

LSE x Kings College London

Advances in Behavioural Research

Can Virtual Reality Enhance Scope Sensitivity? Experimental Evidence from Amazon Rainforest

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What is the problem?



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- Total Economic Value of ecosystem such as Amazon rainforest, at least for individuals residing outside the region, are predominantly non-use values (Navrud & Strand, 2018).
- Stated preference techniques typically uses text and/or images to describe the environmental goods (OECD, 2018). When respondents encounter abstract descriptions of unfamiliar ecosystems, they construct prototypical mental images which can override their ability to distinguish quantities (Kahneman et al., 1999).

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- Scope insensitivity found in 45% of studies focusing on non-use values alone (Burrows et al., 2017).
- This could lead to mismatch in the allocation of conservation funds; true ecological benefits of larger area is much greater than what valuation suggests.

How to solve this problem?



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- Using visual aids (Corso et al., 2001; Alberini et al., 2004), absolute versus relative measures (Ojea & Loureiro, 2001) and labelling of environmental goods (Czajkowski & Hanley, 2009).
- Virtual reality provides direct perceptual experiences that engages spatial cognition and reduce abstraction (Patterson et al., 2017). It is shown to enhance spatial perception and comprehension of scale, volume and depth more effectively (Azarby & Rice, 2022; Sun et al., 2019).
- Creates sense of 'presence', and studies found no significant difference in spatial presence (Wagler & Hanus, 2018), similar psychological and physiological responses (Nukarinen et al., 2022) when comparing VR and being physically present.

This paper



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- First to empirically test whether immersive VR can elicit scope sensitive estimates.
- Testing of whether scope insensitivity is reduced by immersive VR compared to video.

Experiment Design



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- 2 x 2 randomised experiment at LSE Behavioural Lab
- Interventions: VR/ Video and Real/ Hypothetical Donation
- VR treatment: Amazon rainforest, 70% humidity, 32°C, 4 pumps of petrichor scent accord

Results



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- Overall scope elasticity of 0.6, meaning a 10% increase in conservation area leads to 6% increase in donation amount.
- Scope elasticity for video is 0.57, while VR's scope elasticity is 0.59.
- These estimates are not statistically different.
- VR's scope elasticity of real and hypothetical donations were 0.58 and 0.62 respectively

Within-VR Heterogeneity - Presence



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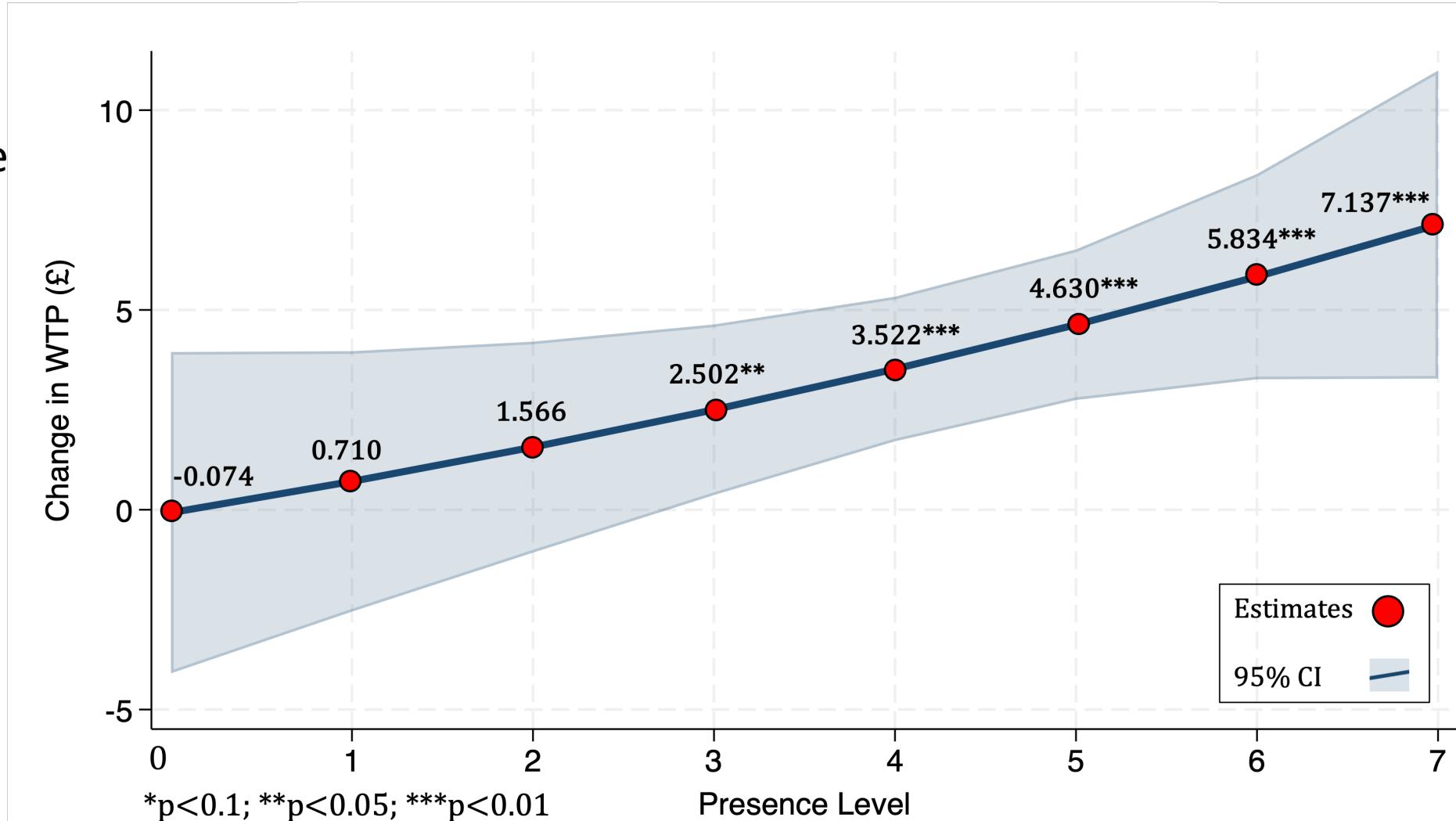
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- Measured via question of “feeling of being there in the rainforest?”
- Scope elasticity increases from 0.1 to 0.7



Within-VR Heterogeneity - Realism



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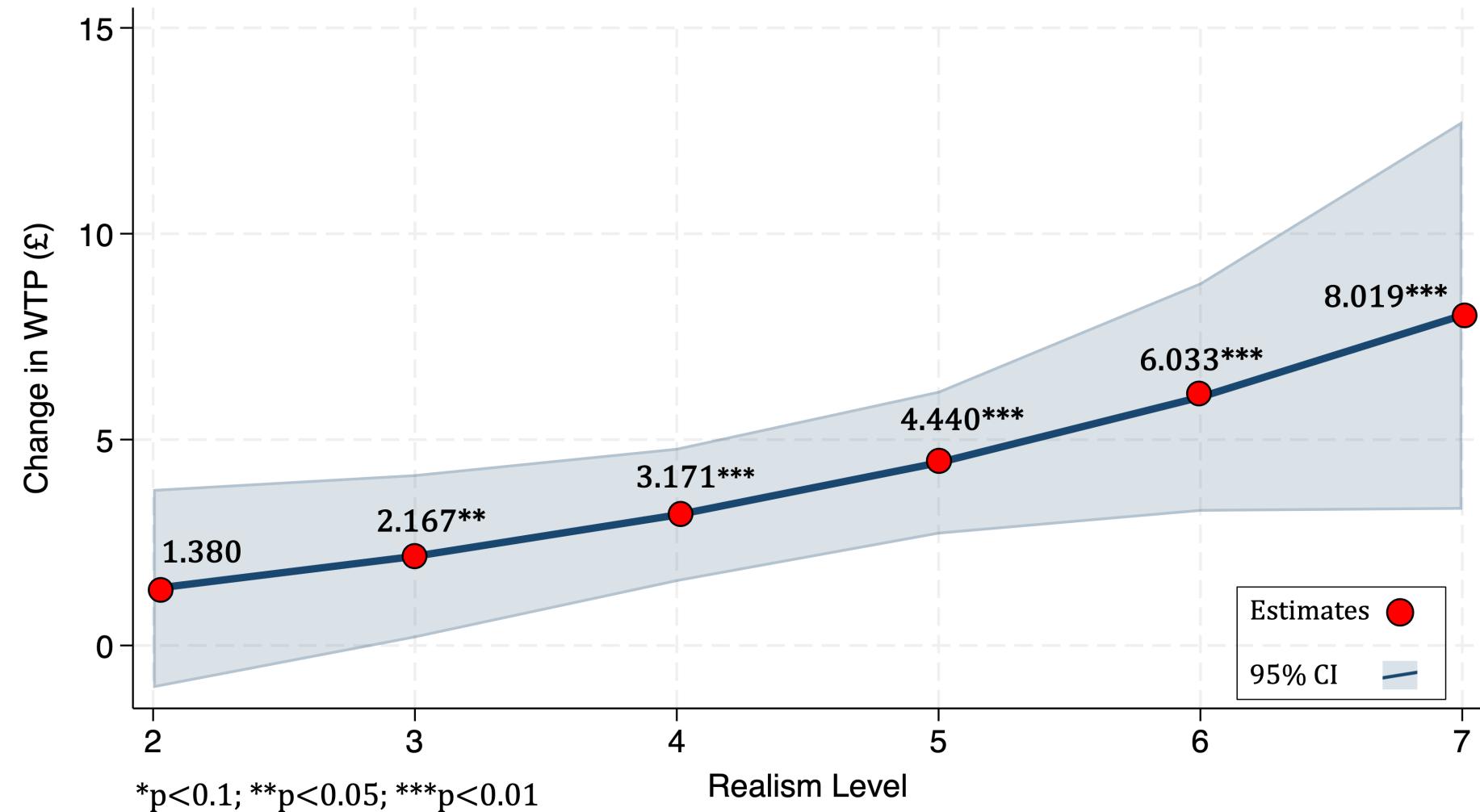
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- Measured via question of “how realistic was the survey?”
- Scope elasticity increases from 0.3 to 0.7



Within-VR Heterogeneity - Discomfort



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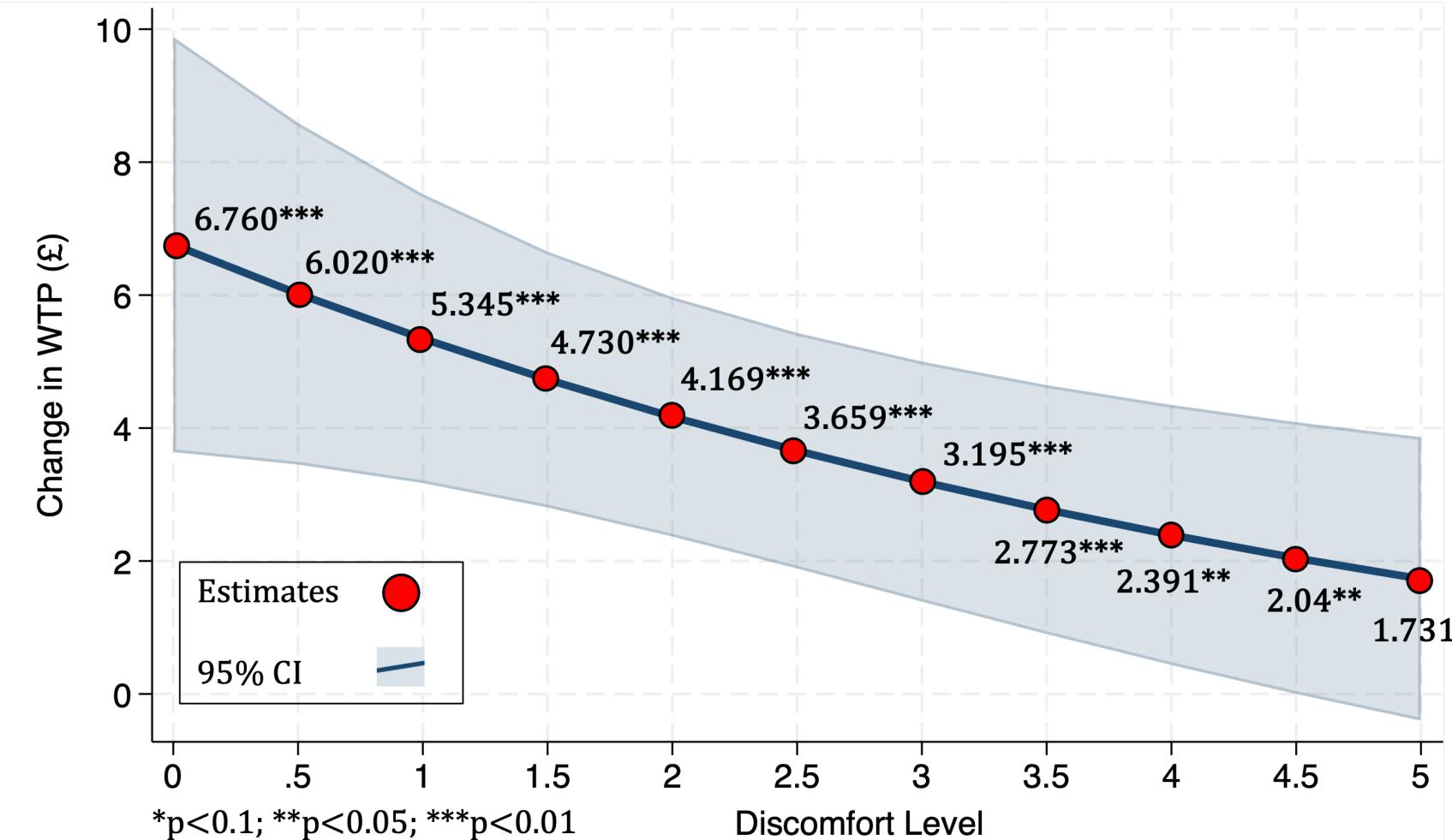
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- Average of three measurement: nausea, disorientation and general discomfort
- Scope elasticity reduce from 0.6 to 0.3



So what does all this mean?



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- Performance equivalence of VR and high-quality video in eliciting scope-sensitive estimates.
- For most stated preference applications, high-quality video should be the preferred medium due to lower cost, complexity and resources compared to VR.
- Effective visual communication, medium familiarity and breaks in presence may explain the parity in results
- Demonstrated validity of using VR in environmental valuation setting, across both real and hypothetical donation payment type.