Behavioural Testing: Examining the impact of video advice on agri-environmental scheme collaborative outcomes

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Newcastle University

From Newcastle. For the world.

Aims and rationale

- Advisors have long been involved in the delivery of agri-environmental schemes.
- Within the UK Environmental Land Management Schemes (ELMS) toolbox, one of their key functions will be to advocate for the public interest while providing support and good quality advice to farmers on how to deliver sustainable outcomes at the level of the individual farm (Brockett et al. 2019).
- However, a further feature of some ELMS is the requirement to **deliver environmental public goods at scale**. This will require **collaborative** as well as **individual actions** by farmers.
- This project will focus how alternative forms of advice can increase farmer's adoption of **collaborative actions**.

Aims and rationale

- Advisory time is a scarce resource. It is therefore important to investigate whether presenting information in a **digital format** can help support/complement DEFRA's Advisory Services.

We will focus on advisory information presented in video format and examine its impact on farmers' collaborative choices within an ELMS-type intervention.

- In addition, given the public goods aims of ELMS and potential behavioural responses by farmers to any initiatives, *we will explore the potential effectiveness of* ***'norm nudges'****, which provides social information with the objective to induce more collaborative behaviour via a change in social expectations*.

Aims and rationale

- This project aims to provide quantitative and supplementary qualitative evidence of the **efficacy of an advisory video** (and associated information script) **on farmers' uptake of collaborative actions** in (relevant) ELMS interventions and, thus, on the overall effectiveness of the scheme.
- We focus on actions that require farmers to actively work together to increase the delivery of spatially cohesive land use patterns and thereby enhance environmental benefits.
- We focus on actions offered in the Countryside Stewardship (CS) scheme.
- We partner with an Arm's Length Body (ALB), Natural England, which provides real-world advice on actions for environmental benefit.

Overall study design

1. To administer a controlled survey experiment based on a DEFRA-ALB co-designed video.
2. To robustly measure the effect of a video accessed and viewed by farmers with specific types of advice on application quality measured through the Countryside Stewardship scoring methodology.
    - The scoring methodology for the Environmental Options was developed by the Defra Environmental Land Management team.
    - Applications will be made in a sandbox environment and are not linked to actual, real-life applications in this setup.
    - Clearly defined outcomes (number of actions selected / application quality).

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Quantitative survey design

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Quantitative survey: intervention arms

The experiment has three intervention arms:

Baseline: No video; basic information on actions **(T0, control)**

Information only: Advisory video providing informed commentary on actions provided by the ALB **(T1)**

Information + nudge: Advisory video providing informed commentary on actions provided by the ALB + norms-based nudge **(T2)**

Main hypotheses

H1a. The number of high collaborative actions selected after viewing the advisory video (T1/T2) is greater than the number of actions selected in the baseline treatment (T0).

H1b. The number of high collaborative actions is greater after viewing the advisory video and the norms-based nudge (T2) than the video only, without the norms-based nudge (T1).

H2a. The share of high collaborative actions selected after viewing the advisory video (T1/T2) is greater than the share of actions selected in the baseline treatment (T0).

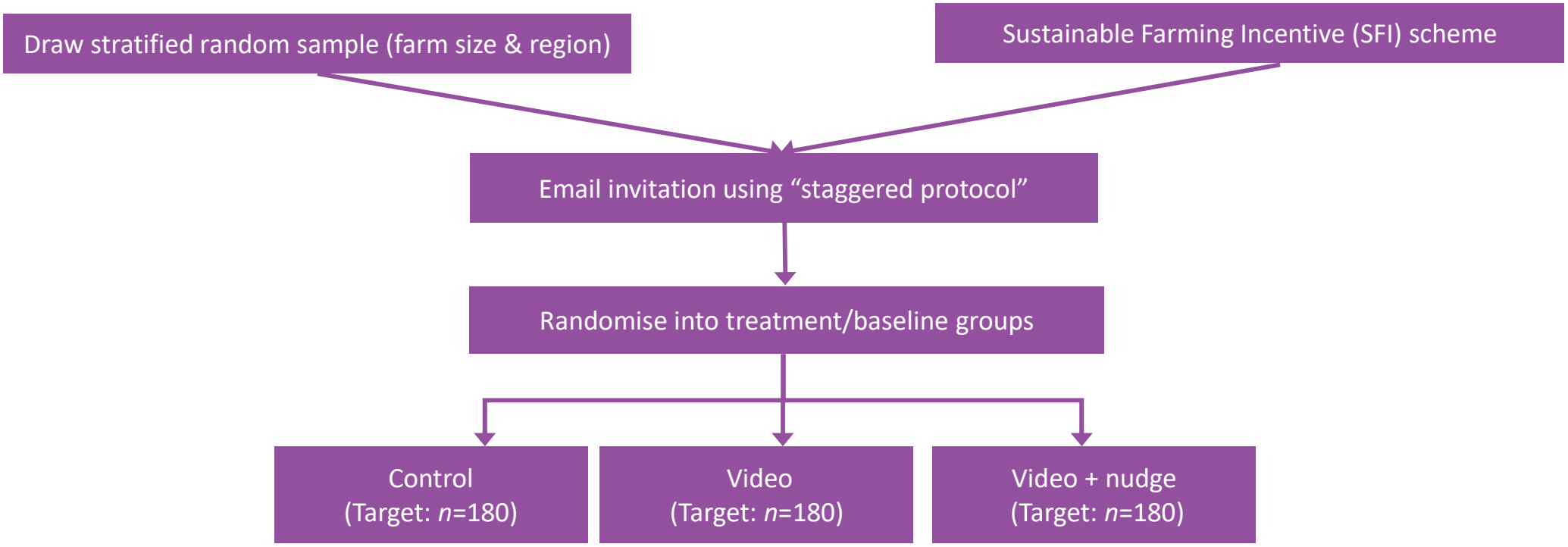
H2b. The share of high collaborative actions is greater after viewing the advisory video and the norms-based nudge (T2) than the video only, without the norms-based nudge (T1).

Note: Collaborative actions were ranked using the application scoring mechanism supplied by DEFRA according to (i) the likelihood that collaboration would strengthen the environmental benefit from each action, and (ii) the strength of Natural Science evidence on the benefits of implementing actions above parcel level. High Collaborative Actions are those actions which ranked above the median.

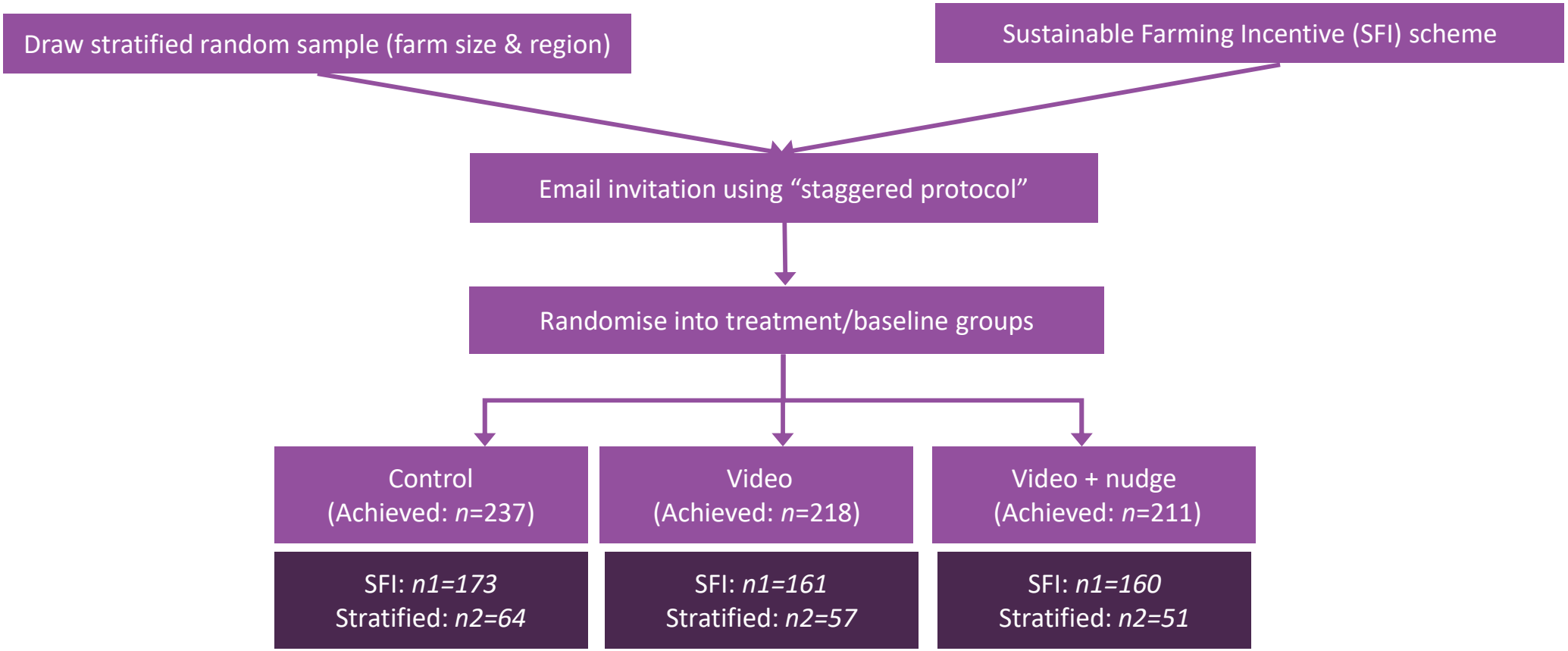
Overview of methods

- One video was produced and tested, for use in informational intervention arms.
- On-line, quantitative survey (survey approved by Newcastle University Ethics Board #296746), split into two data collection subgroups:
  - The SFI farms sample received pilot learning time credits.
  - The non-SFI farmers were incentivized with high street vouchers to complete the survey.
- Semi-structured interviews with 10 farmers, including bespoke content designed to investigate key issues arising from the quantitative results in greater depth.

Quantitative survey: study stages



Quantitative survey: study stages



Quantitative survey: sampling strategy for Non SFI respondents

- **Stratified random sampling of farms representative of region and farm size (6 strata):**
  - Region (North, Midlands, South).
  - Farm size (<150ha, ≥150ha).
  - Stratifying the sample increases the representativeness of the sample and reduces the size of possible sampling error.
- **Random allocation of participants to treatments/baseline groups to allow for causal inference (and control for unobservables).**

Quantitative survey: sampling strategy SFI sample

- **Survey is shared with farmers participating in the SFI.**
  - The scheme gives farmers a choice of actions that reward and support sustainable food production while protecting and enhancing nature.
- **Random allocation of participants to treatments/baseline groups to allow for causal inference (and control for unobservables).**

Quantitative survey: survey flow

Introduction

- Consent
- Questions on region and farm size

Intervention Stage 1

- Basic information on actions/options
- Video on collaborative farmer options (T1/T2 only)

Intervention Stage 2

- Norms-based nudge (T2 only)
- Farmer choices on CS options

Final questionnaire

- Farming advice
- Income
- Farmer/farm characteristics

Quantitative survey: advice video

- 3-minute video, recorded by Natural England advisor where the environmental benefits of DEFRA's CS scheme and how working together can increase collaborative benefits for farmers.
- Brief discussion of CS agreements + incentive provision for environmental protection.
- Emphasis on collaboration to achieve environmental goals on a larger scale.
- **Examples of agreements that describe collaborative benefits of implementation (covers one included high/low benefit option):**
  - Managing wet grassland for breeding waders (GS10).
  - Creation of successional areas of scrub (WD8).
  - 12m to 24m watercourse buffer strip on cultivated land (SW4).

Video

Quantitative survey: CS options

- 15 CS mid/high tier options which differ according to the likelihood that collaboration would strengthen the action's environmental benefit.
- Split into two groups (multiple choice questions) based on two criteria:
  - Whether the option impact is strengthened by collaboration (rating 1/low – 5/high).
  - The strength of evidence for environmental benefits above parcel level (rating 1/low – 5/high).
- Farmers choose as many options as they would like.
- We also provide the actual direct payment/hectare of each option in £.

Quantitative survey: CS options

Code	Mid/high tier action identified as priority by policy
	High environmental benefit from collaboration
AB1	Nectar flower mix
AB16	Autumn sown bumblebird mix
AB8	Flower-rich margins and plots
BE3	Management of hedgerows
GS9	Management of wet grassland for breeding waders
SW17	Raised water levels on cropped or arable lowland peat soils (10-30cm)
SW18	Raised water levels on permanent grassland on lowland peat soils (10-30cm)
	Low environmental benefit from collaboration
AB5	Nesting plots for lapwing
AB6	Enhanced overwinter stubble
AB9	Winter bird food
GS2	Permanent grassland with very low inputs (outside SDAs)
GS6	Management of species-rich grassland
SW1	4m to 6m buffer strip on cultivated land
SW2	4m to 6m buffer strip on intensive grassland
SW4	12m to 24m watercourse buffer strip on cultivated land

Choice q

Quantitative survey: norms-based nudge

- Norms are more likely to affect when they are salient at the time a decision is made – that is, when people's attention can be drawn to the norms.
- Thus, the normative nudge is located after farmers watch the video but before they make their choices.
- Norm is descriptive, stating the most common standard for collaborative behaviour among farmers (i.e., what people commonly do, how to act in a certain situation. Cialdini et al. 1990; Cialdini and Goldstein 2004).
- The nudge design based on the nudges used by Andre et al. (2024) to provide information on climate change.

Screenshot of norms-based nudge

We asked Defra what percentage of the 28,748 farm businesses in England have a CS contract that includes at least one option with a relatively high environmental benefit from collaboration. Here are the results:

Nudge

Quantitative survey: final questionnaire block

- **Farming advice**
  - Sought advice on CS grant options in the last 12 months
  - Sources of advice
  - Frequency of access of farm-related advice from various sources
  - Implementation of farm-related advice from various sources
  - Application to CS Facilitation Fund
- **Income**
  - Main sources of income
  - Farm business income
- **Farmer characteristics**
  - Highest education level
  - Years of experience in the farming, forestry or land management sectors
  - Landowner/tenant (tenancy agreement)
  - Leadership position
  - Main farm business activity
  - General risk aversion

Quantitative results

Farmers' final sample - SFI only

Treatment	N
T0: Control	173
T1: Video	161
T2: Video + Nudge	160
Total SFI	494

Main hypotheses: recap

H1a. The number of high collaborative actions selected after viewing the advisory video (T1/T2) is greater than the number of actions selected in the baseline treatment (T0).

H1b. The number of high collaborative actions is greater after viewing the advisory video and the norms-based nudge (T2) than the video only, without the norms-based nudge (T1).

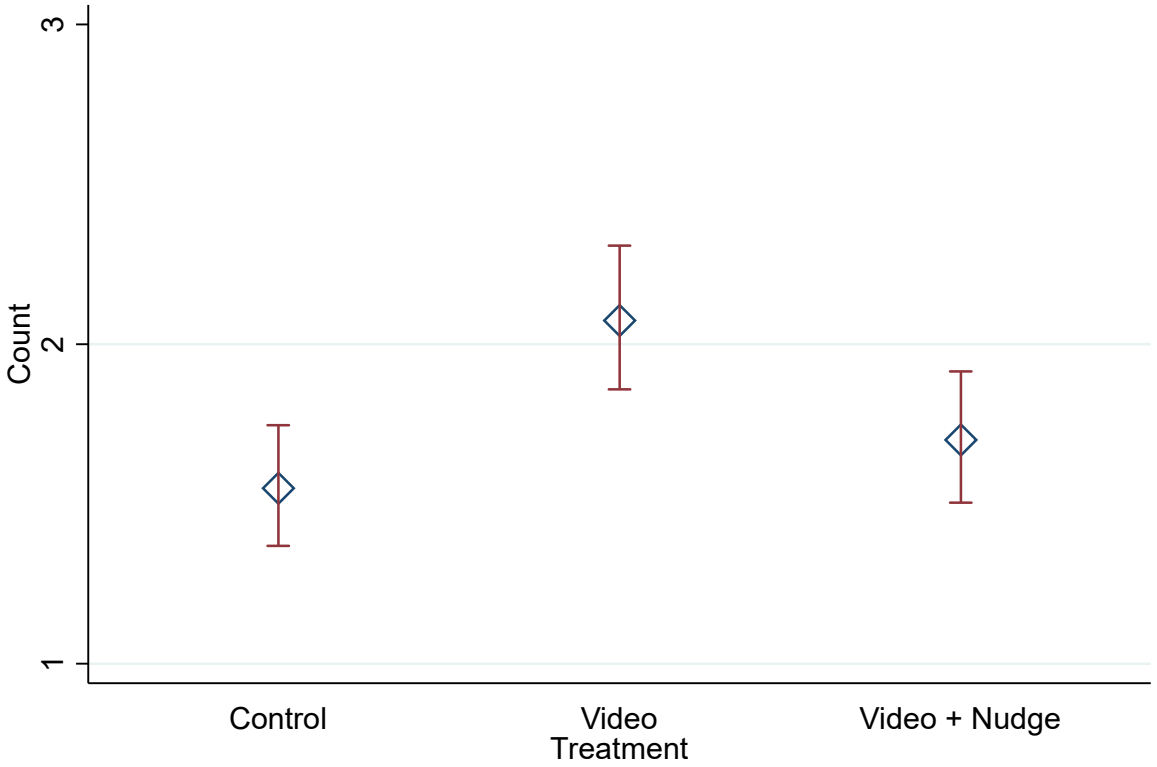
H2a. The share of high collaborative actions selected after viewing the advisory video (T1/T2) is greater than the share of actions selected in the baseline treatment (T0).

H2b. The share of high collaborative actions is greater after viewing the advisory video and the norms-based nudge (T2) than the video only, without the norms-based nudge (T1).

Results: summary (SFI only)

Treatment	Mean number of high collaborative actions (s.d.; out of 7)	Max number of high collaborative actions	Mean share of high collaborative actions (s.d.)
T0: Control	1.55 (1.37)	7	0.43 (0.23)
T1: Video only	2.07 (1.51)	7	0.45 (0.19)
T2: Video + Nudge	1.70 (1.19)	5	0.44 (0.21)

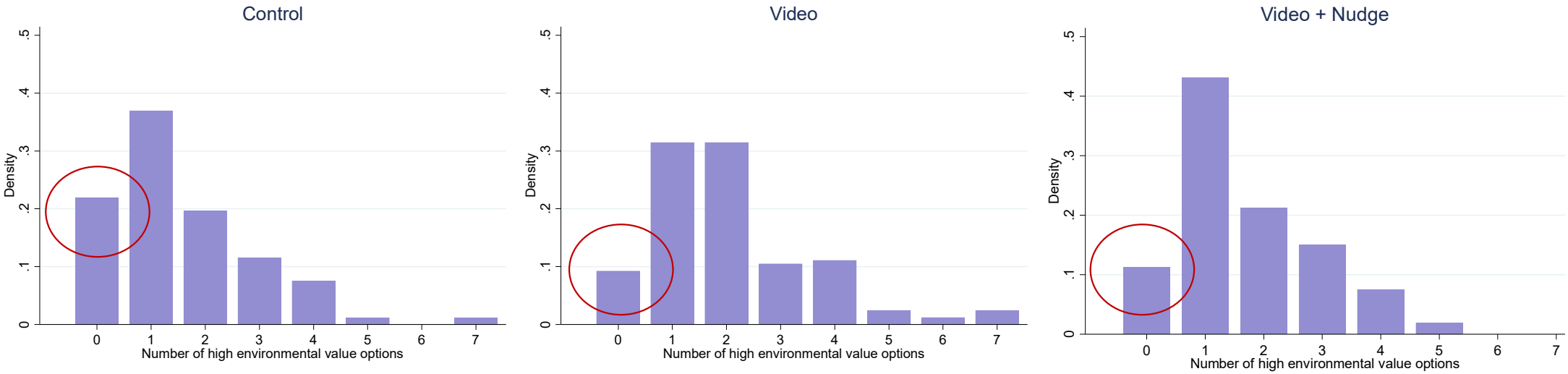
Results: Number of high collaborative actions



In line with H1a, the video highly significantly increases the number of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-2.97, p=0.002).

Contrary to H1b, the nudge significantly decreases the number of high collaborative actions chosen (T1<T2; Mann-Whitney Z=2.13, p=0.016).

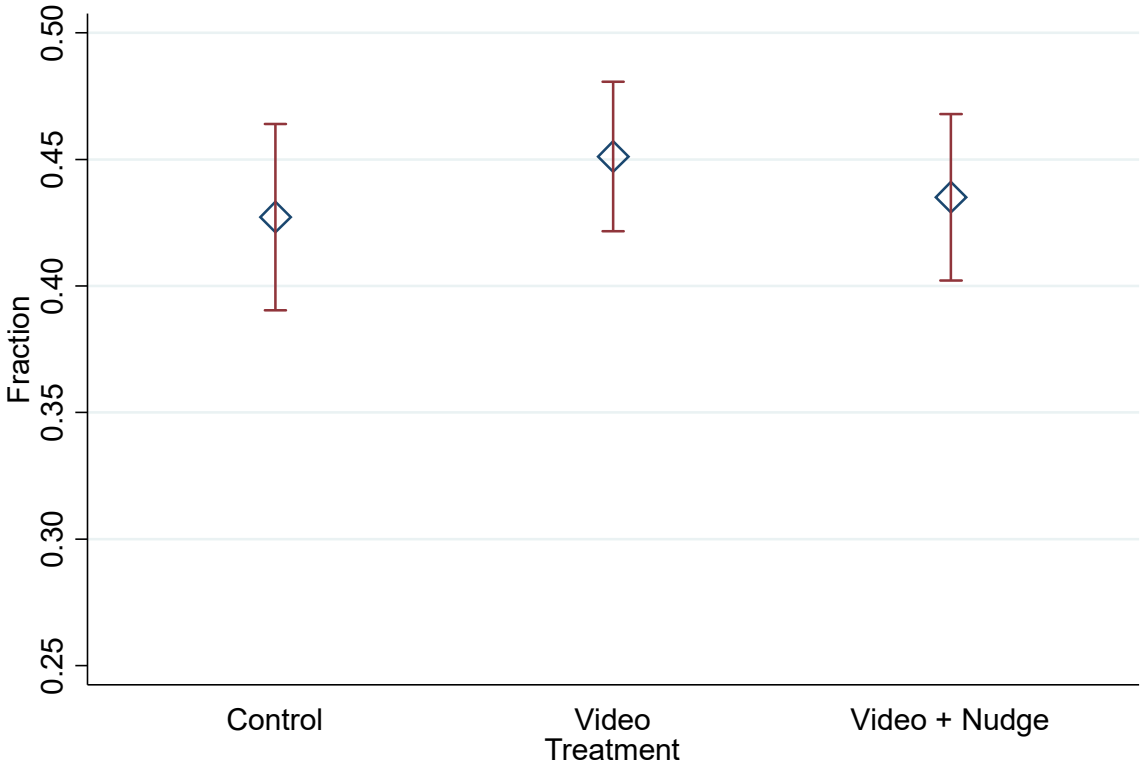
Results: Distribution of the number of high collab. options



We also check if the distribution of the number of high collaborative actions differs across treatments:

- The video significantly affects the distribution (T0 vs T1/2; Chi2(7)=14.98, p=0.036).
- The nudge significantly affects the distribution (T1 vs T2; Chi2(7)=14.56, p=0.042).
- Interestingly, the video reduces the share of participants who choose zero collaborative options from 22% to 10%.

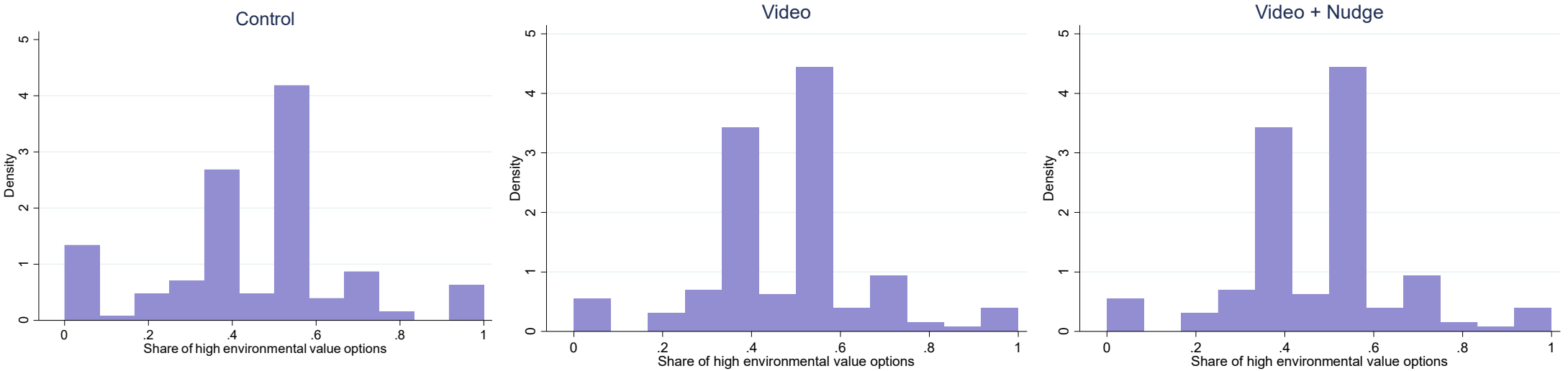
Results: Share of high collaborative actions



We find no support for H2a: No significant effect of the video on the share of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-0.439, p=0.331).

H2b is not supported: No significant effect of the nudge on the share of high collaborative actions chosen (T1<T2; Mann-Whitney Z=0.789, p=0.216).

Distribution of share of high collaborative actions



Again, we check if the distribution of the share of high collaborative actions differs across treatments:

- The video has no significant effect on the distribution (T0 vs T1/2; Kolmogorov-Smirnov p=0.566).
- The nudge has no significant effect on the distribution (T1 vs T2; Kolmogorov-Smirnov p=0.955).

Regression specification

- **Given that our main variable is a "count" (the number of high collaborative actions chosen), we can specify a Poisson model to test H1a:**

$$a_i = exp(\beta_0 + \beta_1 video_i)$$

a_i is the number of high collaborative actions chosen by each individual
$video_i$ is a binary variable =1 if the participant was shown the video only (T1 and T2)

- **To test for H2a, we specify the following model:**

$$a_i = exp(\beta_0 + \beta_1 videonudge_i)$$

$videonudge_i$ is a binary variable =1 if the participant was shown the video and the nudge (T2)

Regression results

	(1) Control vs. pooled treatments	(2) Video Vs. Video+Nudge
d.v.: number of high collaborative options	IRR	IRR
Video (T1+T2)	1.219** (0.095)	
Video + Nudge (T2)		0.819** (0.065)
constant	1.549*** (0.104)	2.075*** (0.119)
Pseudo R2	*<0.01*	*0.01*
Wald Chi2	*6.39*	*6.23*
N	*494*	*321*

Notes: RR = incidence-rate ratios; The constant estimates the baseline incidence rate. Standard errors between parentheses. Col. 1 includes all treatments. Col. 2 includes T1 and T2 only.
*** p<0.01, ** p<0.05, * p<0.1

Interpretation of significant regression results

- **H1a:** The video treatments (T1+T2) **increased** the number of high collaborative options chosen by **22%,** relative to the non-video (T0) treatment (*p-value* = 0.012).

- **H2a:** The video+nudge treatment (T2) **decreased** the number of high collaborative options chosen by **18%,** relative to the video treatment (T1) (*p-value* = 0.013).

Heterogeneity analysis

- We examined whether there are any significant differences in farmer characteristics, farm characteristics and experience with advice which might influence the number of high collaborative actions selected.
- We present non-parametric statistical tests for each sub-group, under H1a and H2a.
- Consistent with prior presented results, there are no significant differences for the share of high collaborative options selected, under H1b and H2b.

Testing H1a across sub-groups

Variable	Mann-Whitney test (T0 < pooled T1+T2)
Region	Significant increase for farmers in North (Midlands and South not significant).
Area of Farm >150 hectares	Significant increase for small (<150ha) and large farms (>=150ha).
Participant is agent or farming consultant	Significant increase if the farmer is NOT an agent or farming consultant.
Land-use	Significant increase for sub-groups "Cropping" and "Other (Dairy/Horticulture/Pig and Poultry)". Not significant for "Livestock" and "Mixed".
Previous ALB visit	Significant increase if there has been a previous ALB visit.
Experience >35 years	Significant increase if farmer has farming experience of more than or equal to 35 years.
University graduates	Significant increase if farmer has a University degree.
Owner	Significant increase if farmer mostly or fully owns the land.
Business income > £100,000	Significant increase if the business income is below or equal to £100,000.

p-values

Summary of significant heterogeneity results

H1: The video treatments (T1+T2) **increased** the number of high collaborative options in the case of farmers:

- in the North
- who are not consultants
- who have had a previous ALB visit
- with over 35 years of experience
- who mostly or fully owns the land
- for both small and large farms
- working in cropping, dairy, horticulture and pig and poultry farms
- with a business income of less than or equal to £100k
- who are university graduates

Testing H2a across sub-groups

Variable	Mann-Whitney test (T1 < T2)
Region	No significant increase.
Area of Farm >150 hectares	No significant increase.
Participant is agent or farming consultant	No significant increase.
Land-use	No significant increase.
Previous ALB visit	No significant increase.
Experience >35 years	No significant increase.
University graduates	No significant increase.
Owner	No significant increase.
Business income > £100,000	No significant increase.

p-values

Summary of significant heterogeneity results

H2a: The video+nudge treatment (T2) **does not increase** the share of high collaborative options chosen in any sub-group.

Conclusions

- **Video information appears to be relatively important influencing the number options chosen overall relative to no video information.**

  → *However, the video does not seem to be as effective increasing the share of high collaborative options chosen by participants.*

- **Providing information about existing uptake does not increase the number or share of high collaborative options chosen.**

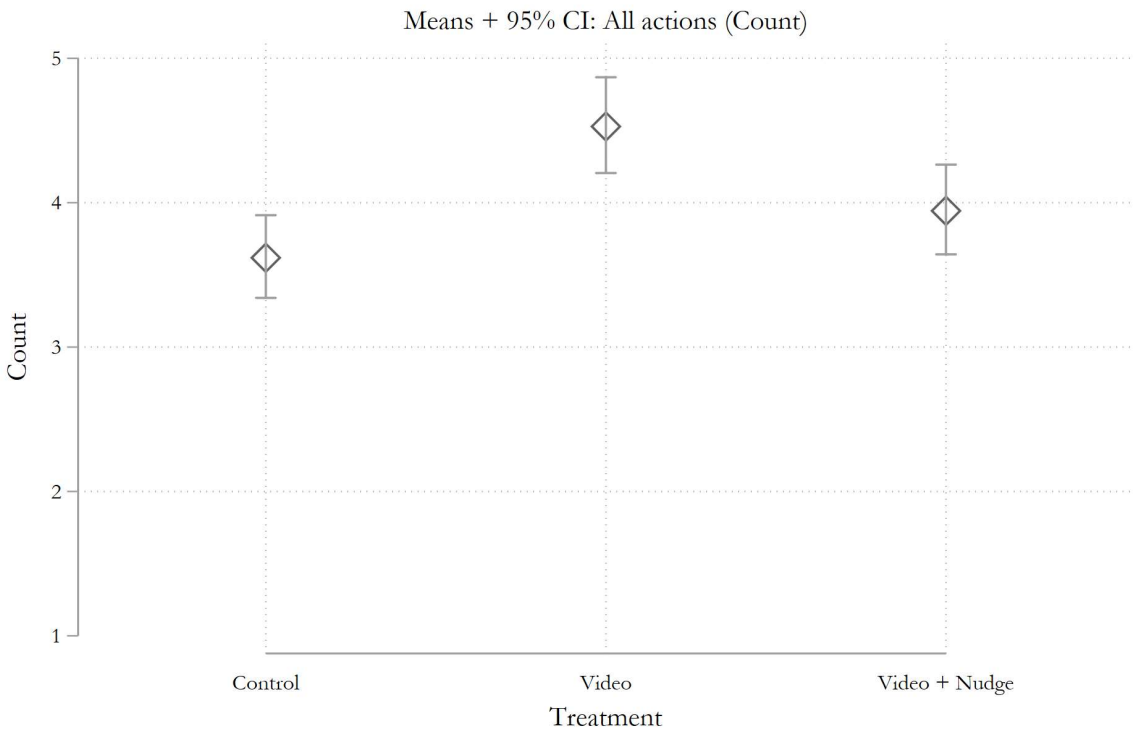
  → *But we need to be cautious interpreting these results as the nudge was combined with the video, and thus its individual impact cannot be established.*

Addendum: total number of actions

Results: summary (SFI only)

Treatment	Mean number of total actions (s.d.; out of 15)	Max number of total actions
T0: Control (n=173)	3.62 (2.69)	12
T1: Video only (n=161)	4.53 (2.68)	15
T2: Video + Nudge (n=160)	3.94 (2.44)	10

Results: Number of total collaborative actions



The video highly significantly increases the total number of actions chosen (T0<T1/2; Mann-Whitney Z=-2.83, p=0.002).

The nudge significantly decreases the total number of actions chosen (T1<T2; Mann-Whitney Z=2.05, p=0.020).

Appendix

Appendix: ALB advice video on collaborative options

Video

Appendix: screenshots of CS survey questions

Please imagine that you are applying to the Countryside Stewardship (CS) Scheme.

On the next screen, we will show you a number of grant options available to you. They are split across two lists:

- Options in which collaborating with neighbouring farms has a relatively high environmental benefit;
- Options in which collaborating with neighbouring farms has a relatively low environmental benefit.

On the next screen we will also ask you to select all the grants options that you would apply for.

In a real CS agreement, overall payment for each option would be calculated by multiplying payment rates by the number of units you chose to input.

Note, this is not a real application. It will not affect your current CS agreements.

Choice q

Appendix: screenshots of CS survey questions

Please select all the grants options that you would apply for.
You can view a detailed description of each grant option by clicking on the link next to it.

Options which have a relatively high environmental benefit from collaboration.

- AB1 - Nectar flower mix (£739 per hectare). Option details.
- AB16 - Autumn sown bumblebird mix (£747 per hectare). Option details.
- AB8 - Flower-rich margins and plots (£798 per hectare). Option details.
- BE3 - Management of hedgerows (£13 per 100m for 1 side of a hedge). Option details.
- GS9 - Management of wet grassland for breeding waders (£676 per hectare). Option details.
- SW17 - Raised water levels on cropped or arable lowland peat soils (10-30cm) (£1,409 per hectare). Option details.
- SW18 - Raised water levels on permanent grassland on lowland peat soils (10-30cm) (£1,381 per hectare). Option details.
- None of the above

Options which have a relatively low environmental benefit from collaboration.

- AB5 - Nesting plots for lapwing (£765 per hectare). Option details.
- AB6 - Enhanced overwinter stubble (£589 per hectare). Option details.
- AB9 - Winter bird food (£853 per hectare). Option details.
- GS2 - Permanent grassland with very low inputs (outside SDAs) (£151 per hectare). Option details.
- GS6 - Management of species-rich grassland (£646 per hectare). Option details.
- SW1 - 4m to 6m buffer strip on cultivated land (£515 per hectare). Option details.
- SW2 - 4m to 6m buffer strip on intensive grassland (£235 per hectare). Option details.
- SW4 - 12m to 24m watercourse buffer strip on cultivated land (£707 per hectare). Option details.
- None of the above

Choice q

Appendix: p-values for MW test, H1

Variable	Two-sided p-value Mann-Whitney test for difference (T0 vs. pooled T1+T2)
Region	North: 0.005; Midlands: 0.354; South: 0.198
Area of Farm >150 hectares	<150 ha: 0.064, >= 150 ha: 0.004
Participant is agent or farming consultant	Agent: 0.306; Not agent: 0.007
Land-use	Cropping: 0.066; Livestock: 0.143; Mixed: 0.723; Other: 0.015
Previous ALB visit	ALB visit: 0.000; No visit: 0.213
Experience >35 years	Experience >= 35 years: 0.000 ; experience < 35 years: 0.979
University graduates	Graduate: 0.069; Less than graduate: 0.214
Owner	Owner: 0.023 ; Not owner: 0.216
Business income > £100,000	>= £100,000: 0.233; <£100,000: 0.065

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Appendix: p-values for MW test, H2

Variable	Two-sided p-value Mann-Whitney test for difference (T1 vs. T2)
Region	North: 0.369; Midlands: 0.417; South: 0.022
Area of Farm >150 hectares	<150 ha: 0.027, >= 150 ha: 0.094
Participant is agent or farming consultant	Agent: 0.020 ; Not agent: 0.220
Land-use	Cropping: 0.658; Livestock: 0.108; Mixed: 0.180; Other: 0.087
Previous ALB visit	ALB visit: 0.055; No visit: 0.352
Experience >35 years	Experience >= 35 years: 0.014 ; experience < 35 years: 0.693
University graduates	Graduate: 0.250; Less than graduate: 0.196
Owner	Owner: 0.064 ; Not owner: 0.334
Business income > £100,000	>= £100,000: 0.455; <£100,000: 0.050

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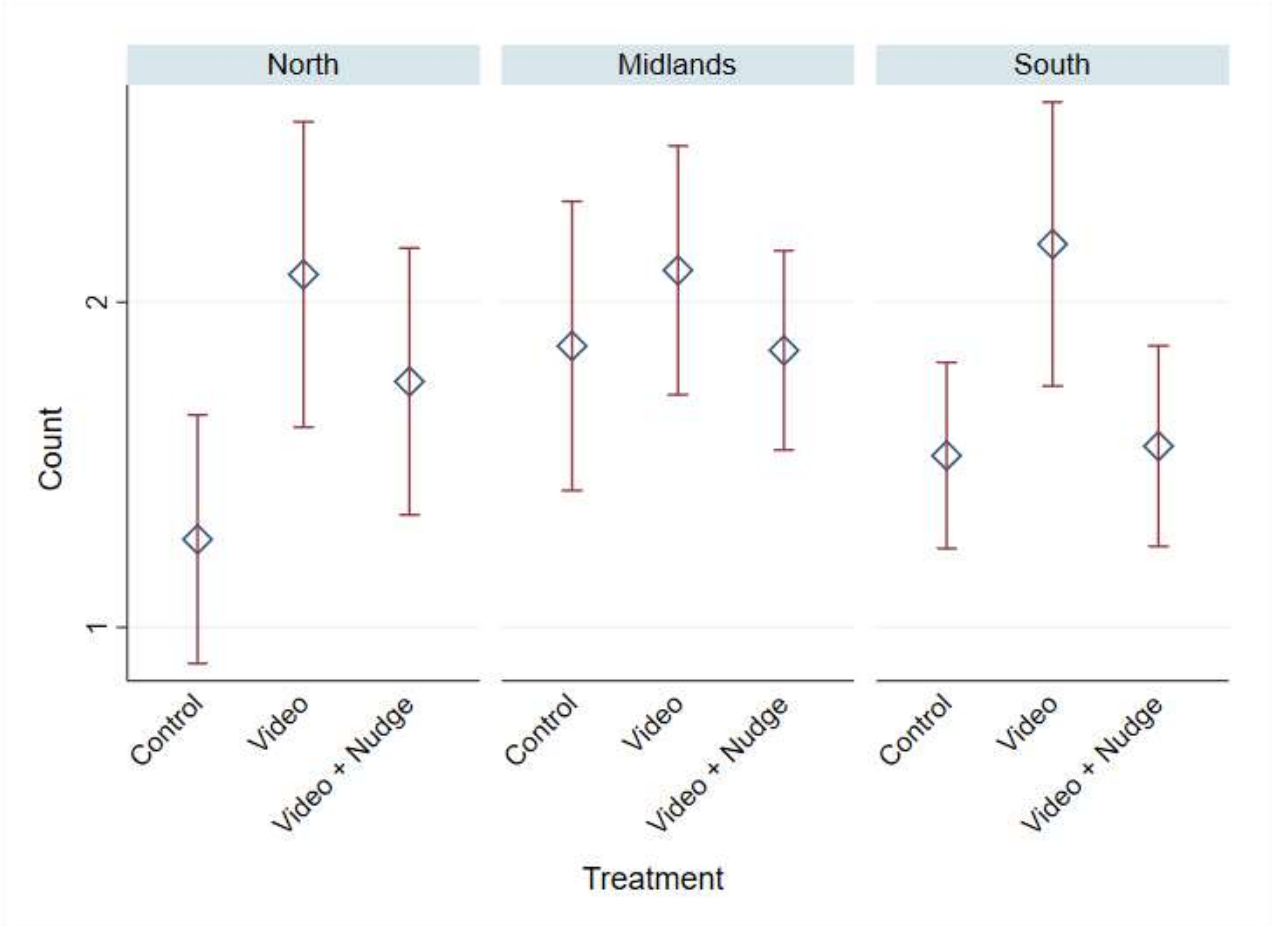
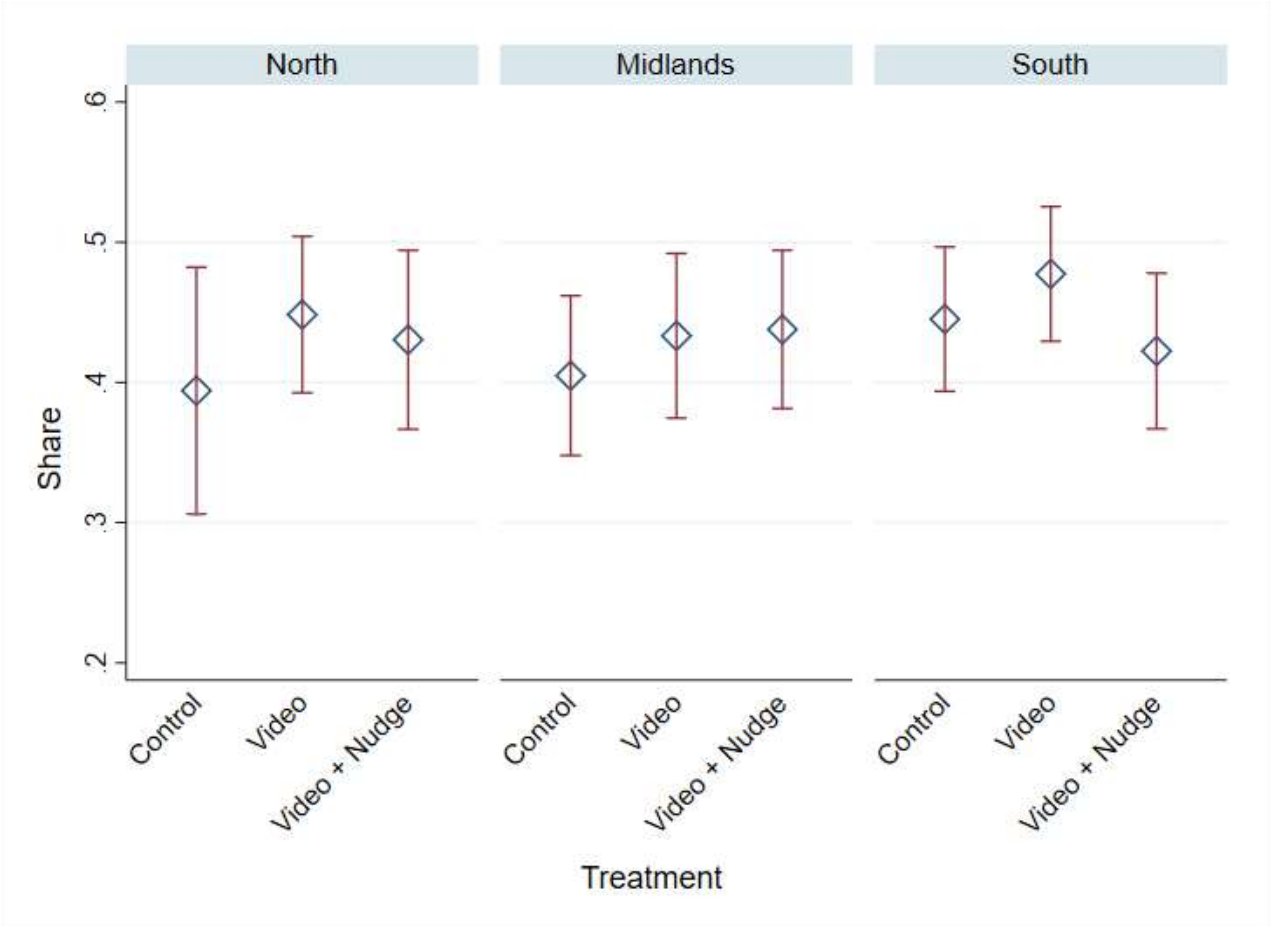
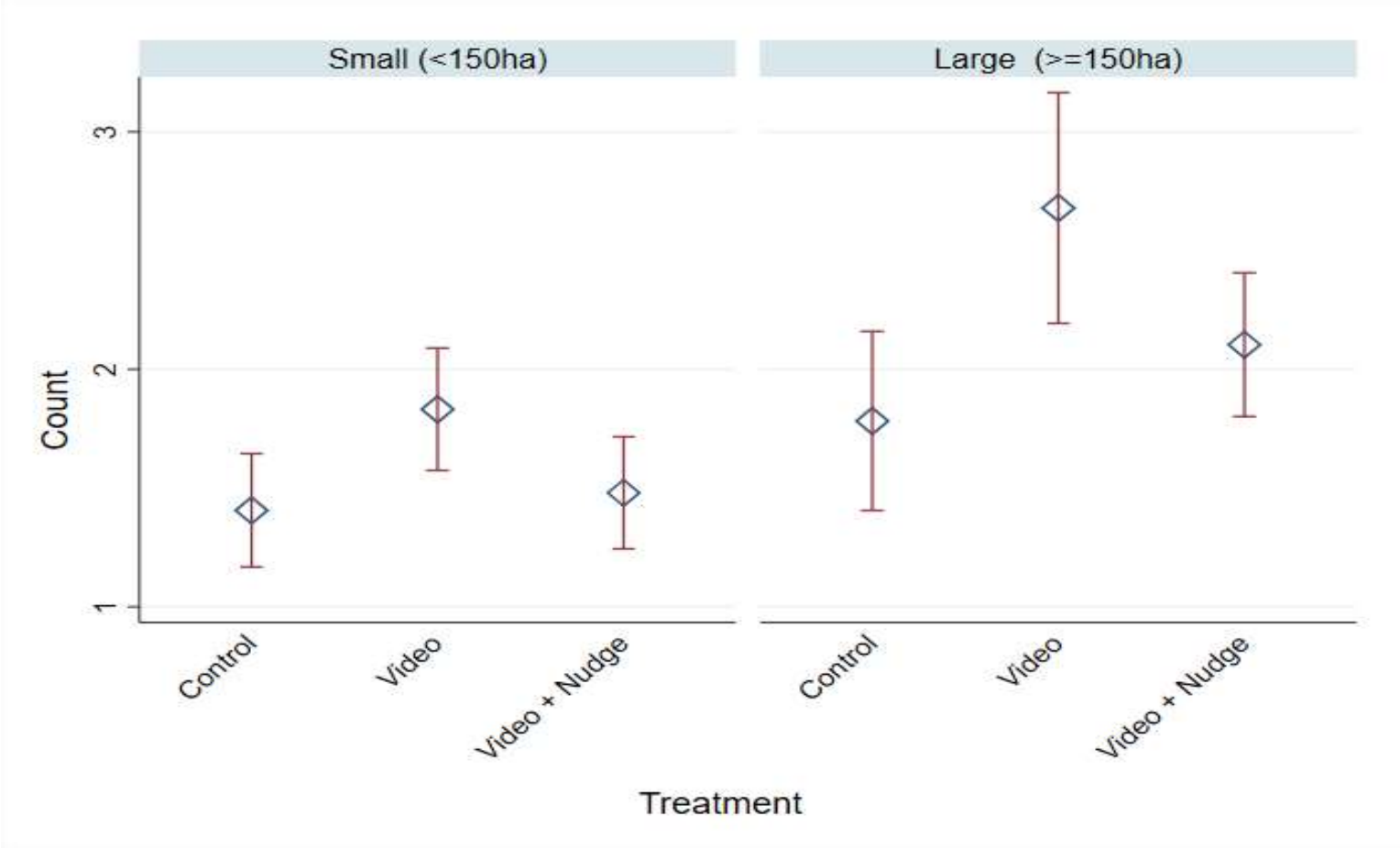
Appendix: Count by region



Appendix: Share by region



Appendix: Count by farm size



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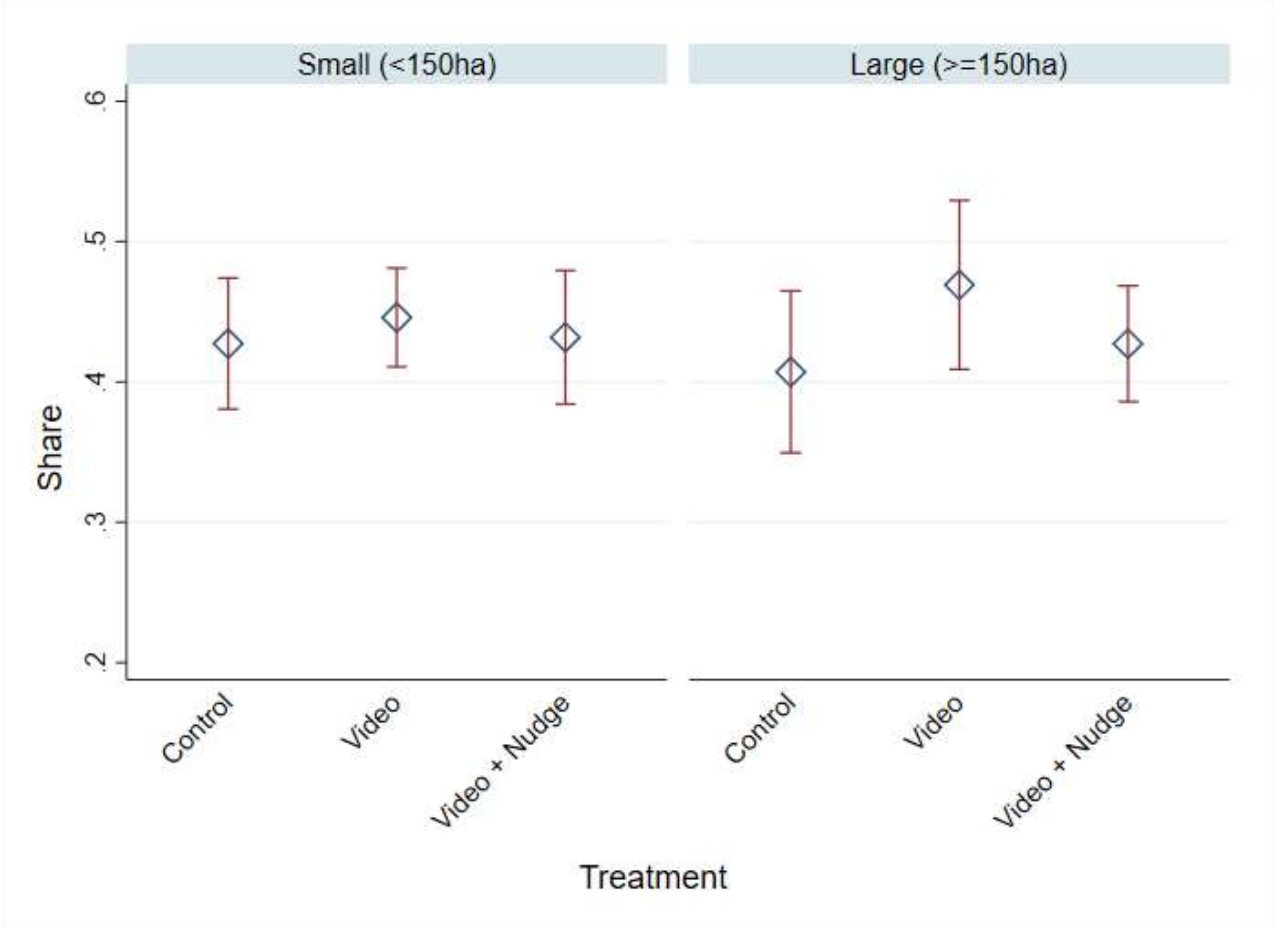
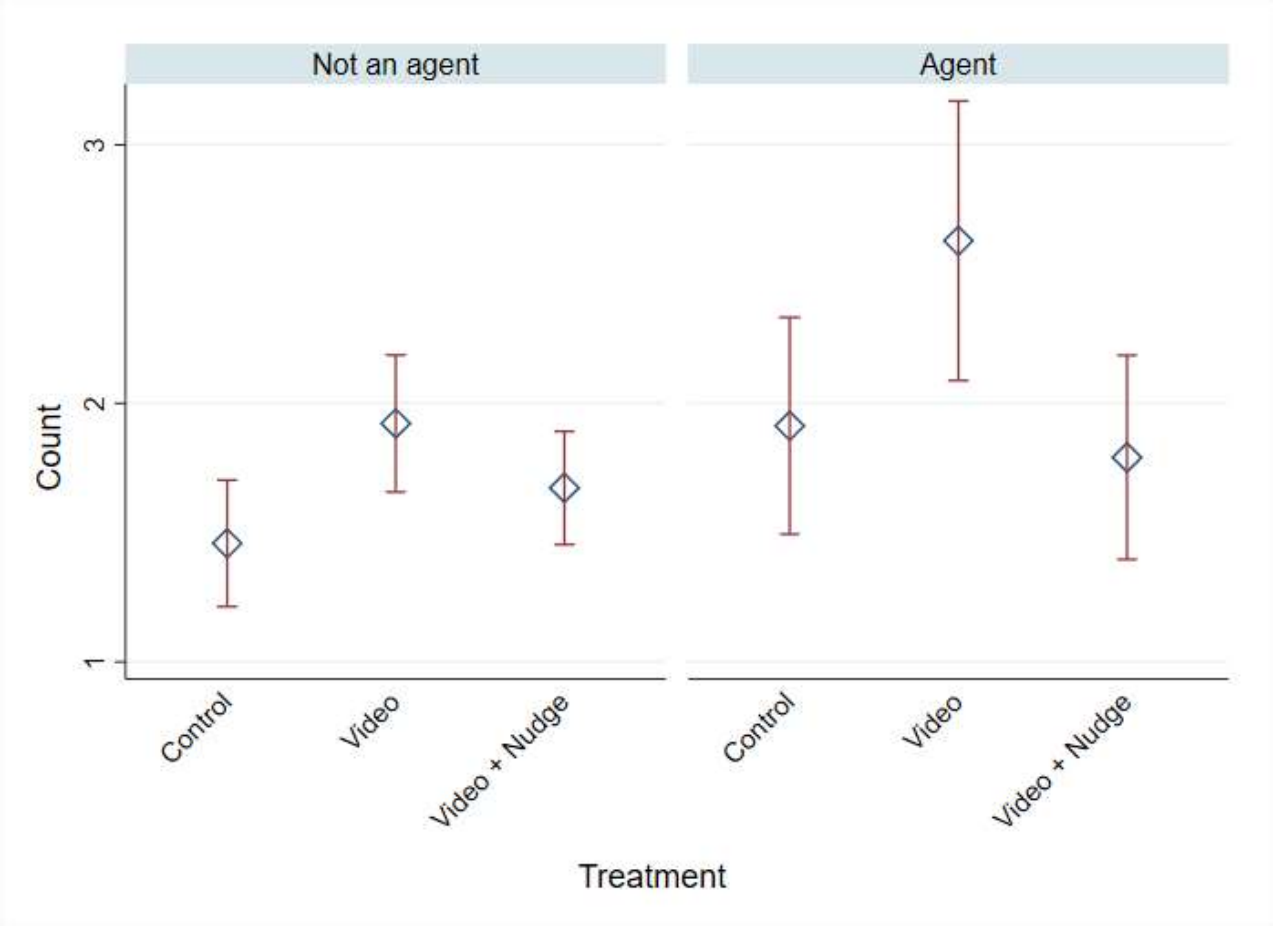


Appendix: Count by agent



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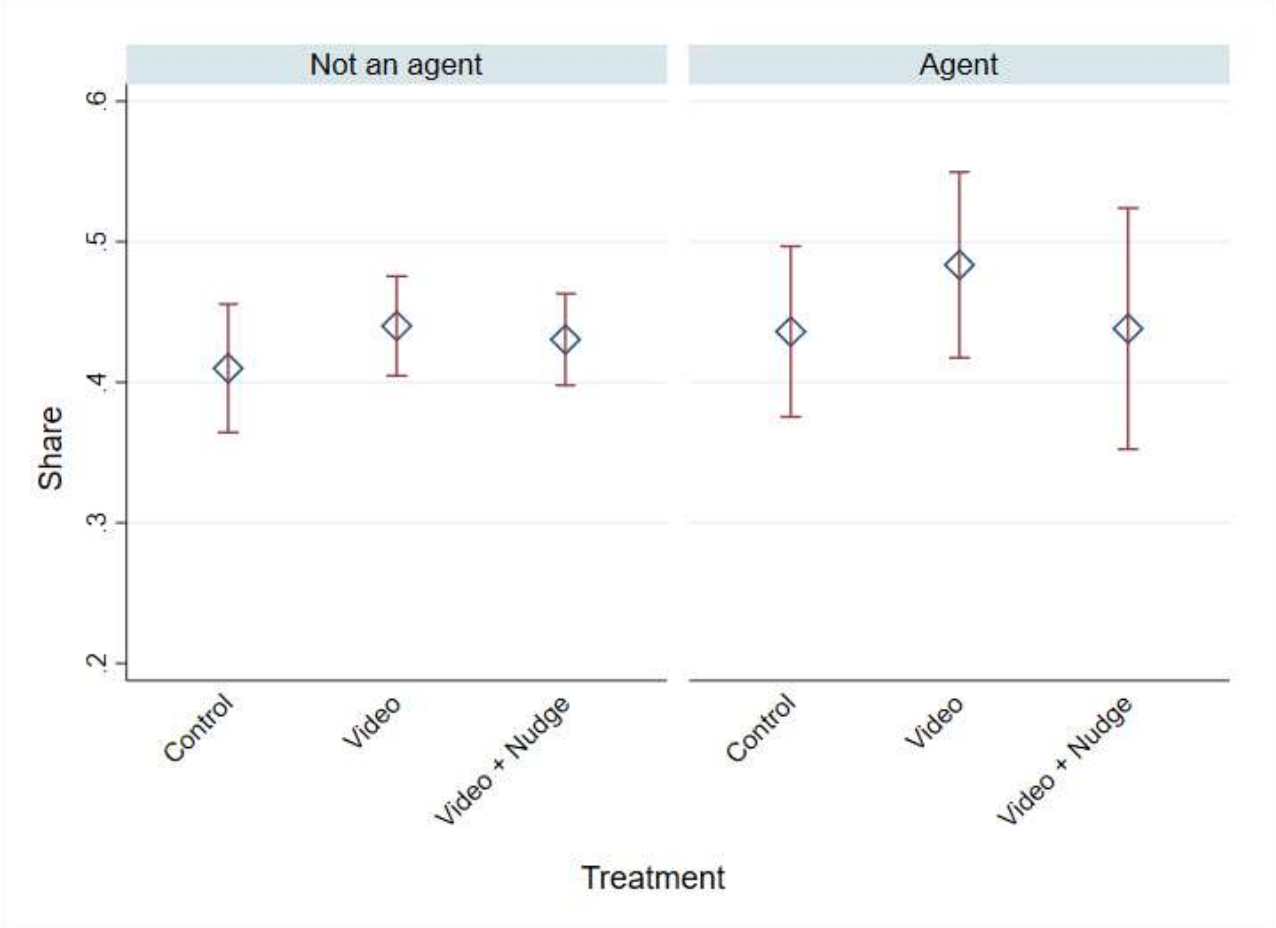
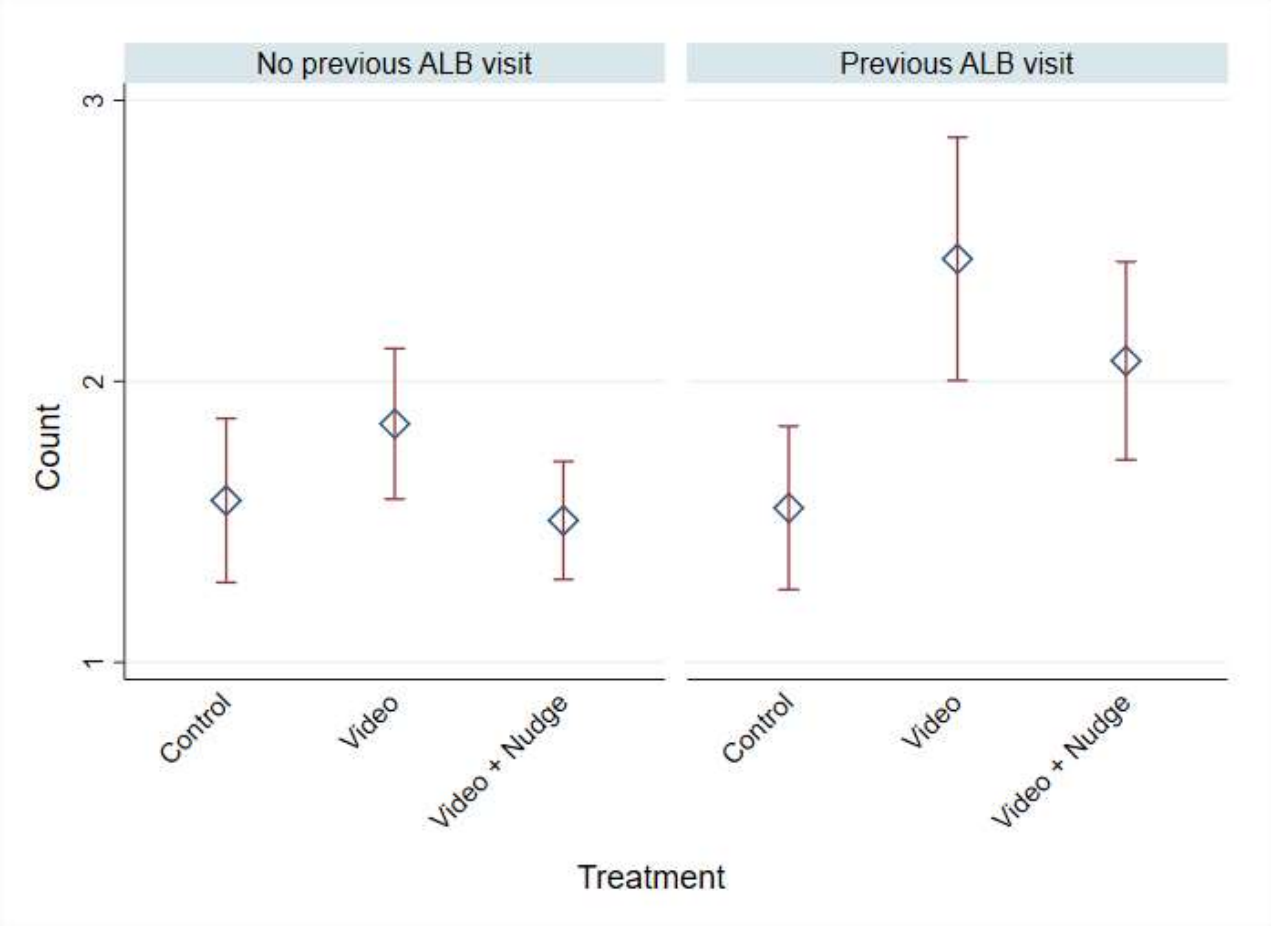


Appendix: Count by previous ALB visit



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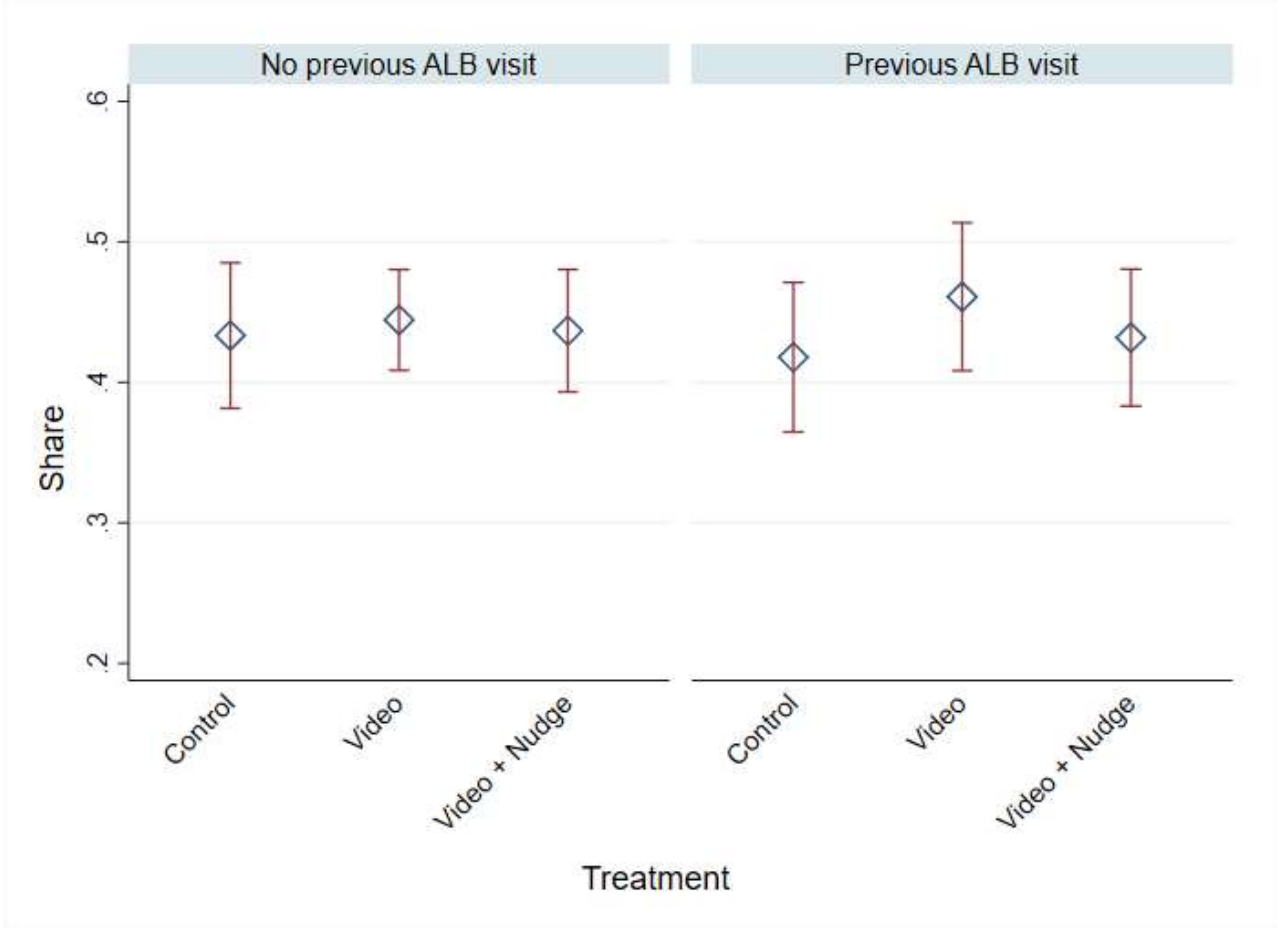
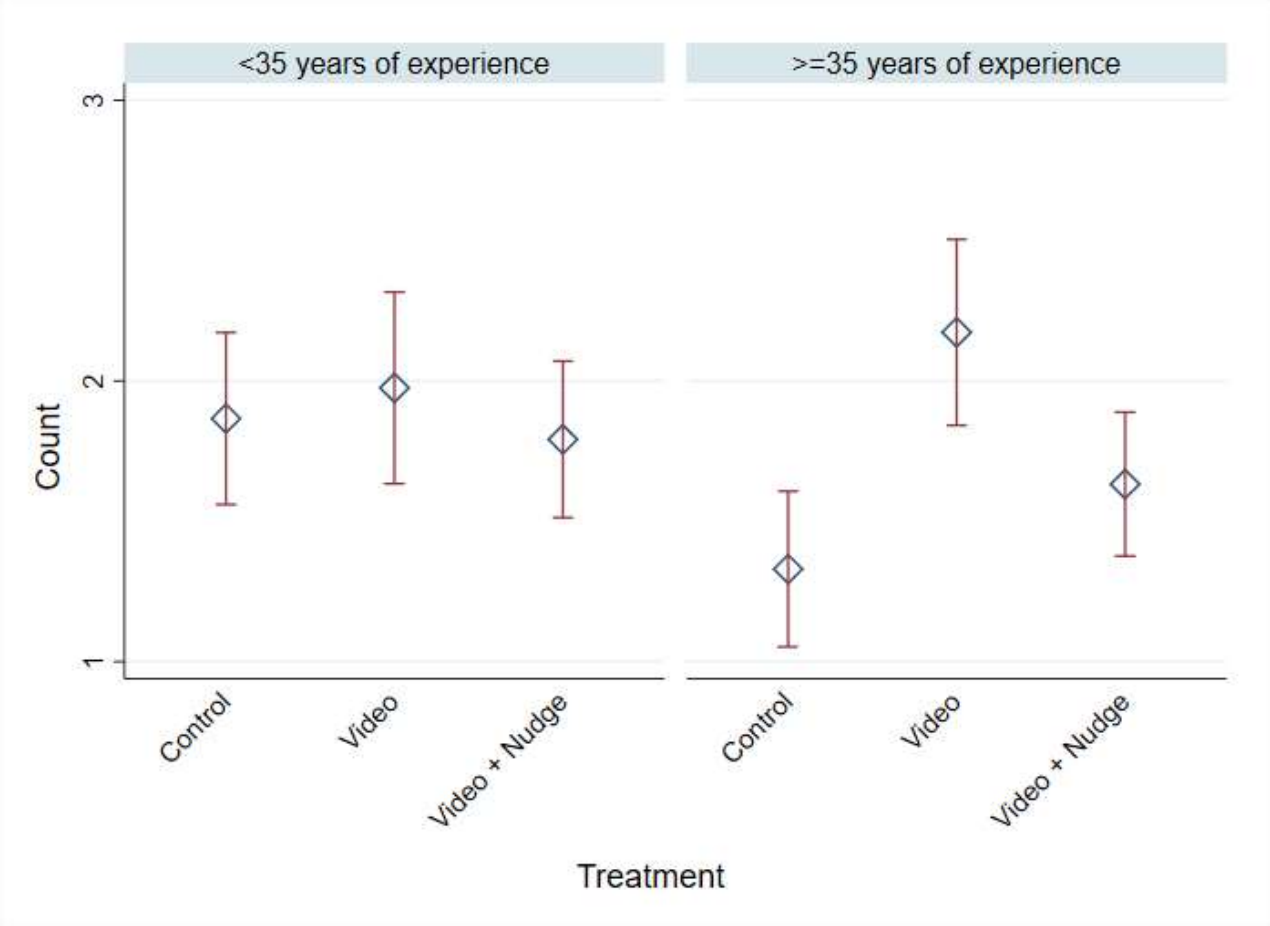
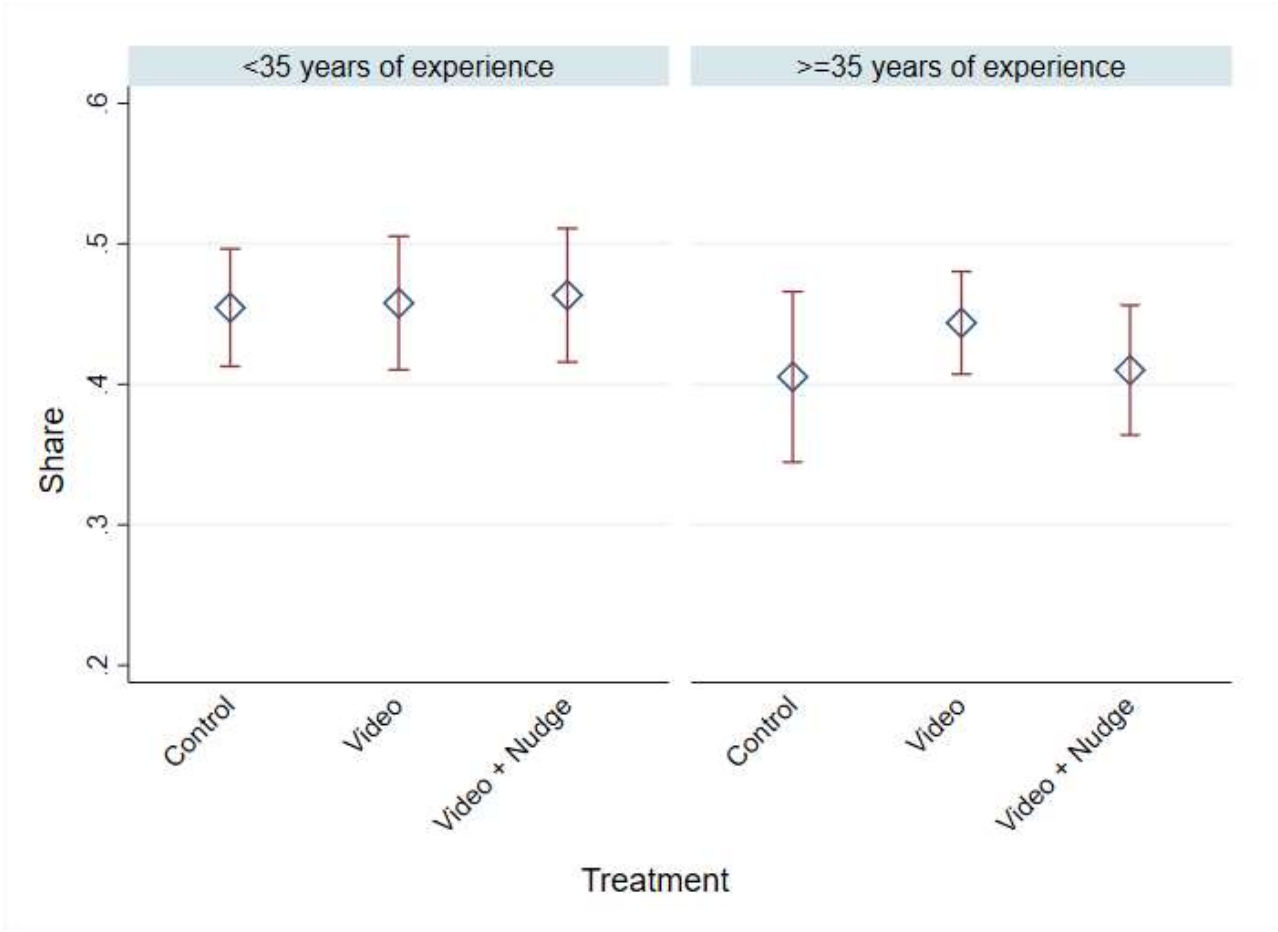


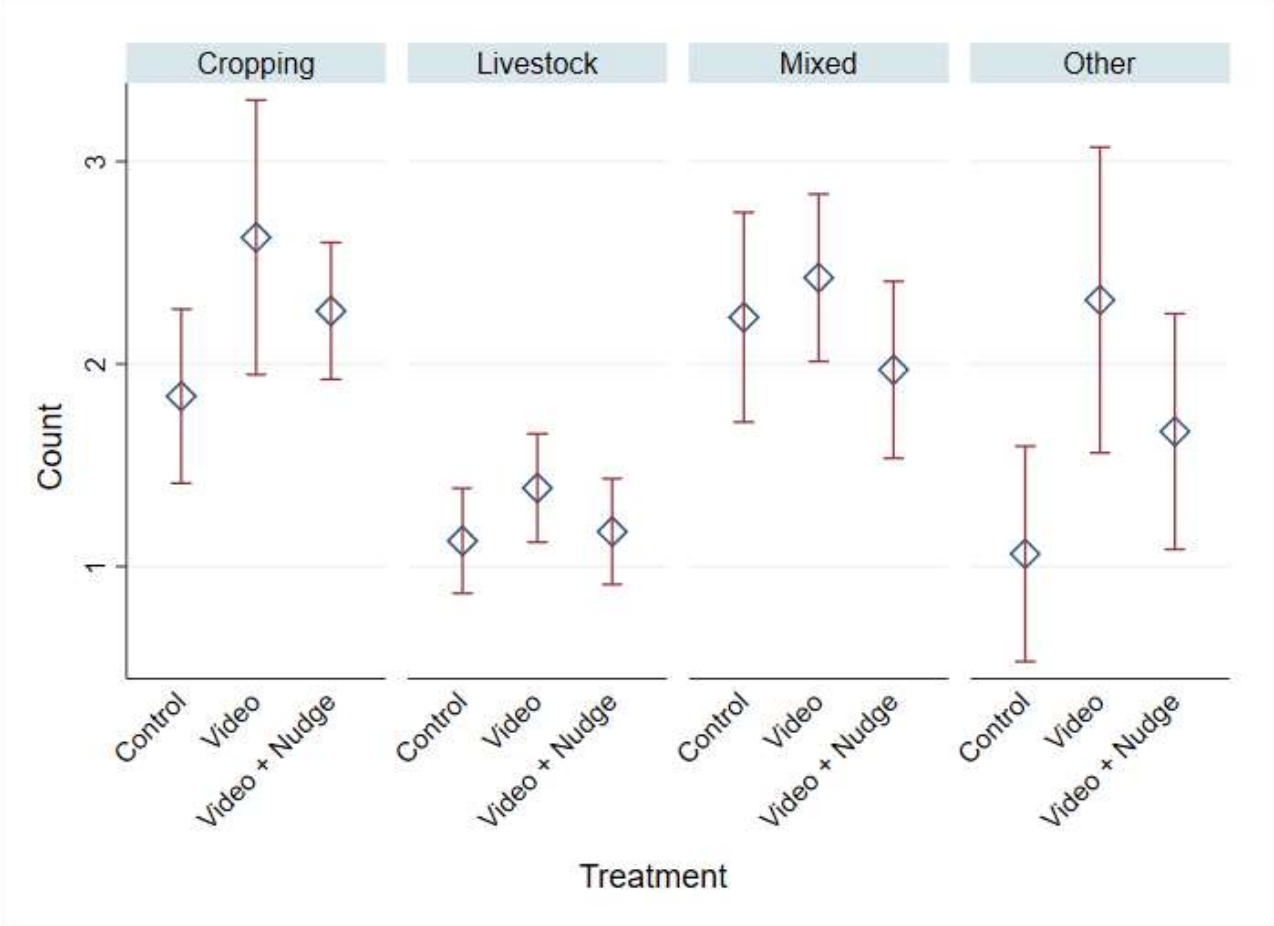
Appendix: Count by experience



Appendix: Share by experience

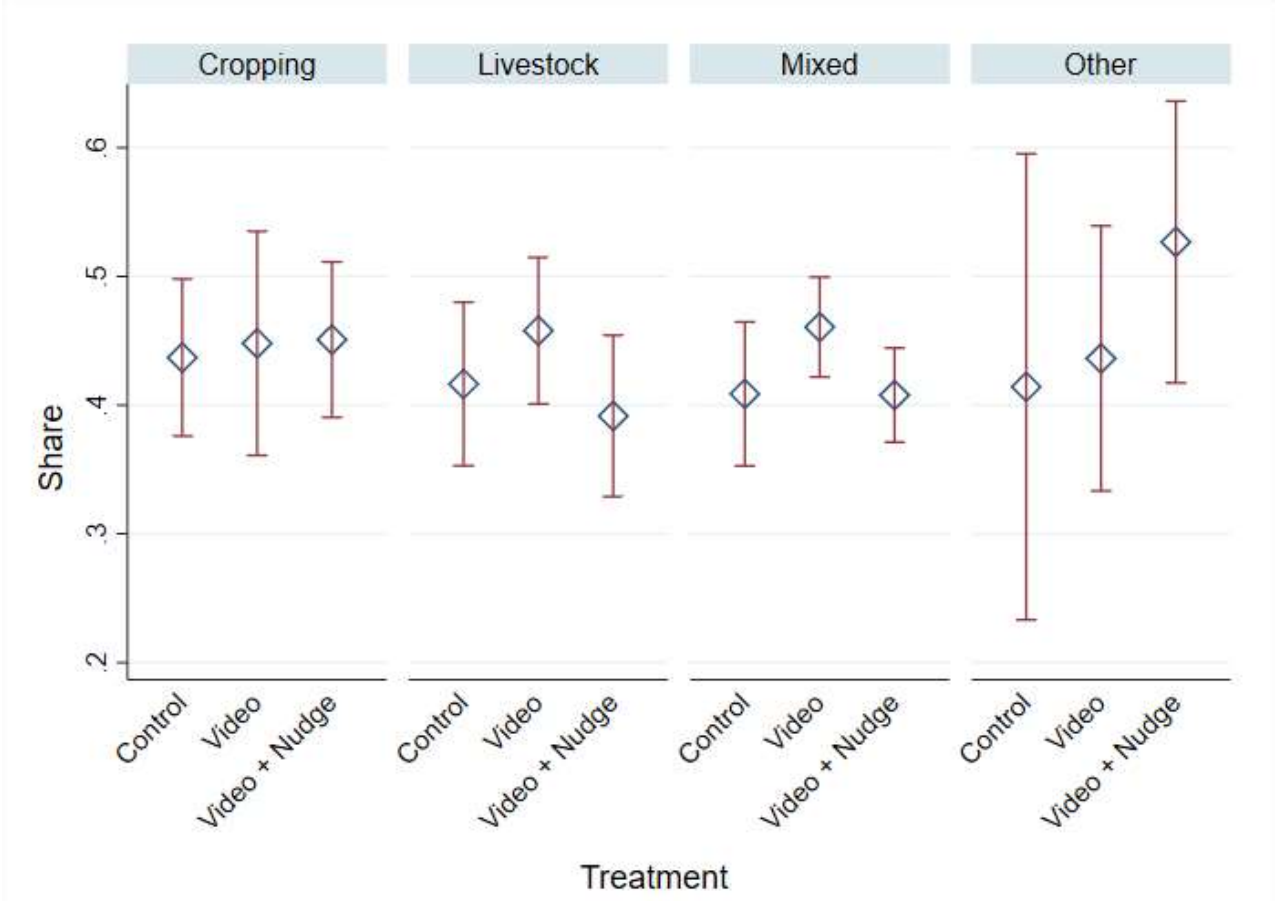


Appendix: Count by farm type



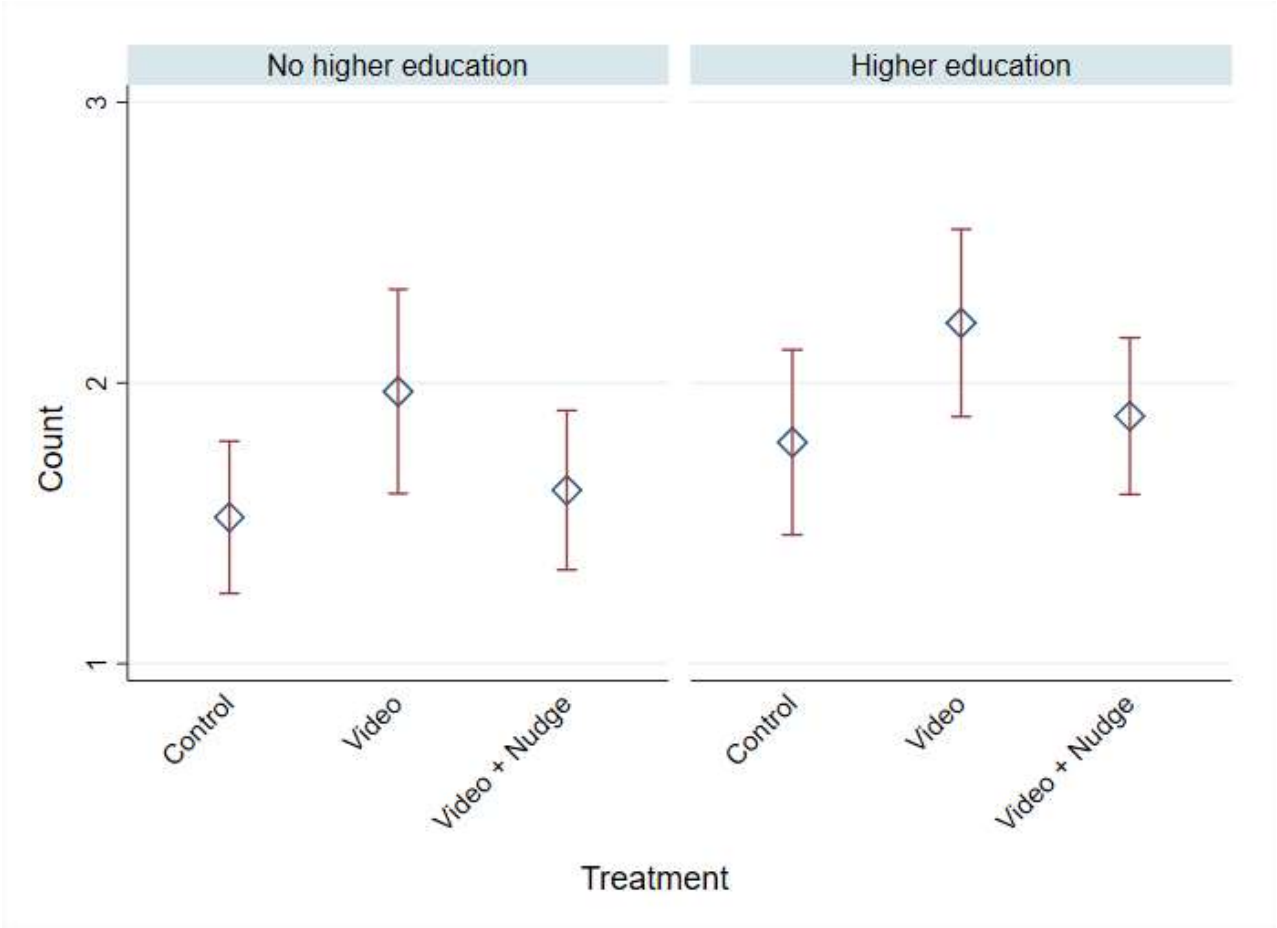
- Cropping (Cereal/General)
- Livestock (Grazing)
- Mixed
- Other (Dairy/Horticulture/Pig and Poultry)

Appendix: Share by farm type

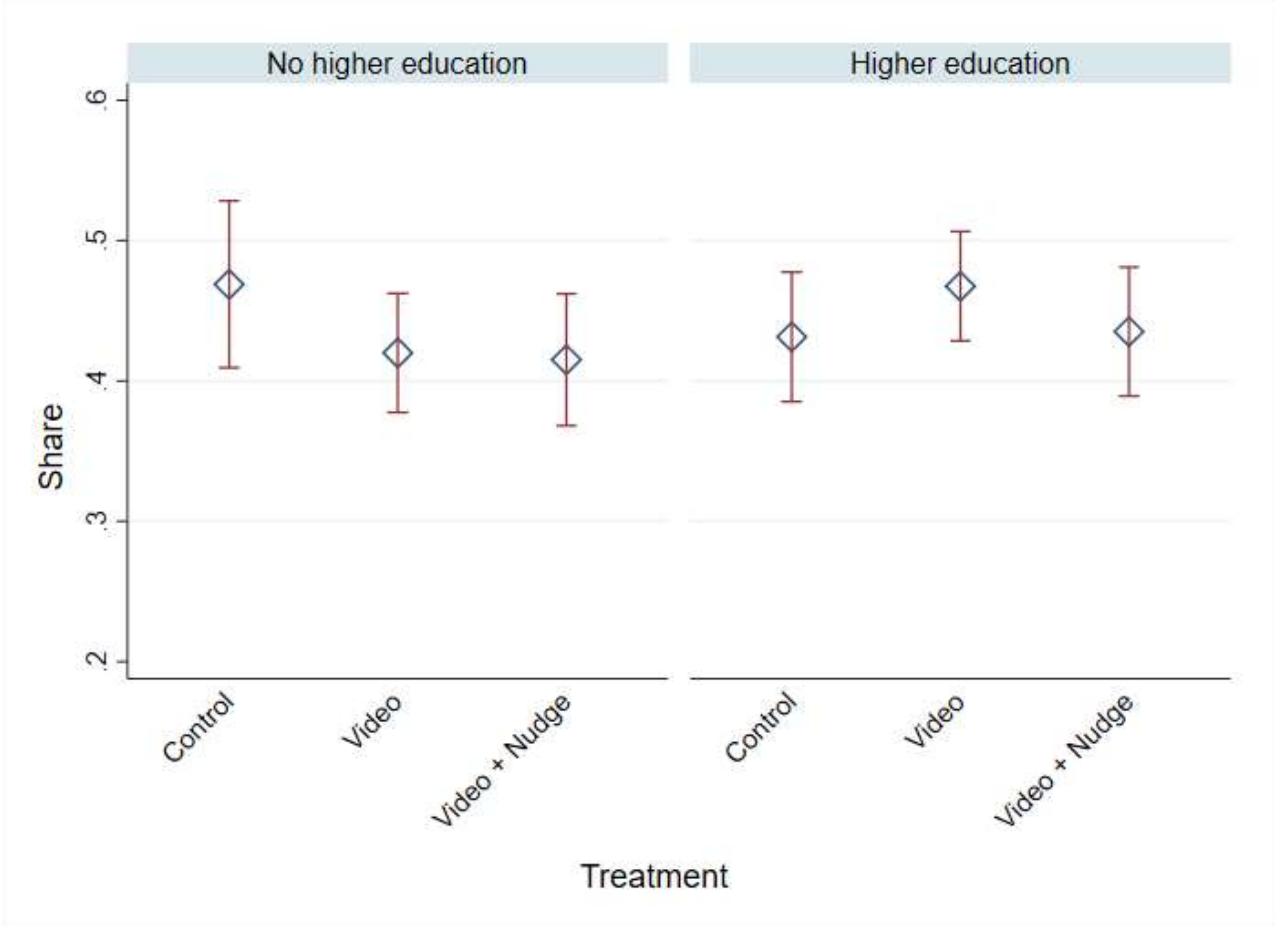


- Cropping (Cereal/General)
- Livestock (Grazing)
- Mixed
- Other (Dairy/Horticulture/Pig and Poultry)

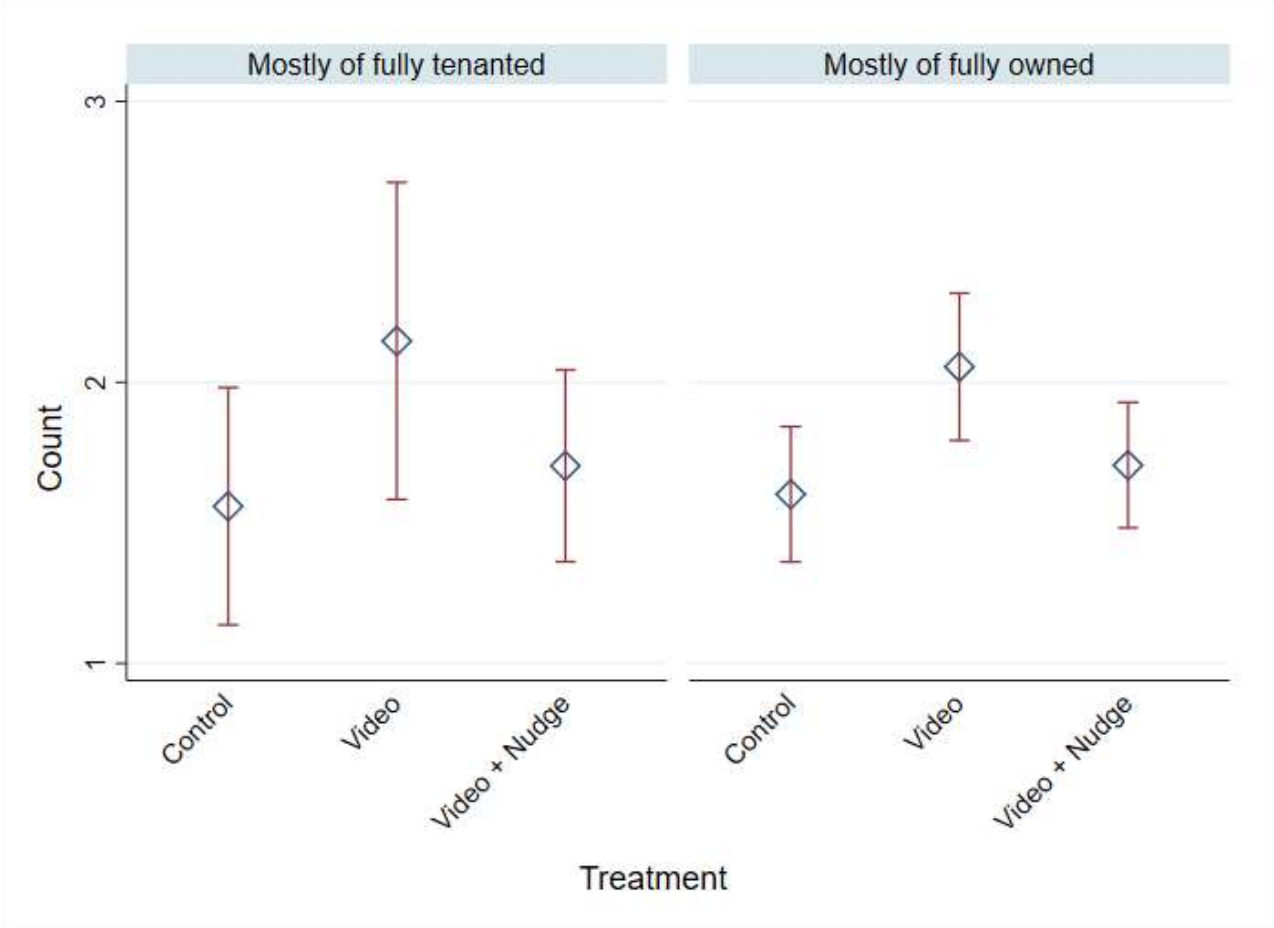
Appendix: Count by education



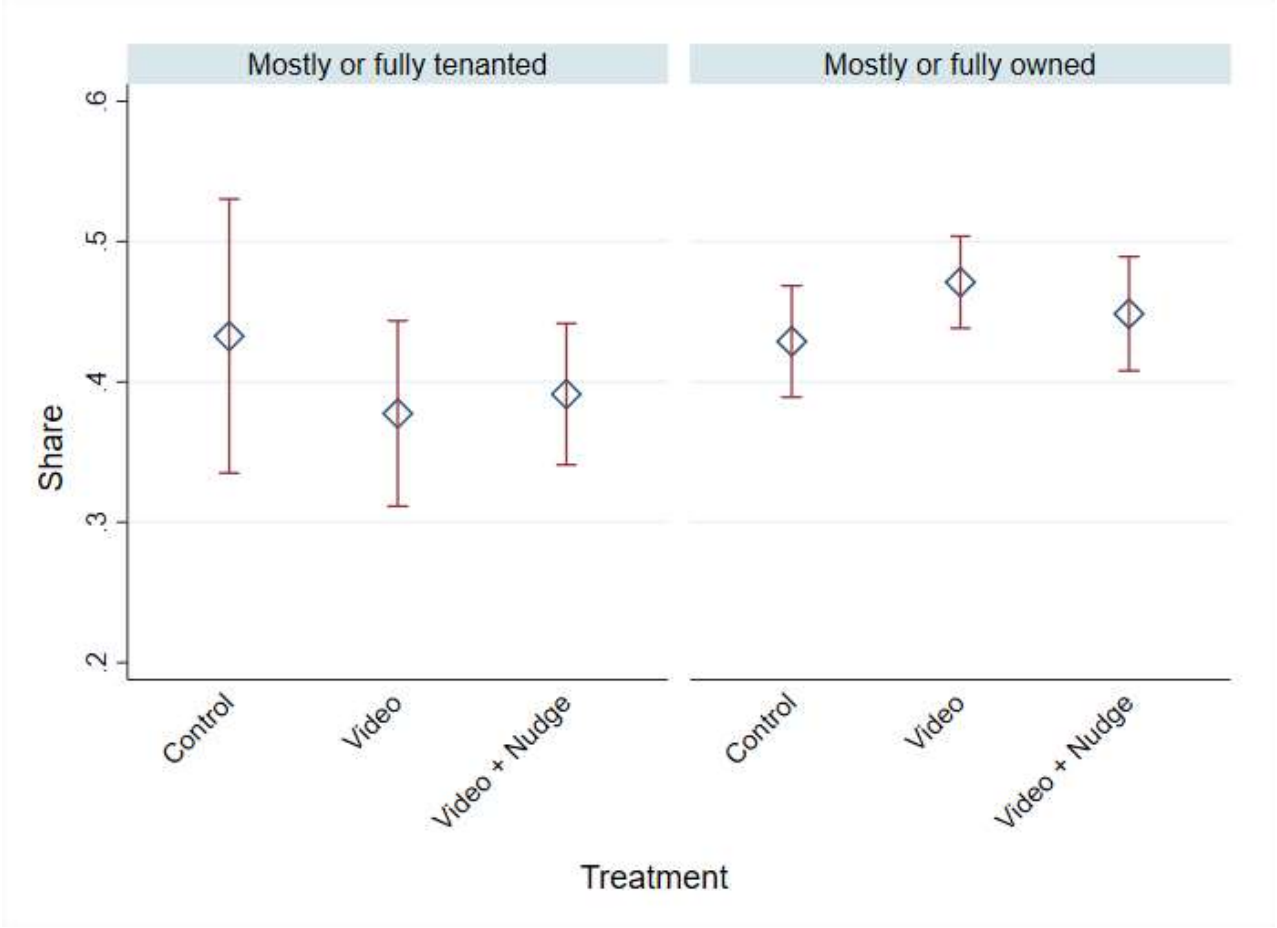
Appendix: Share by education



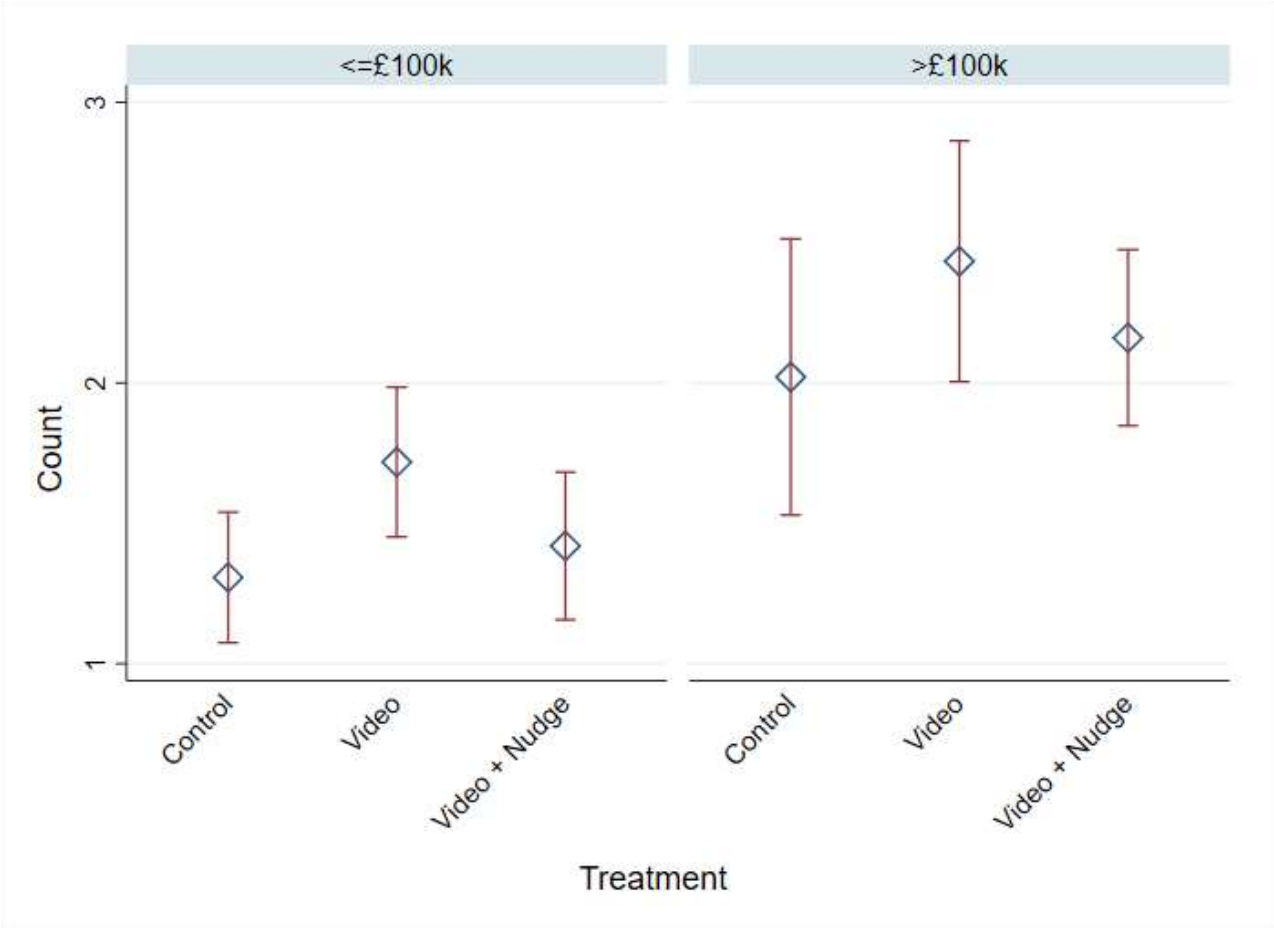
Appendix: Count by land ownership



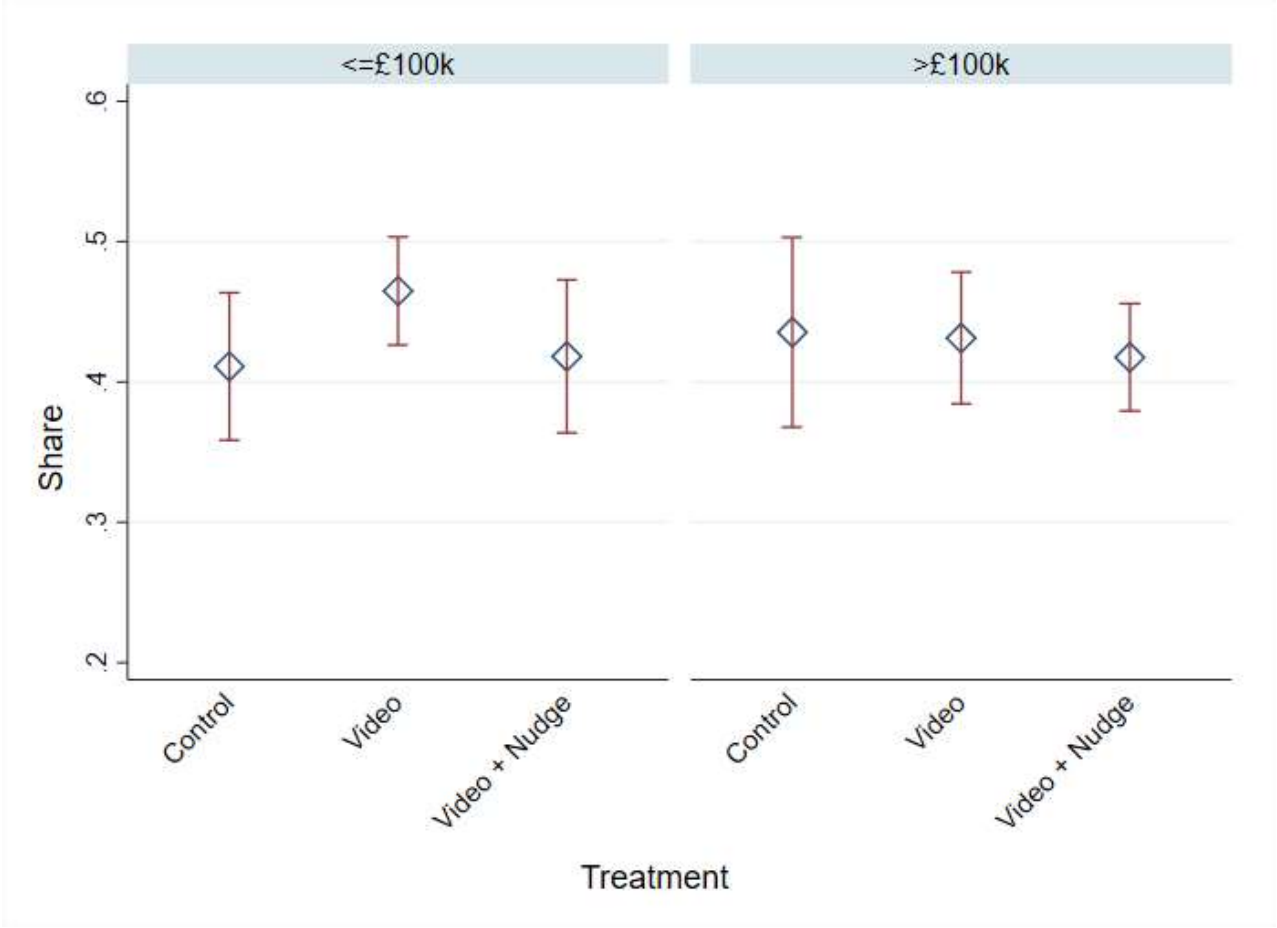
Appendix: Share by land ownership



Appendix: Count by business income



Appendix: Share by business income



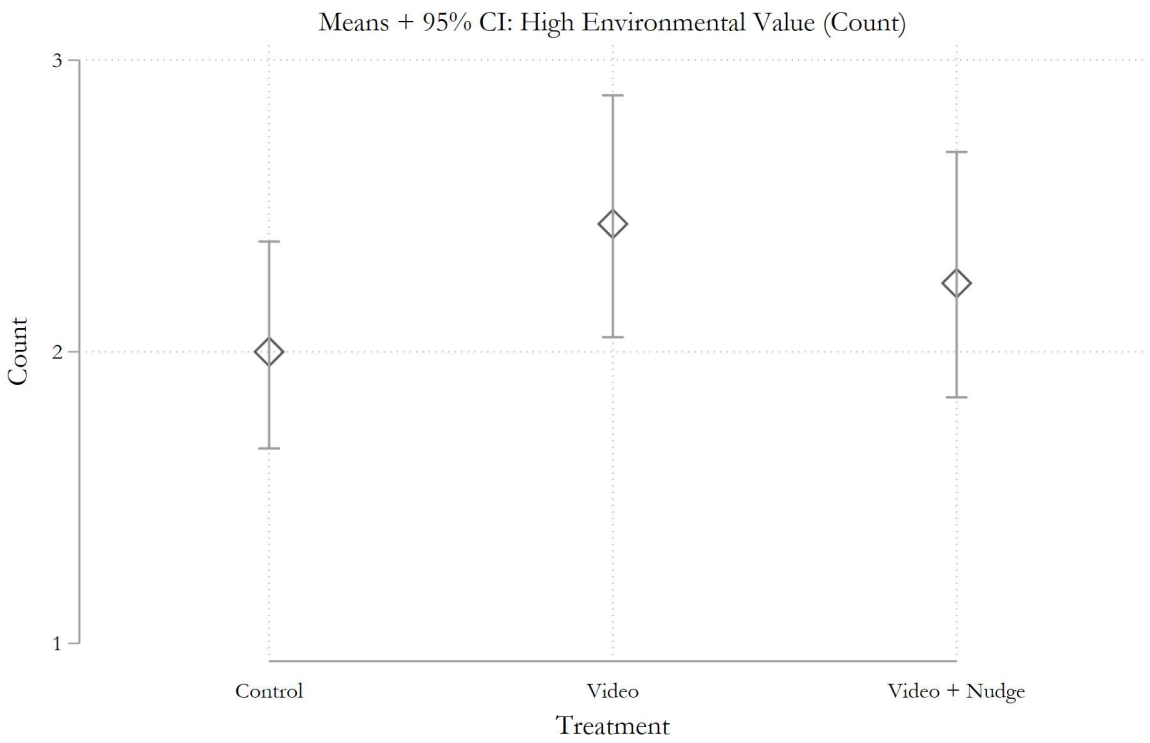
Stratified random sample (farm size & region) only

Treatment	N
T0: Control	64
T1: Video	57
T2: Video + Nudge	51
Total SFI	172

Results: Qualitatively unchanged from the SFI sample

Treatment	Mean number of high collaborative actions (s.d.; out of 7)	Max number of high collaborative actions	Mean share of high collaborative actions (s.d.)
T0: Control	2.00 (1.46)	7	0.46 (0.21)
T1: Video only	2.44 (1.59)	7	0.46 (0.22)
T2: Video + Nudge	2.24 (1.19)	5	0.46 (0.19)

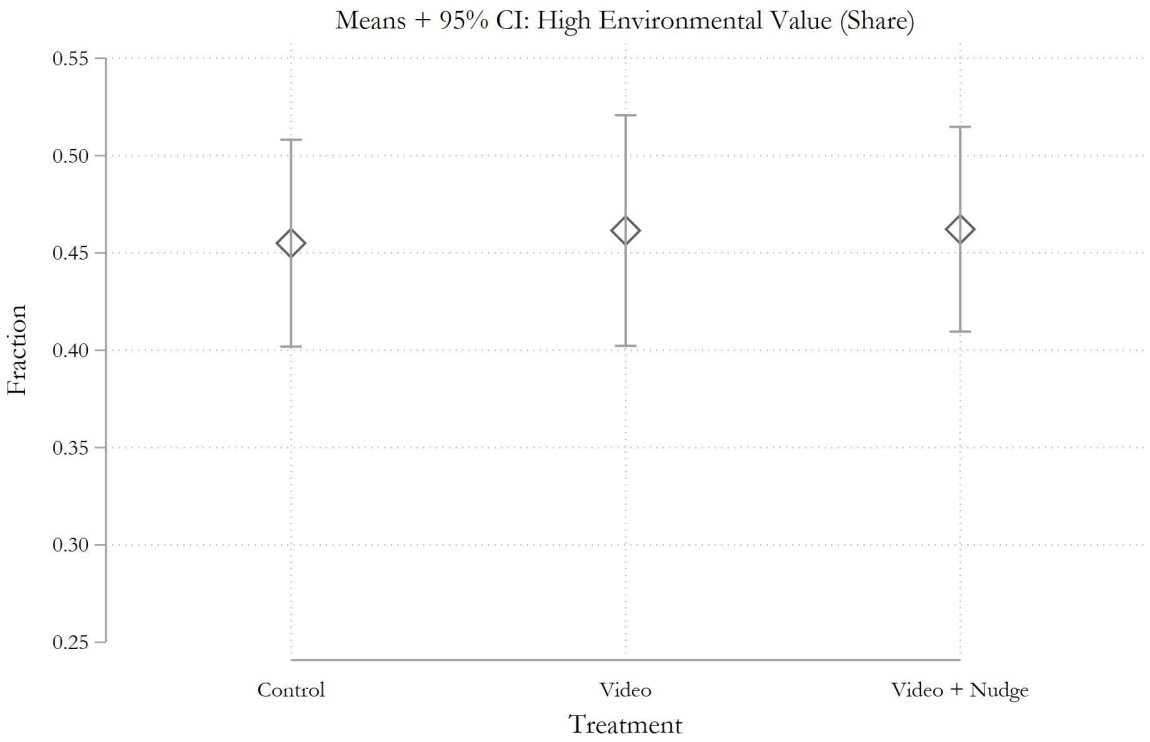
Results: Number of high collaborative actions



In line with H1a, the video significantly increases the number of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-1.75, p=0.040).

Contrary to H1b, the nudge does not significantly increase the number of high collaborative actions chosen (T1<T2; Mann-Whitney Z=0.287, p=0.613).

Results: Share of high collaborative actions



We find no support for H2a: No significant effect of the video on the share of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-0.266, p=0.396).

H2b is not supported: No significant effect of the nudge on the share of high collaborative actions chosen (T1<T2; Mann-Whitney Z=-0.547, p=0.294).

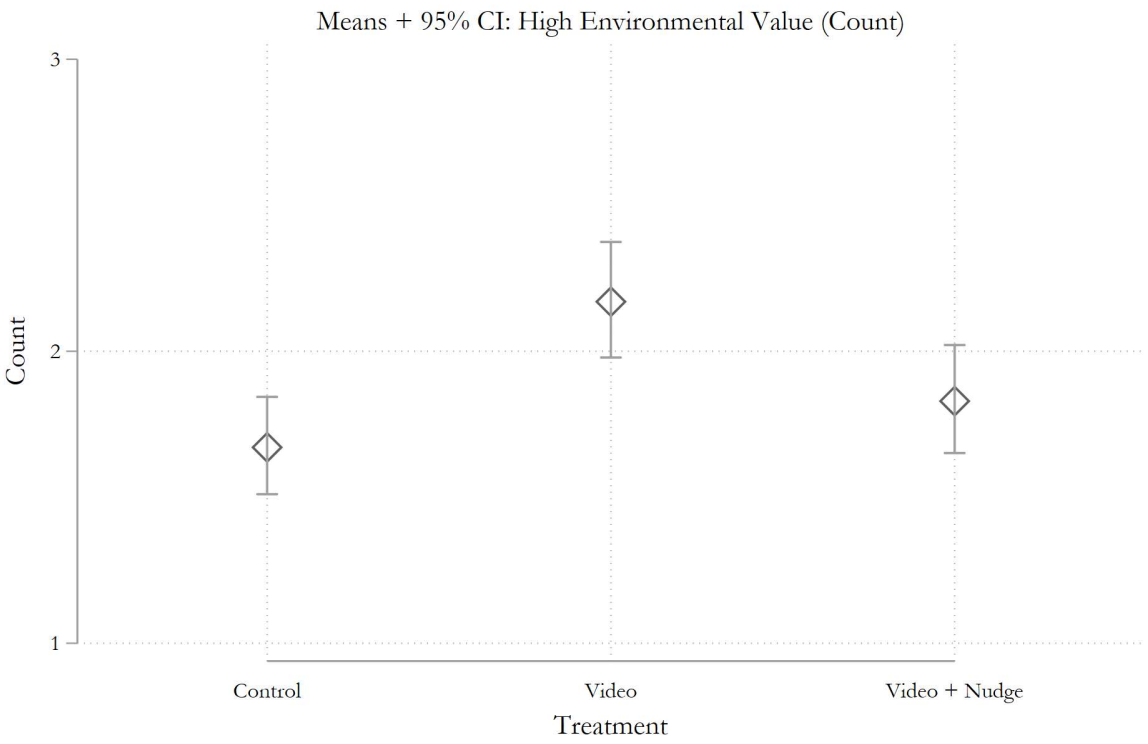
Pooled (SFI + Stratified)

Treatment	N
T0: Control	237
T1: Video	218
T2: Video + Nudge	211
Total SFI	666

Results:

Treatment	Mean number of high collaborative actions (s.d.; out of 7)	Max number of high collaborative actions	Mean share of high collaborative actions (s.d.)
T0: Control	1.67 (1.40)	7	0.44 (0.22)
T1: Video only	2.17 (1.54)	7	0.45 (0.20)
T2: Video + Nudge	1.83 (1.21)	5	0.44 (0.20)

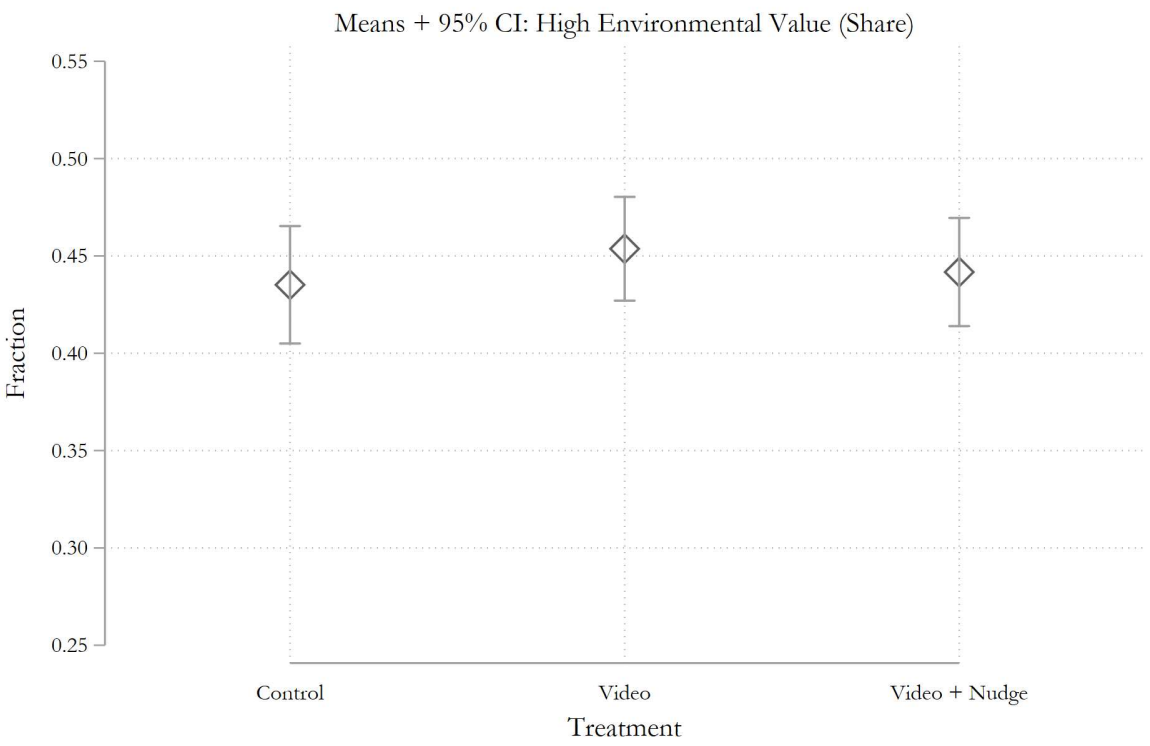
Results: Number of high collaborative actions



In line with H1a, the video highly significantly increases the number of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-3.30, p<0.001).

Contrary to H1b, the nudge significantly decreases the number of high collaborative actions chosen (T1<T2; Mann-Whitney Z=1.94, p=0.026).

Results: Share of high collaborative actions



We find no support for H2a: No significant effect of the video on the share of high collaborative actions chosen (T0<T1/2; Mann-Whitney Z=-0.424, p=0.336).

H2b is not supported: No significant effect of the nudge on the share of high collaborative actions chosen (T1<T2; Mann-Whitney Z=0.363, p=0.642).