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What is the Causal Effect of Knowledge on Preferences?

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Introduction

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- Contingent valuation: the information problem which has been identified as “amongst the most important and most problematic sources of error” (Mitchell & Carson, 2013).

Introduction

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- Design a field experiment that:

1. Identifies respondents prior understanding
2. Exogenously varies information
3. Subjects undertake an economic decision
4. Identifies what respondents have learned throughout the survey process

Case Study (1)

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- Valuing managed realignment as an alternative form of flood defence in Scotland.

Case Study (2)

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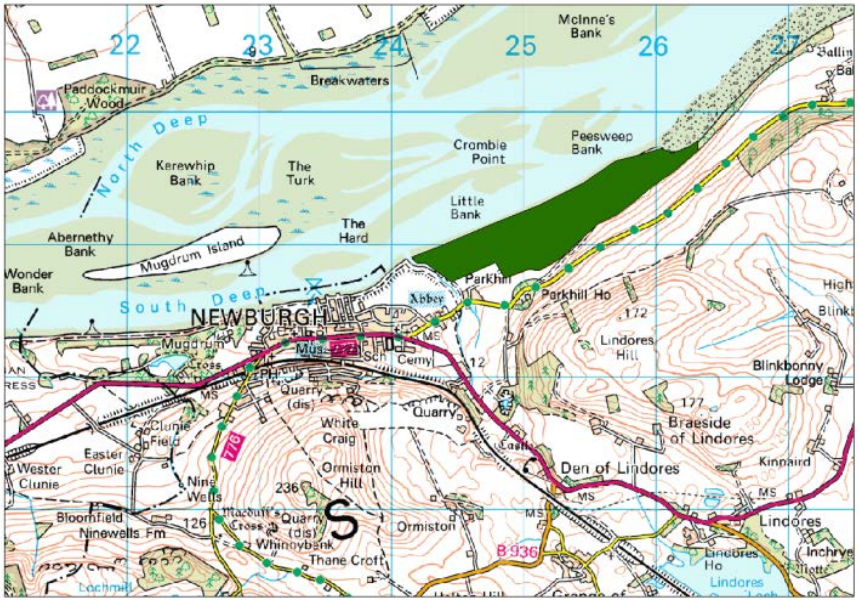

Experimental Design (1)

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1. Introductory text
2. Multiple Choice Quiz 1:

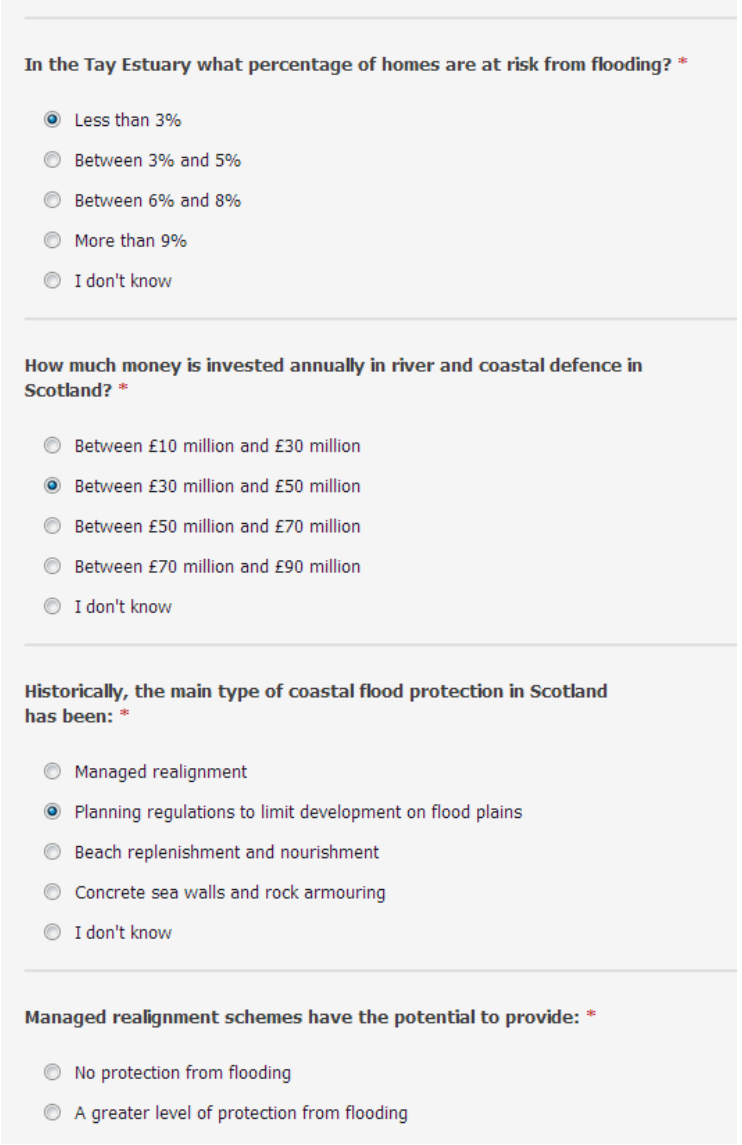
- Need to elicit prior information sets
- Respondents are grouped into a priori types:

  Low (0-3 correct)

  Medium (4-6 correct)

  High (7-9 correct)

  Control group who do no take the first quiz



In the Tay Estuary what percentage of homes are at risk from flooding? *

- (•) Less than 3%
- ( ) Between 3% and 5%
- ( ) Between 6% and 8%
- ( ) More than 9%
- ( ) I don't know

How much money is invested annually in river and coastal defence in Scotland? *

- ( ) Between £10 million and £30 million
- (•) Between £30 million and £50 million
- ( ) Between £50 million and £70 million
- ( ) Between £70 million and £90 million
- ( ) I don't know

Historically, the main type of coastal flood protection in Scotland has been: *

- ( ) Managed realignment
- (•) Planning regulations to limit development on flood plains
- ( ) Beach replenishment and nourishment
- ( ) Concrete sea walls and rock armouring
- ( ) I don't know

Managed realignment schemes have the potential to provide: *

- ( ) No protection from flooding
- ( ) A greater level of protection from flooding

Experimental Design (2)

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3. Respondents are assigned a treatment, the amount of additional information they will receive.

Treatments can be:

- Low (L – 3 pieces of information),
- Medium (M – 6 pieces of information)
- High (H – 9 pieces of information)

Treatment		Prior information		
		L	M	H
	H	LH	MH	HH
	M	LM	MM	--
	L	LL	--	--

Experimental Design (3)

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5. All respondents are presented with the proposed managed realignment scenario.
6. Respondents receive their 3, 6 or 9 pieces of information (control group receive all 9 pieces).
7. Asked WTP using payment card format ranging from £0 to £150.
8. Set of debriefing & socio-demographic questions.
9. Repeat first quiz.

At the end of the survey each respondent is summarised by an initial set of quiz questions (a priori information set), a type treatment pair, their max WTP and a second set of quiz answers (final information set).

Hypotheses

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- Combining the initial quiz, the information treatments and second quiz allows us to test for how subjects learn and what information updating procedure individuals are using in forming their willingness to pay estimates.

$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i \quad (1)$$

$$WTP_i = X_i'\gamma + 1\{LL_i\}\omega_{LL} + 1\{LM_i\}\omega_{LM} + 1\{LH_i\}\omega_{LH} + 1\{MM_i\}\omega_{MM} + 1\{MH_i\}\omega_{MH} + 1\{HH_i\}\omega_{HH} + \varepsilon_i \quad (2)$$

Hypotheses: Score conditional on prior knowledge and treatment

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$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i$$

1) No Learning – H_0: $\Gamma_{LL} = \Gamma_{LM} = \Gamma_{LH} > 0$, $\Gamma_{MM} = \Gamma_{MH} > 0$, $\Gamma_{HH} > 0$

Only a priori information matters.

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Hypotheses: Score conditional on prior knowledge and treatment

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$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i$$

2) Complete learning: H_0: $\Gamma_{LM} = \Gamma_{MM} > 0$, $\Gamma_{LH} = \Gamma_{MH} = \Gamma_{HH} > 0$, $\Gamma_{LL} \neq \Gamma_{LM} \neq \Gamma_{LH}$

In this case, the information treatment fully determines ex post information levels.

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Hypotheses: Score conditional on prior knowledge and treatment

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$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i$$

3) Incomplete learning – H_0: $\Gamma_{LL} < \Gamma_{LM} < \Gamma_{LH}$, $\Gamma_{MM} < \Gamma_{MH}$

In this case, type L individuals can learn but they can't fully learn in the high information treatment.

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Hypotheses: WTP conditional on prior knowledge and treatment

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$$WTP_i = X_i'\gamma + 1\{LL_i\}\omega_{LL} + 1\{LM_i\}\omega_{LM} + 1\{LH_i\}\omega_{LH} + 1\{MM_i\}\omega_{MM} + 1\{MH_i\}\omega_{MH} + 1\{HH_i\}\omega_{HH} + \varepsilon_i \qquad (2)$$

1) Prior knowledge based preferences

H_0: $\Gamma_{LL} = \Gamma_{LM} = \Gamma_{LH} > 0$, $\Gamma_{MM} = \Gamma_{MH} > 0$, $\Gamma_{HH} > 0$

Only a priori information matters.

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Hypotheses: WTP conditional on prior knowledge and treatment

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$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i$$

2) Additional information based preferences –

H_0: $\Gamma_{LM} = \Gamma_{MM} > 0$, $\Gamma_{LH} = \Gamma_{MH} = \Gamma_{HH} > 0$, $\Gamma_{LL} \neq \Gamma_{LM} \neq \Gamma_{LH}$

In this case, the information treatment fully determines WTP.

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Hypotheses: WTP conditional on prior knowledge and treatment

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$$WTP_i = X_i'\gamma + 1\{LL_i\}\omega_{LL} + 1\{LM_i\}\omega_{LM} + 1\{LH_i\}\omega_{LH} + 1\{MM_i\}\omega_{MM} + 1\{MH_i\}\omega_{MH} + 1\{HH_i\}\omega_{HH} + \varepsilon_i \qquad (2)$$

3) No knowledge based preferences

Learning occurs but treatment groups do not statistically influence WTP

H_{info}	Γ_{LH}	Γ_{MH}	Γ_{HH}
M_{info}	Γ_{LM}	Γ_{MM}	--
L_{info}	Γ_{LL}	--	--
	L	M	H

Results – Descriptive Statistics

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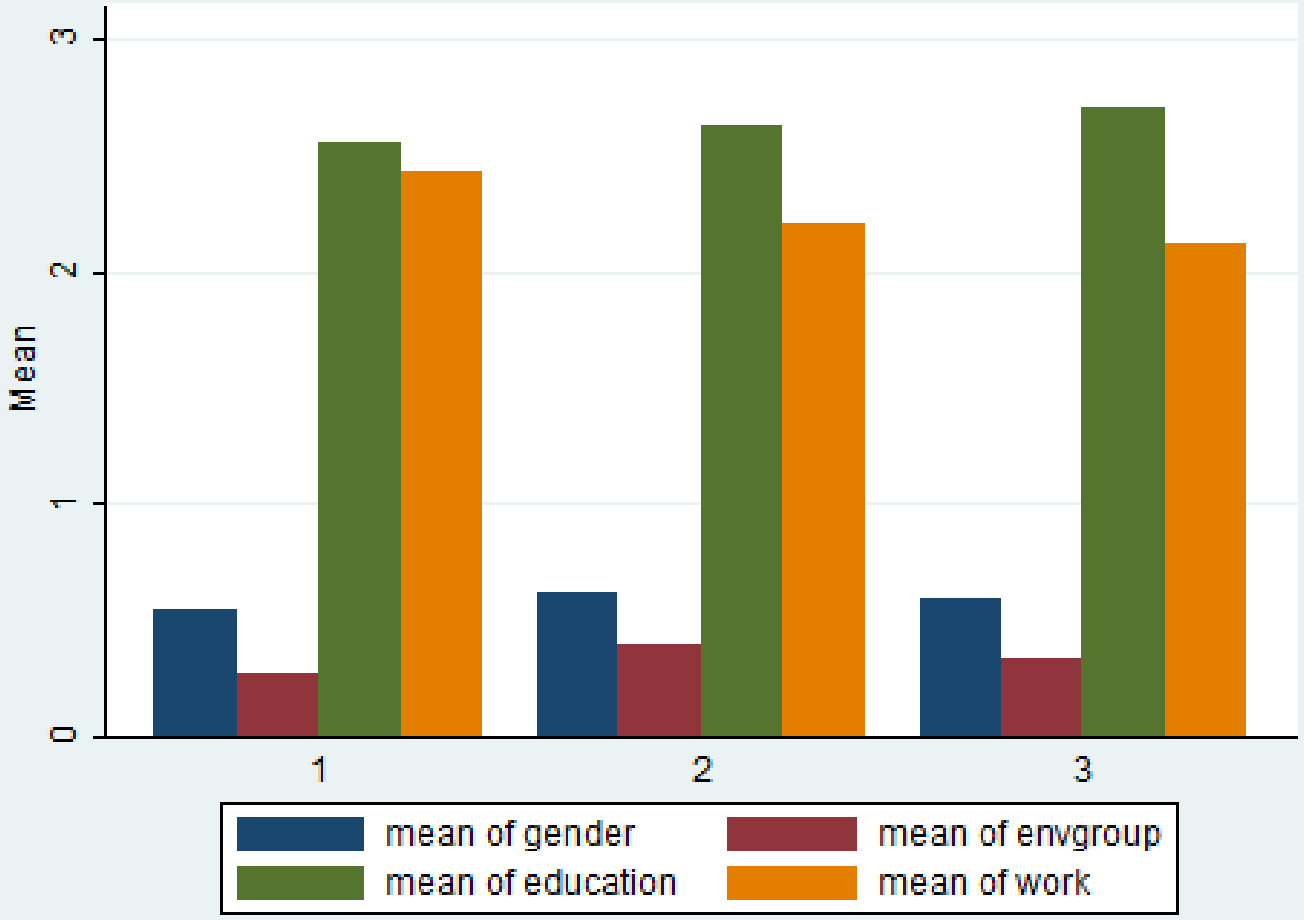

Results – Information & Learning (1)

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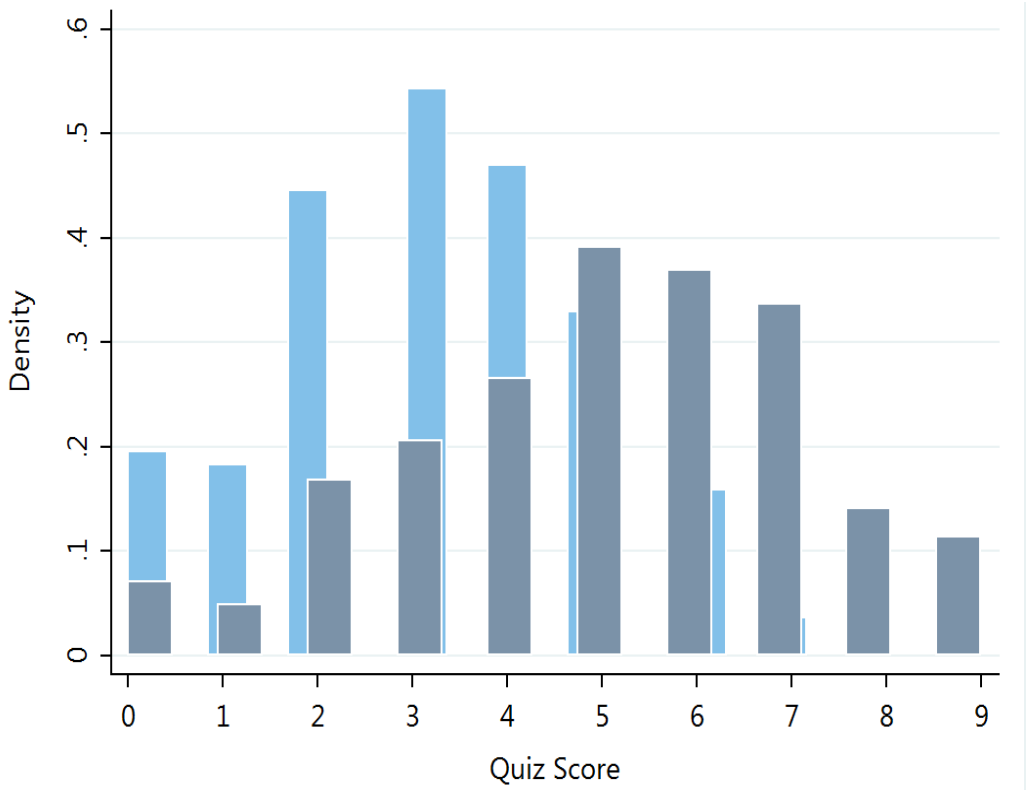
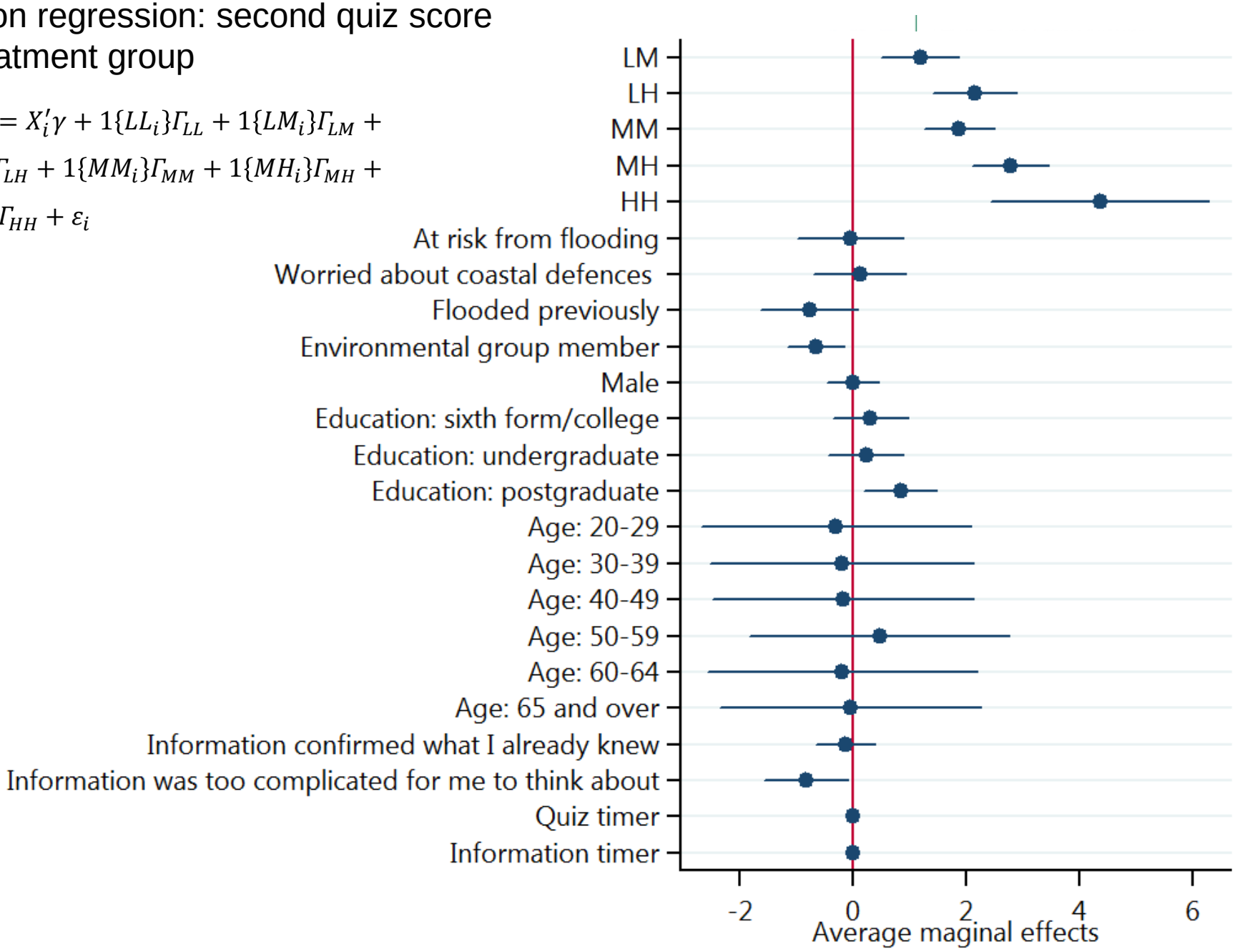


A Priori Type – Treatment Pairs	
LL	151
LM	78
LH	72
MM	97
MH	94
HH	12
Control	89
Note: n = 593 total subjects	

Poisson regression: second quiz score on treatment group

$$Score_i = X_i'\gamma + 1\{LL_i\}\Gamma_{LL} + 1\{LM_i\}\Gamma_{LM} + 1\{LH_i\}\Gamma_{LH} + 1\{MM_i\}\Gamma_{MM} + 1\{MH_i\}\Gamma_{MH} + 1\{HH_i\}\Gamma_{HH} + \varepsilon_i$$



Results – Willingness to Pay (1)

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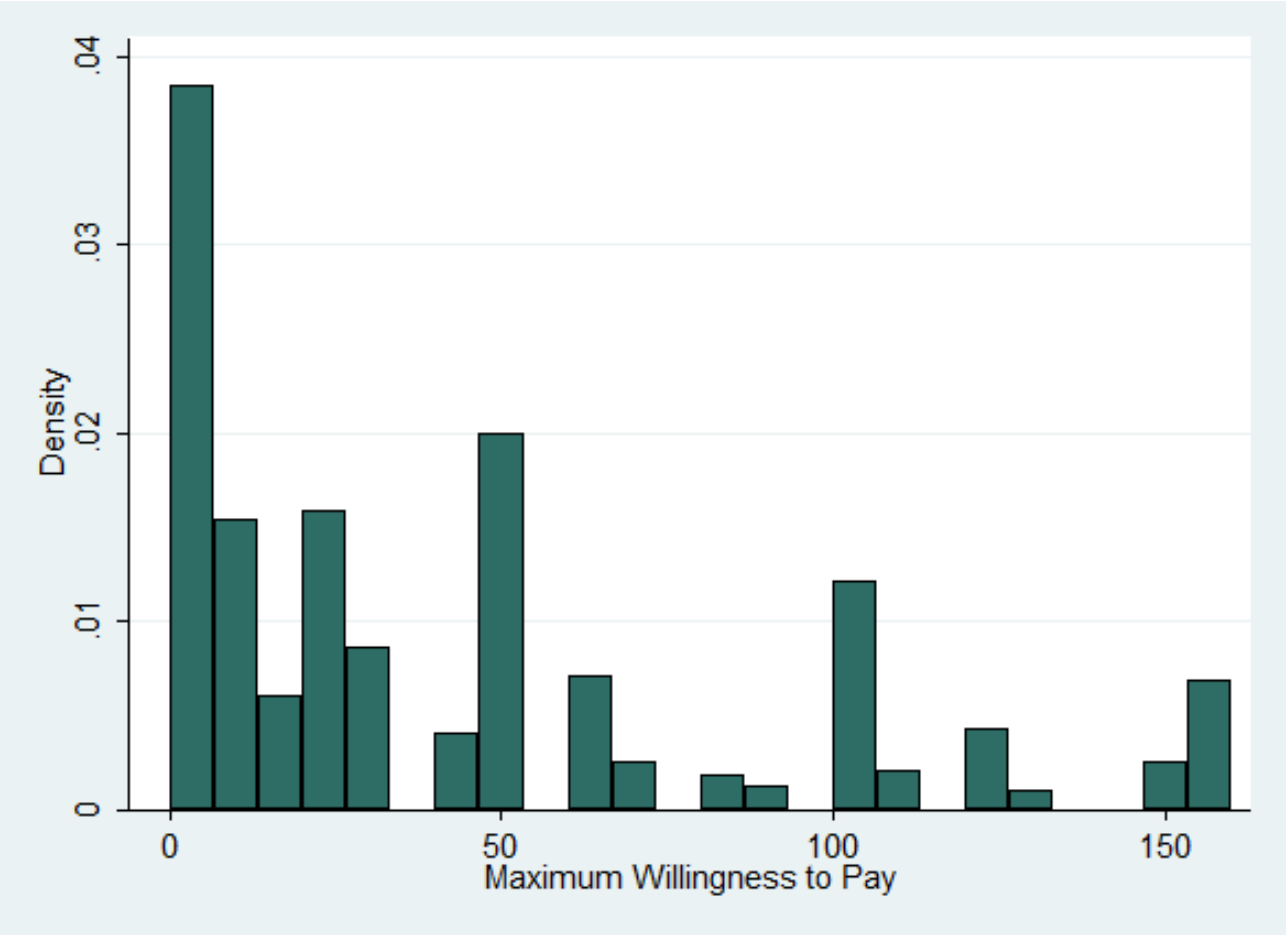

Interval regression: treatment pair on WTP

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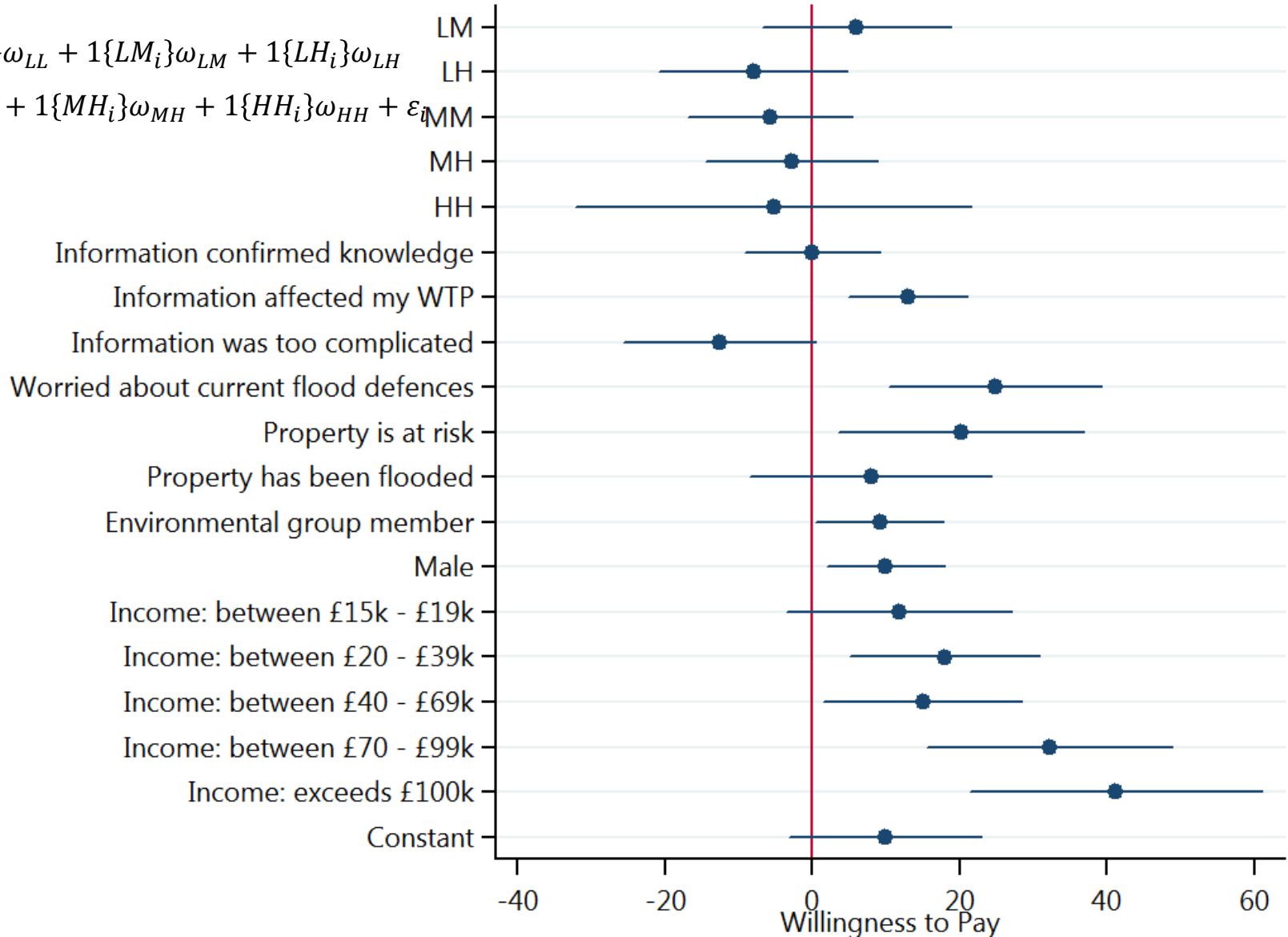
$$WTP_i = X_i'\gamma + 1\{LL_i\}\omega_{LL} + 1\{LM_i\}\omega_{LM} + 1\{LH_i\}\omega_{LH} + 1\{MM_i\}\omega_{MM} + 1\{MH_i\}\omega_{MH} + 1\{HH_i\}\omega_{HH} + \varepsilon_i$$



Conclusions

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- We find that respondents do indeed learn the additional information presented to them in the survey but this learning is incomplete.
- In this survey additional information did not affect WTP.
- Potential that additional information was deemed irrelevant buy the respondents when forming their preferences, only concerned about the scheme cost, location and how many homes protected, less interested in the additional ecosystem service benefits.
- Would this result be consistent for a less familiar good?