

Valuing ecosystem resilience

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Ecosystem resilience

- 'The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks—in other words, stay in the same basin of attraction' (Walker et al., 2004)
- → Probability of a system shifting from one state to another
- Reversibility, time, geographic extent
- Marginal changes in ecosystem conditions → non-marginal, discontinuous and irreversible changes in ecosystem functioning and the provision of goods and services
- Impact on economic value of ecosystem in a given state
- Estimating implicit prices for ecosystem resilience directly – discrete choice experiments

1. Do respondents understand the concept of ecosystem resilience?
2. Do respondents hold preferences for ecosystem resilience?
3. Are preferences for ecosystem resilience homogenous across respondents?
4. What is respondents' marginal willingness to pay for ecosystem resilience?
5. Is respondents' marginal willingness to pay for ecosystem resilience homogeneous across respondents?

Discrete choice experiment

Focus groups



Internet surveys

Managing the rainforests in the Border Ranges

A survey of community preferences

20 choice sets (Db-efficient design)
(5 choice sets per respondent)



Sample of population of Brisbane

Pilot: n=40

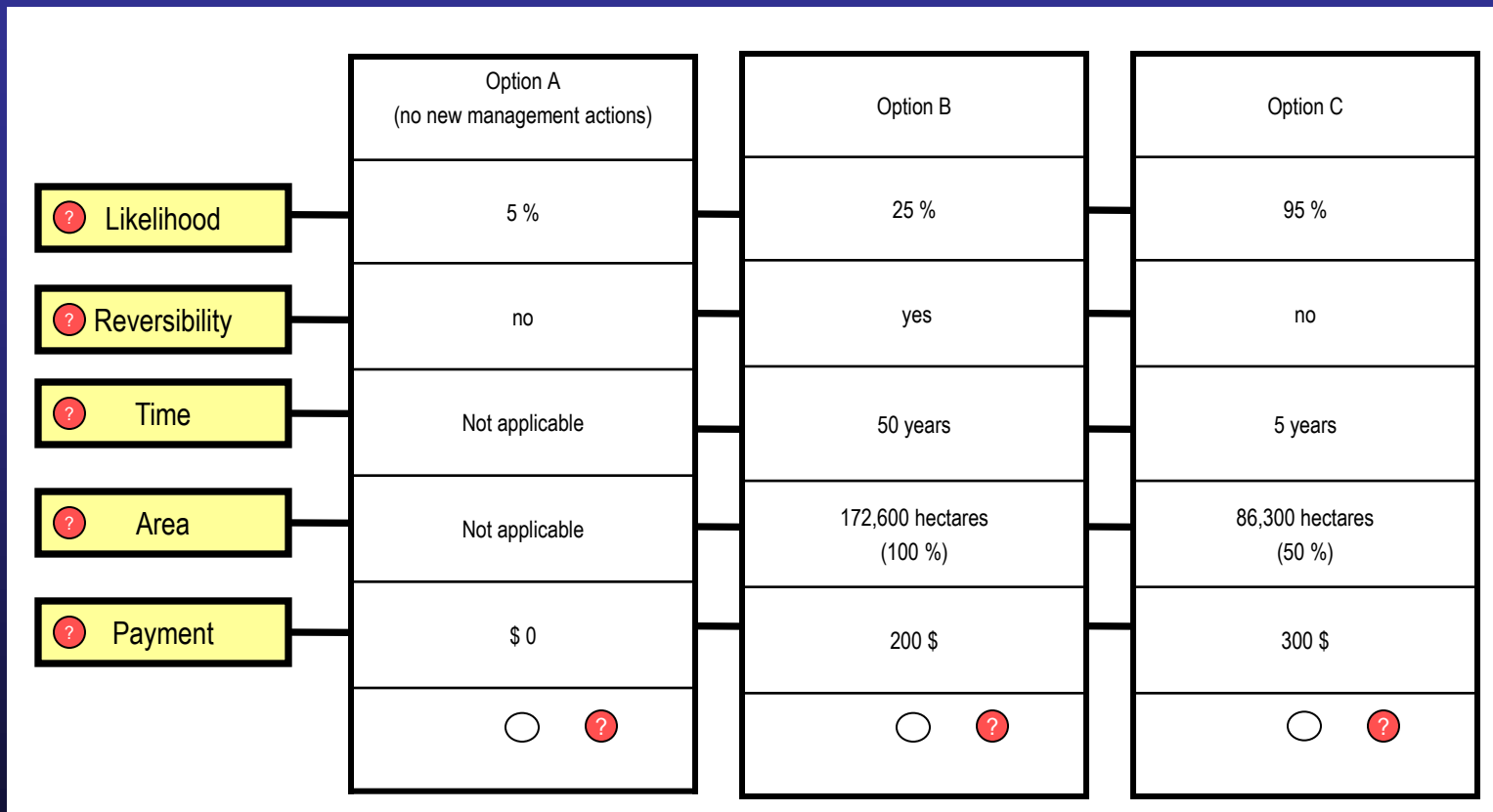
Main: n = 1,941

Border Ranges Rainforests

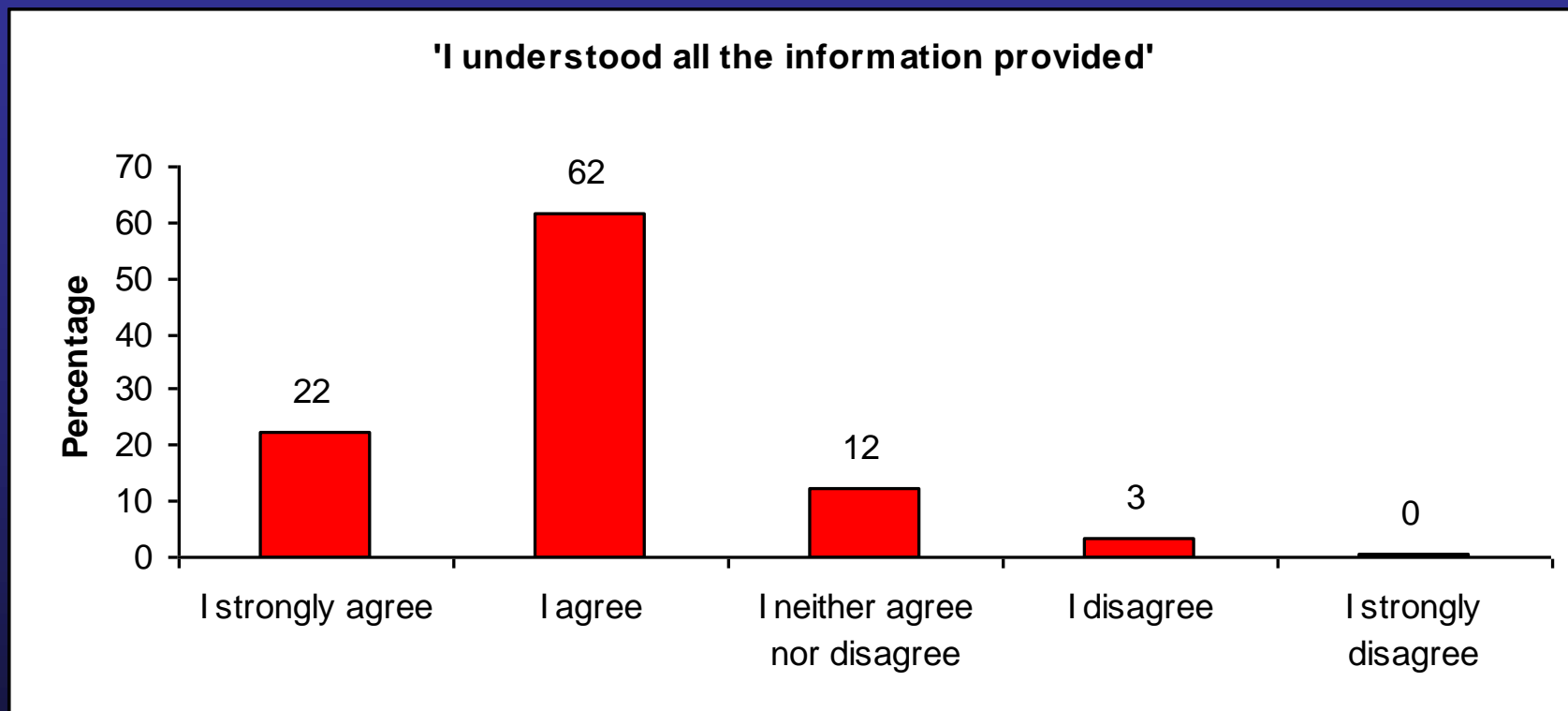


Photo: Michael Dawes (www.flickr.com)

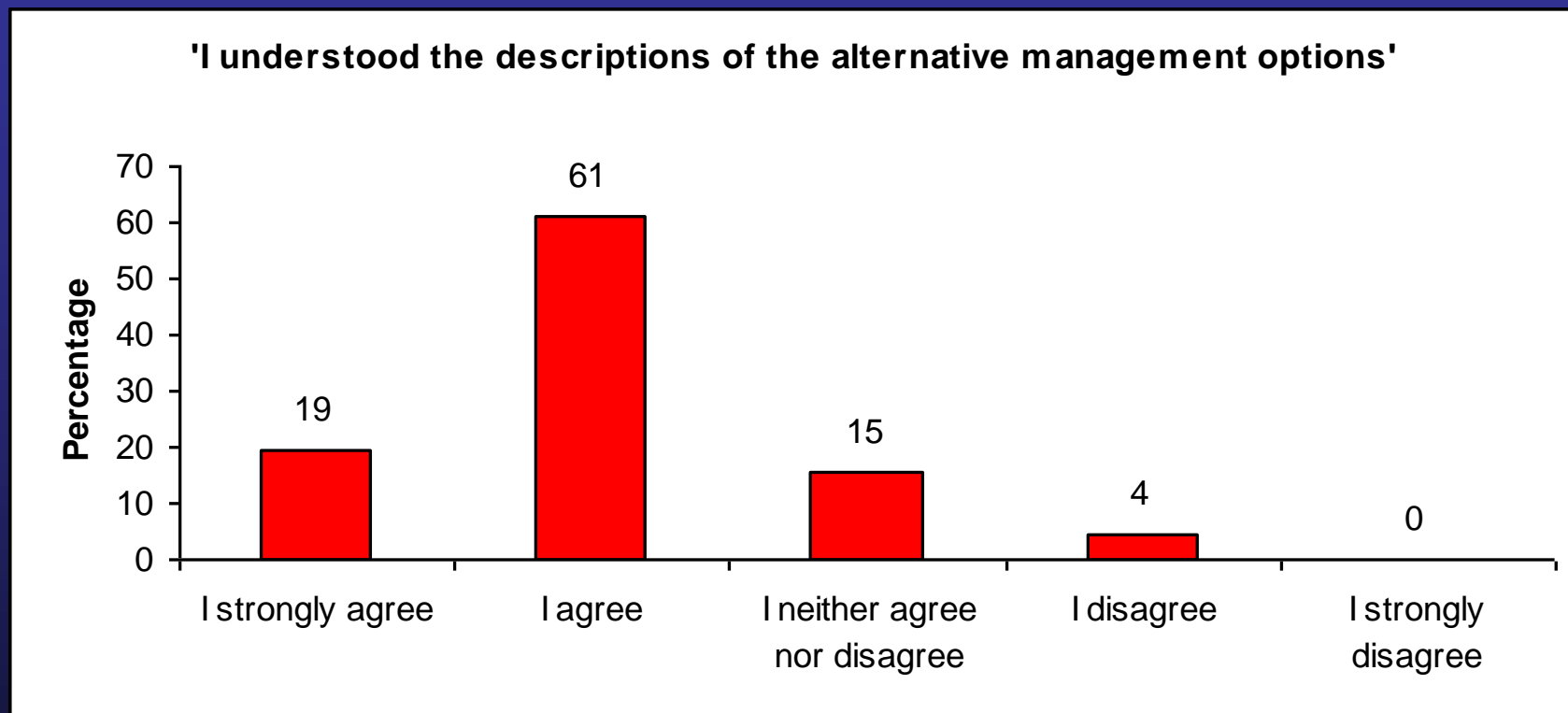
Choice set example



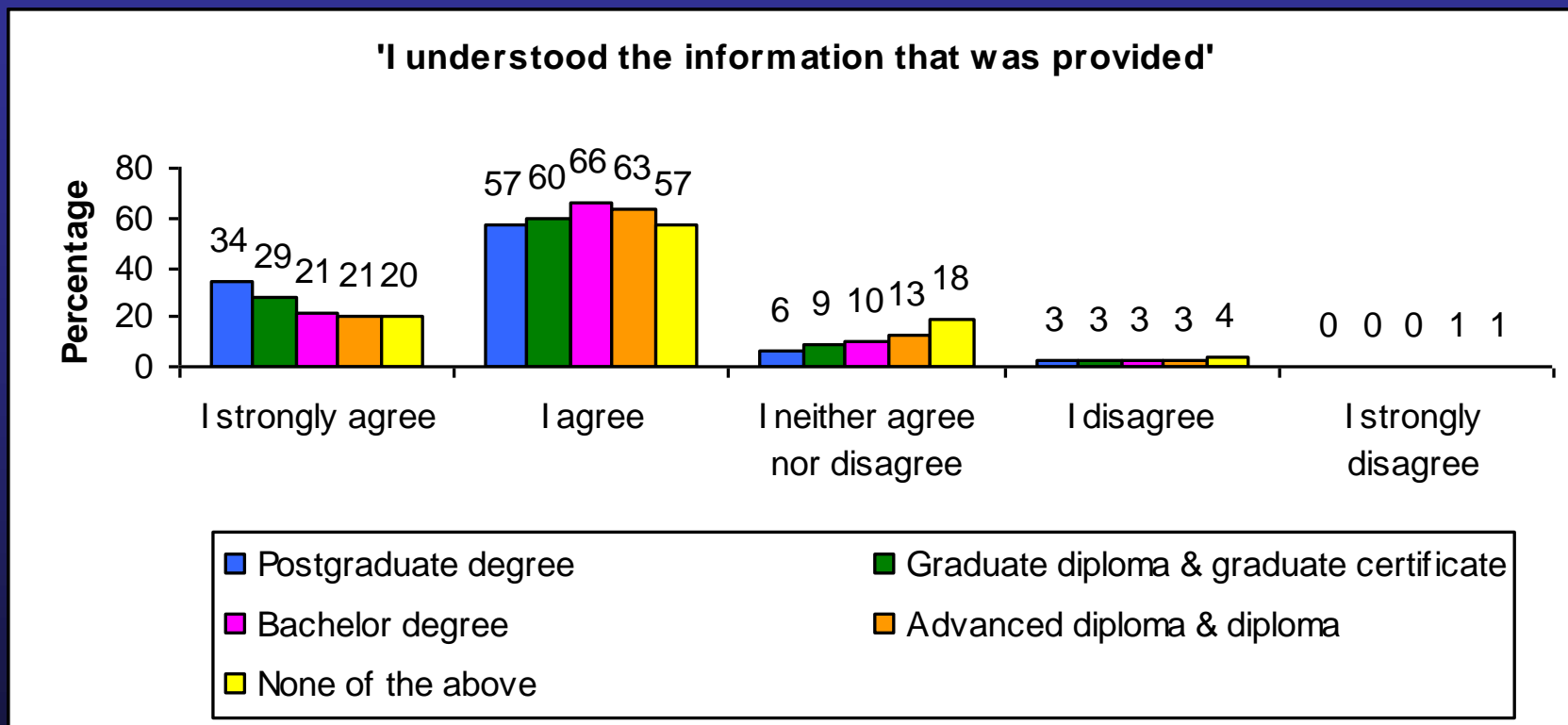
1. Do respondents understand the concept of ecosystem resilience?



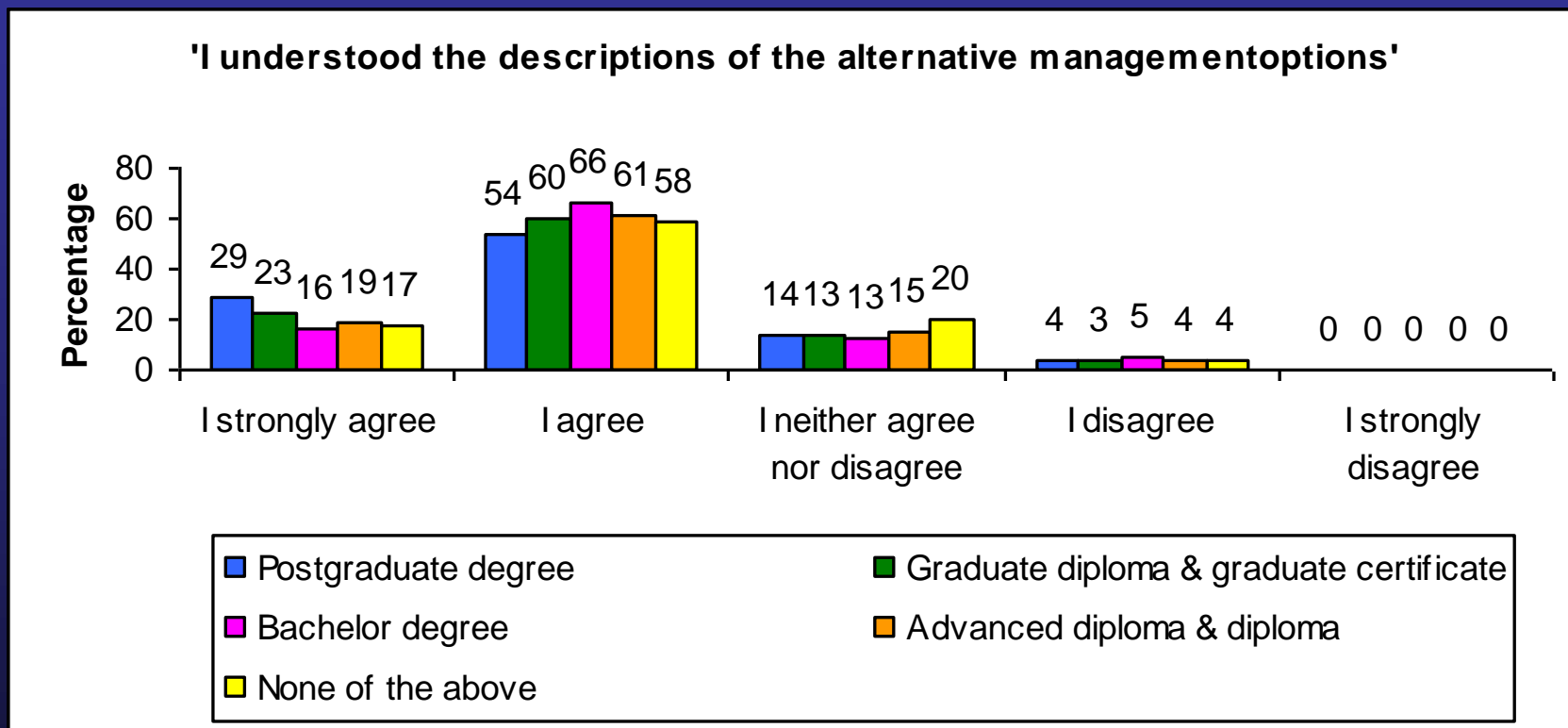
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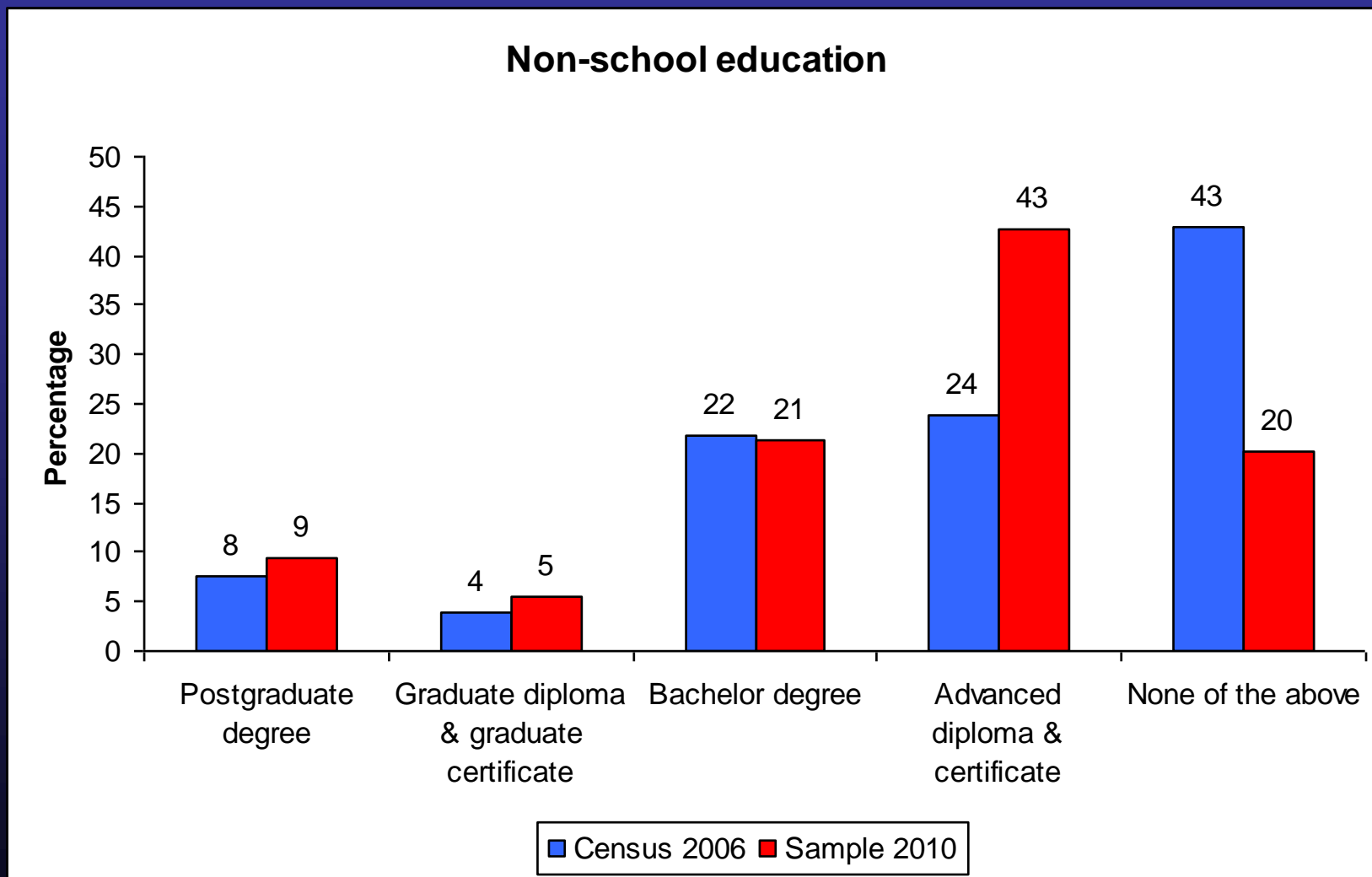
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2. Do respondents hold preferences for ecosystem resilience?

Panel RPL model in preference space

Variable	Coefficient		Standard error
<i>Random parameters</i>			
cost	-0.00930***	(0.0000)	0.00050
likelihood	0.03511***	(0.0000)	0.00193
reversibility	0.44574***	(0.0000)	0.03426
time	0.00956***	(0.0000)	0.00222
area	0.10809D-04***	(0.0285)	0.71362D-06

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

2. Do respondents hold preferences for ecosystem resilience?

Panel RPL model in preference space

Variable	Coefficient		Standard error
<i>Nonrandom parameters</i>			
constant	0.66482	(0.2098)	0.53013
income	0.10278D-04***	(0.0003)	0.28334D-05
age	0.02060**	(0.0399)	0.01002
gender	0.27015**	(0.0285)	0.12335
<i>Model statistics</i>			
N (observations)	9035		
LL _β	-6293.457		
$\chi^2_{,24}$	7265.01	(0.0000)	
McFadden pseudo ρ^2 adj	0.3642		
AIC	1.39844		
BIC	1.39846		

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

2. Are preferences for ecosystem resilience homogenous across respondents?

Panel RPL model in preference space

Variable	Coefficient		Standard error
<i>Diagonal values in Cholesky matrix</i>			
cost	0.01197***	(0.0000)	0.00061
likelihood	0.03497***	(0.0000)	0.00219
reversibility	0.32895***	(0.0000)	0.08853
time	0.03632***	(0.0000)	0.00337
area	0.19300D-05	(0.5724)	0.34189D-05

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

5. What is respondents' marginal willingness to pay for ecosystem resilience?

Panel RPL model in wtp space

Variable	Coefficient		Standard error
<i>Random parameter</i>			
likelihood	4.56***	(0.00)	0.246
reversibility	5.76***	(0.00)	0.393
time	1.90***	(0.00)	0.311
area	1.40***	(0.00)	0.095

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

5. What is respondents' marginal willingness to pay for ecosystem resilience?

Panel RPL model in wtp space

Variable	Coefficient		Standard error
<i>Nonrandom parameter</i>			
constant	16.7**	(0.02)	7.290
income	1.19***	(0.01)	0.428
age	0.23*	(0.09)	0.138
gender	2.30	(0.19)	1.740
<i>Model statistics</i>			
N (observations)	9035		
LL _β	-6591.657		
$\chi^2_{,24}$	6668.626	(0.00)	
McFadden pseudo ρ^2 adj	0.334		
AIC	1.46357		
BIC	1.46790		

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

5. Is marginal willingness to pay for ecosystem resilience homogeneous across respondents?

Panel RPL model in wtp space

Variable	Coefficient		Standard error
<i>Diagonal values in Cholesky matrix</i>			
likelihood	5.57***	(0.00)	0.335
reversibility	-5.98***	(0.00)	1.020
time	0.27	(0.69)	0.685
area	0.35*	(0.06)	0.189

***=significant at 1% level, **=significant at 5% level, *=significant at 10% level; p-values in parentheses

5. What is respondents' marginal willingness to pay for ecosystem resilience?

Attribute	Mean WTP	95% confidence interval
Likelihood	\$4.56/ %	\$4.08 - \$5.04
Reversibility	\$115.20/ yes	\$96.15 - \$134.25
Time	\$1.90/ year	\$1.29 - \$2.51
Area	\$1.40/ 1000 ha	\$1.22 - \$1.58

Compensating surplus (mean): \$862.24

Likelihood	5%	95%
Reversibility	irreversible	reversible
Time	-	50 years
Area	-	100%

Summary:

- Evidence that more than the majority of respondents understood the concept of ecosystem resilience (sample selection?)
- Evidence that respondents hold positive preferences for ecosystem resilience
- Evidence that preferences for ecosystem resilience are heterogeneous across respondents
- Evidence that respondents have a positive marginal willingness to pay for ecosystem resilience
- Evidence that marginal willingness to pay for ecosystem resilience is heterogeneous across respondents

Conclusion:

- Indications that ecosystem resilience is important driver for biodiversity values
- Values for ecosystem resilience useful for prioritizing of the different threats to biodiversity for management and investment purposes (compensating surplus)

Future research:

- Do alternative 'ecosystem states' affect preferences/ marginal willingness to pay for ecosystem resilience?
- Does the ecosystem type influence preferences/ marginal willingness to pay for ecosystem resilience?

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