and policy relevant
 - o measurable

>Attribute selection is the fundamental element in a choice experiment

It defines the valuation frame

> Varying the tradeoffs alters the valuation frame

- Often in environmental valuation only ecological attributes are applied
- Some mix environmental /social /economic

 Some have all positive attributes and some mix positive and negative

Attribute selection – no uniformity

No uniform agreement about what or how many attributes to apply even in the valuation of commonly valued goods such as water quality

Study A

- bathing water quality
- coastal cod stock
- biodiversity

Study B

- water clarity
- abundance of coarse (non-attractive) fish
- status of bladder wrack (seaweed)
- blue-green algae blooms

Reef – Qld

Reef – WA

Fish

Coral

•

- Coral
- Fish
- Seagrass Turtles
 - Whale sharks

Attribute selection – can affect results

The effects of altering the information provided in SP surveys has attracted a great deal of attention

- Many studies have shown that the valuation context as well as design dimensions can affect survey responses
 - eg. changing # of attributes / the levels and range of attributes / the description of attributes /non-attendance

> There has been less attention paid to attribute selection and changing the combination of attributes in a choice profile

- Attribute causality (Blamey et al 2002)
 - WTP for policy package not affected. WTP for causal attribute offsets reduced WTP for effect attribute
- Attribute combinations (Zhao et al 2013)
 - no impact on welfare estimates
- Attribute packaging (Hensher et al 2006; Caussade et al 2005)
 - increasing # attributes increases error variance and WTP

Attribute selection – relevancy Vs load

➢ Typically consideration of what and how many attributes is a tradeoff between increasing the valuation scope without increasing complexity and cognitive burden.

More attributes does not necessarily increase complexity

Information relevancy is more important than information load

Case study: Mining development in Surat Basin

Surat Basin - rapid expansion mining development mainly coal seam gas

Significant impacts - by 2031:

 \odot 10 fold increase in production of coal and coal seam gas

- gross regional product will double
- o 12,500 new jobs
- 44% increase in population growth

Choice experiment to value the impacts

- o sample of (distant) Brisbane resident
 - primarily non-use values

Surat Basin: distant survey sample



Surat Basin

- Traditionally supported by agriculture
- Sparsely populated (declining towards the west)
- o employment opportunities in the smaller towns declining

Case study: attribute selection

Local residents concerned about adverse impacts (economic benefits well recognised)

- \odot loss of affordable housing
- o lack of skilled local labour
- o potential increase in social dysfunction
- risk that the currently diverse economic base could be undermined if mining became the dominant economic activity

Focus groups in Brisbane to identify attributes relevant to them and for which WTP to improve

- Some issues important but not WTP
 - eg social dysfunction large workcamps for FIFO employees

Some important but too difficult to measure as too many confounding issues

- eg changing culture of small rural towns (away from ag)
- loss of prime agricultural land / food security

Case study: attribute selection

Four impact attributes identified – primarily non-use values Two attributes easily identified o economic benefits more local jobs • adverse impact on housing (non mining sector) rising prices and shortages One impact of concern but hard to define and measure o environmental impacts mainly water supply and water quality issues outcome uncertainty - lack of scientific knowledge One impact of concern but mixed opinions if cost or benefit labour affordability/shortage for local business (non mining) higher wage rates and more employment opportunities \succ Cost : justification – multiplier effect (more benefits in Brisbane)

Choice set: full attribute design

Mining development in the Surat Basin						
	More jobs	Local housing	Local business (non mining)	Environmental health	Cost	Your choice
	*	-	"WITTER			
	Jobs created locally in the mining industry	Higher prices/rents (Housing shortage)	Rising wages (Labour shortage)	More independent monitoring activity and inspections	How much you pay each year for 5 years (2012-2016)	Select one option only
	Current situation now (2011)					
	1400 local jobs in the mining sector	Current house prices in the non mining sector	Current wage rates in the non mining sector	Inspections at 10% of coal seam gas mining sites	\$0	
	Situation in 5 years time (2016)					
CURRENT POLICY Option A	157% increase 2200 extra local jobs in mining	50% increase	30% increase	10% of sites inspected	\$0	
OTHER POLICY OPTIONS Option B	157% increase 2200 extra local jobs in mining	50% increase	20% increase	10% of sites inspected	\$20	
OTHER POLICY OPTIONS Option C	71% increase 1000 extra local jobs in mining	35% increase	20% increase	20% of sites inspected	\$200	

Split sample experiment

Survey1: JHWE

- COST
- JOBS
- HOUSING
- BUSINESSS WAGE
- ENV MONITORING

Survey 2: JHW

- COST
- JOBS
- HOUSING
- o WAGE

Survey 3: JHE

- COST
- JOBS
- HOUSING

o ENV

➤The three comparisons

1. Status quo selection

	Survey 1:	Survey 2:	Survey 3:	
	JHVVE	JHVV	JHE	
	n=178	n=168	n=176	
Proportion of status quo	34.6%	<u>/8 3%*</u>	31 5%	
responses (n*6 choice sets)	34.070	40.370	51.570	
Proportion of serial (all)	17 /1%	25%*	17 5%	
status quo responses	17.470	23/0	12.370	

* Significant difference between Survey 2 and Survey 1 and 3 No significant different between Surveys 1 and 3.

not more protest / complexity in 4 attribute version
 Payment options most attractive when ENV attribute included - more so in Survey 3 without WAGE

2. Mixed logit models

	Survey 1	Survey 2	Survey 3
Random parameter means			
$COST \qquad 1 \longrightarrow$	-0.011 ***	-0.021 ***	-0.021 ***
JOBS 2>	0.026 *	0.040 *	0.058 ***
HOUSING	-0.036 ***	-0.064 ***	-0.027 ***
BUSINESS WAGE	• 0.024 ***	0.041 ***	
ENV MONITORING $\xrightarrow{4}$	0.074 ***		0.071 ***

Random parameter standard deviations: All significant at the 5% level

Non random parameters included in the status quo option

ASC	1.095	0.934	0.850
AGE	-0.027	-0.035	-0.054 **
GENDER	0.973	1.211 *	· 1.175 *
EDUCTION	-0.648	0.529	-0.276
INCOME	-6.9E6	-4.1E6	-3.8E6
SigmaE01	3.162 **	** 3.152 *	*** 3.030 ***
Model Statistics			
Sample (n)	178	168	176
Observations	1068	1008	1056
Log Likelihood	-860	-728	-836
AIC	1.640	<u> </u>	1.610
McFadden R sqrd	0.267	0.342	0.279

3. WTP estimates

	JOBS	HOUSING	WAGE	ENVIR
	('00s)	(%)	(%)	(%)
Survey 1	\$2.40	-\$3.40	\$2.27	\$6.93
Survey 2	\$1.90	-\$3.04	\$1.95	
Survey 3	\$2.84	-\$1.29		\$3.46
Statistical difference (Poe statistic)				
1. Survey 1 Vs 2	0.39	0.63	0.38	
2. Survey 1 Vs 3	0.61	0.01**		0.01**
3. Survey 2 Vs 3	0.74	0.02**		

- Introducing a complementary attribute (Env) Survey 1 Vs 2
 o no significant impact on utility
- Introducing an overlapping attribute (Wage) Survey 1 Vs Survey 3

 o did not reduce utility for related attribute (Jobs)
 o increased (doubled)utility for non-related (Env and Housing)
- **3.** Comparing Survey 2 and 3 significant impact on Housing

4. Latent class: 2 class significance



Survey 1 (all 4 atts): neither overlapping attributes significant
 3 attribute surveys perform better than the 4 att version

Summary

- 1. Status quo selection
 - a) Less when an (important complementary) attribute included (Env)
 - i. Respondents more likely to find a suitable improvement option
- 2. ML models
 - a) reduced significance of associated overlapping attribute (Jobs)
 - b) changes in attribute weights not for Env
- 3. WTP
 - a) affected by introduction of an overlapping attribute but not by a complementary attribute
 - i. Introducing Wage : no impact on jobs but doubled value of Housing and Env monitoring
 - b) Survey 2 Vs 3 (3 att versions) affects WTP Housing
- 4. LCMs 2 class models
 - a) Survey 1 100% preferences for Jobs and Wage not significant

Which design is preferred?



Including Env Monitoring reduced status quo selection and had no impact of utilities of other attributes

 Including Business wage increases utilities of non related attributes
 Survey 1: 4 attribute version non significant employment related attributes in a LCM

Survey 3: 3 attribute version preferred option BUTs:

- 1. Maybe more about the type of attribute than the relationship
- 2. Distant sample applied maybe different for a local sample