

Narrow framing, information treatment, and interactions with domain experience and actuarial fairness

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Motivation--description of context

- People often buy too little insurance, relative to predictions of Expected Utility Theory (EUT)
 - **Long-term care insurance:** Undersubscription despite benefits (Gottlieb & Mitchell 2020)
 - **Annuity markets:** Low uptake despite longevity protection (Brown et al. 2021)
 - **Crop insurance:** Selection of lower coverage levels (Du et al. 2017)
- Different driving factors have been examined
 - Positive loading factors
 - Transactions costs
 - Information constraints
 - **Framing effects:**

“While loss/gain asymmetry...is the most commonly discussed example, framing is a more general phenomenon. Put simply, experimental findings suggest that choices are not based solely on material consequences but instead are filtered through the particular frame that individuals use to interpret the choices.” (Brown et al. 2008)

Motivation—narrow and broad framing

- Framing might be a factor in these suboptimal choices (Barberis, Huang, and Thaler, 2006, AER)
 - **Broad Framing:** “...define utility over total wealth or consumption, an agent who is offered a new gamble evaluates that gamble by merging it with the other risks she already faces and checking whether the combination is attractive.”
 - **Narrow Framing:** “when an agent who is offered a new gamble evaluates that gamble to some extent in isolation, separately from her other risks.”
- Narrow framing provides a compelling explanation for these patterns (e.g., Rabin & Weizsäcker, 2009; Zheng, 2020).
 - Insurance viewed as an investment (return on premium) rather than a risk management tool.
- Providing more comprehensive information has been shown to counter narrow framing
 - Consumption vs. investment framing for annuities increases uptake by 51% (Brown et al., 2008)
 - Distribution graphs of medical spending reduce suboptimal health plan choices (Samek & Sydnor, 2020)

Motivation--crop insurance setting

- The Federal Crop Insurance Program (FCIP) provides an ideal setting to address these questions.
 - Covered over 85% of planted acres of major U.S. crops (RMA 2024)
 - Farmers purchase FCIP policies annually and frequently receive indemnities
 - Many farmers constantly choose lower coverage levels despite EUT dominance (Du et al., 2017).
 - Return-on-premium perspective (narrow framing) may explain these suboptimal choices (Babcock, 2015; Feng et al., 2020).
- Research questions:
 - Does experience with insurance temper the impact of narrow framing?
 - How do the information treatment effects differ across insurance products with different familiarity levels?

Motivation—what we do

- Building on existing literature, we set up a conceptual framework of farmers' crop insurance decisions that accommodates both broad framing (BF) and narrow framing (NF).
- Using our framework, we hypothesize how BF and NF will affect farmers' coverage level choices.
 - We identify two channels through which NF messaging can affect insurance choices.
- We conducted two experiments with farmers:
 - A. the 1st one mimics crop insurance coverage level decisions in the United States
 - B. the 2nd is about insurance decisions on a generic asset insurance

Preview of some main findings

- Suboptimal crop insurance choices that indicate under-insurance are chosen by significant proportions of participants in experiments in both familiar or unfamiliar domains.
- Domain familiarity significantly affects the information treatment effectiveness
- In the crop insurance experiment,
 - Narrow-framing information that highlights indemnity results reduces suboptimal choices, especially when the net indemnity distribution figure is shown.
- In the asset insurance experiment,
 - we obtain opposite results—narrow framing leads to lower insurance demand. This result is consistent with the typical findings in the literature
- Broad-framing information that shows net revenue figures does not reduce suboptimal choices.

Theoretical framework--crop insurance setting:

- Probability distribution of revenue r :

$$F(r) \equiv \int_0^{\hat{r}} f(r) dr .$$

- The expected crop revenue:

$$\bar{r} \equiv E(r) = \int_0^{\hat{r}} r dF(r) .$$

- Crop insurance policy with coverage level ϕ ,
guarantees revenue at $G(\phi) \equiv \phi \bar{r}$.
- Indemnity is $n(\phi) \equiv \max(G(\phi) - r, 0)$,
the expected indemnity $E((n(\phi)))$.
- Premium is $p(\phi) \equiv E((n(\phi)))$,
representing the actuarially fair premium.

Theoretical framework—perceived premium

- The U.S. government subsidizes crop insurance.
- Farmers may still perceive the premium as not actuarially fair and too expensive.
- We introduce a scaling factor τ to capture farmers' perceptions.
- Let $\tilde{p} = (1 + \tau)E(n(\phi)) = (1 + \tau)p(\phi)$ represent the farmer's perception:
 - $\tau = 0$: perceived the insurance policy as actuarially fair.
 - $\tau > 0$: perceived the policy as too expensive.
 - $\tau < 0$: perceived the policy as actuarially favorable.

Theoretical framework--Farmers' decision making

- (perceived) Total net return: $r + n(\phi) - (1 + \tau)p(\phi)$
- (perceived) Net payout from insurance: $n(\phi) - (1 + \tau)p(\phi)$
- Farmer's decisionmaking framework:
 - **Broad Framing**: based on total net return
$$E[u(r + n(\phi) - (1 + \tau)p(\phi))]$$
 - **Narrow Framing**: based net payout from insurance
$$E[g(n(\phi) - (1 + \tau)p(\phi))]$$
- Assumption: farmers make decisions on a weighted average of broad frame (BF) and narrow framing (NF)
- $$U(\phi; \alpha, \tau) = E[(1 - \alpha)u(r + n(\phi) - (1 + \tau)p(\phi)) + \alpha g(n(\phi) - (1 + \tau)p(\phi))]$$

Theoretical framework--Information treatment effects

- Broad framing (BF) messaging makes the total net return part more salient and thus increase the weight, $(1 - \alpha)$, for BF part of the payoff.
- Similarly, narrow framing (NF) messaging makes the payout from insurance more salient and thus increase the weight, (α) , for NF part of the payoff.
- BF and NF nudges can have the side effect of changing τ , the perceived actuarial fairness of an insurance policy.
 - If so, then the eventual τ and α will determine the overall effects of BF and NF information nudges.

Theoretical framework—linkage with experiments

We consider farmer's choice between two coverage levels ϕ^+ and ϕ^- with $0 \leq \phi^- < \phi^+ \leq \hat{\phi}$.

	$\alpha = 0$ (Broad framing)	$\alpha \in (0,1)$ (Partial narrow framing)	$\alpha = 1$ (Narrow framing)
$\tau < 0$ (actuarially favorable)	ϕ^+	Either; depending on other factors	Either; depending on other factors
$\tau = 0$ (actuarially fair)	ϕ^+	Either; depending on other factors	ϕ^-
$\tau > 0$ (actuarially unfair)	Either; depending on other factors	Either; depending on other factors	ϕ^-

Specific questions for experiments:

- How does NF and BF messaging affect the choices between ϕ^+ and ϕ^- , i.e., a higher vs lower coverage level?
- What are the likely effects of domain experience and actuarial fairness?

Survey and Experiment

- We conduct two complementary experiments involving 653 corn producers from Iowa and Kansas.
 - Experiment 1: FCIP-like crop insurance decisions under four information frames
 - Experiment 2: Insurance for hypothetical risky asset (unfamiliar context) under two information frames
- Participation was restricted to farmers from Iowa and Kansas who planted at least 100 corn acres in either 2021 or 2022.
- The survey was administered in two waves through the Qualtrics online survey platform.
- In total, 653 farmers participated: 330 in the first wave and 323 in the second, with 476 from Iowa and 177 from Kansas.

Crop Insurance Experiment—experiments

Experiment 1: Crop insurance experiment (Domain experiment)

1. Broad-framing, Table only (BF-T)

- Coverage level
- Out-of-pocket premium
- *Revenue guarantee*

2. Broad-framing, Table + Graph (BF-G)

- BF-T information
- *Net revenue distribution figure*

3. Narrow-framing, Table only (NF-T)

- Coverage level
- Out-of-pocket premium
- *Average indemnity over 20 years*
- *# of years receiving indemnity*

4. Narrow-framing, Table + Graph (NF-G)

- NF-T information
- *Net indemnity distribution figure*

Experiment 2: Asset insurance experiment (Non-domain experiment)

1. BF-T (includes both BF-T & BF-G farmers from the crop insurance experiment)

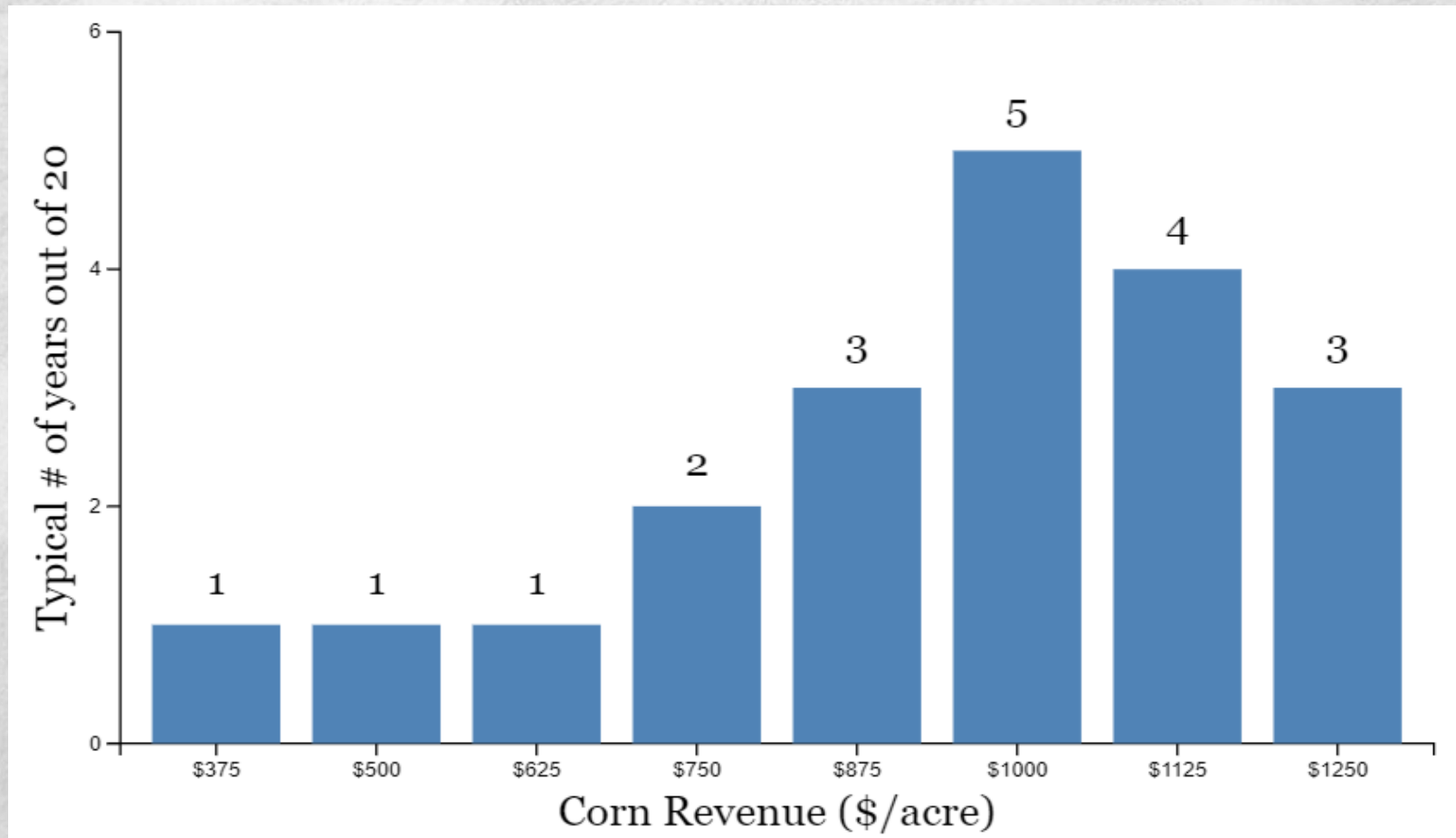
- Contract name
- Out-of-pocket premium
- *Asset return guarantee*

2. NF-T (includes both NF-T & NF-G farmers from the crop insurance experiment)

- Contract name
- Out-of-pocket premium
- *Average indemnity over 20 years*
- *# of years receiving indemnity*

Crop Insurance Experiment—distribution of revenue

- Farmers saw the following revenue distribution at the beginning of the experiment:



Crop Insurance Experiment

- Each farmer evaluate six questions involve three comparisons:
 - 55% coverage level vs. 65% coverage level
 - 65% coverage level vs. 75% coverage level
 - 75% coverage level vs. 85% coverage level
- Each comparison appeared twice:
 - once with unsubsidized actuarially fair premiums, and
 - once with premiums subsidized at the FCIP enterprise unit subsidy rates.
 - Under EUT, risk-averse farmers should choose the higher coverage level in each question.
- Farmers were randomly assigned into four groups:
 - Baseline Group (BF-T)
 - Broad-framing Group (BF-G)
 - Narrow-framing, Table-only Group (NF-T)
 - Narrow-framing, Table & Figure, Group (NF-G)

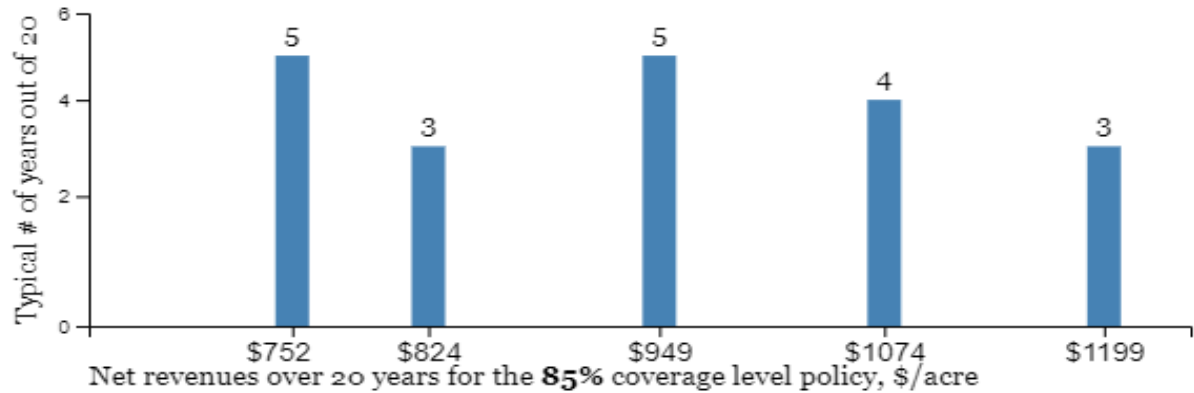
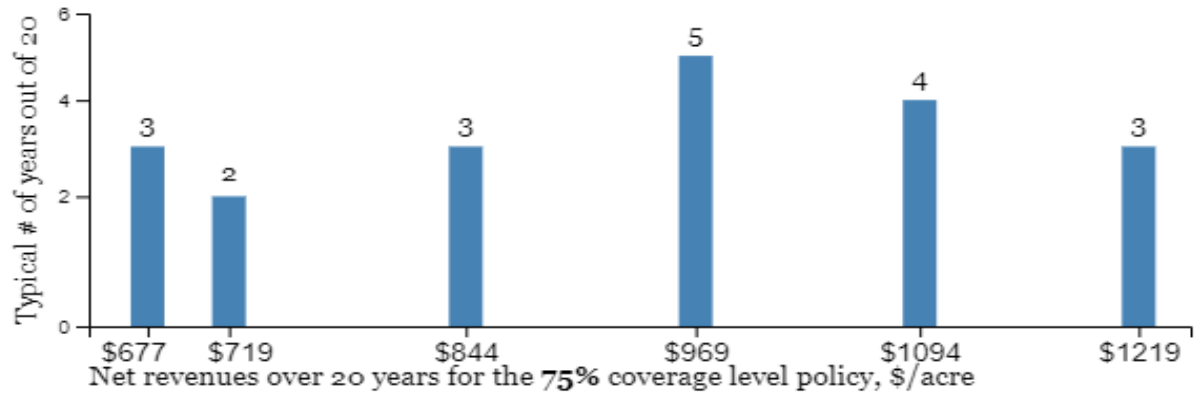
The table below shows two crop insurance policies. It lists the coverage level, out-of-pocket premium and revenue guarantee for each policy. The figure below the table plots **the net revenues over 20 years** for each policy.

[If you do not remember the corn revenue distribution in the earlier figure, click [here](#) to show/hide it]

Crop insurance policies: 75% vs 85% coverage level

Coverage level	Out-of-pocket premium	Revenue guarantee
(%)	(\$/acre)	(\$/acre)
75	31.2	708
85	50.5	802

→ **Baseline Group**

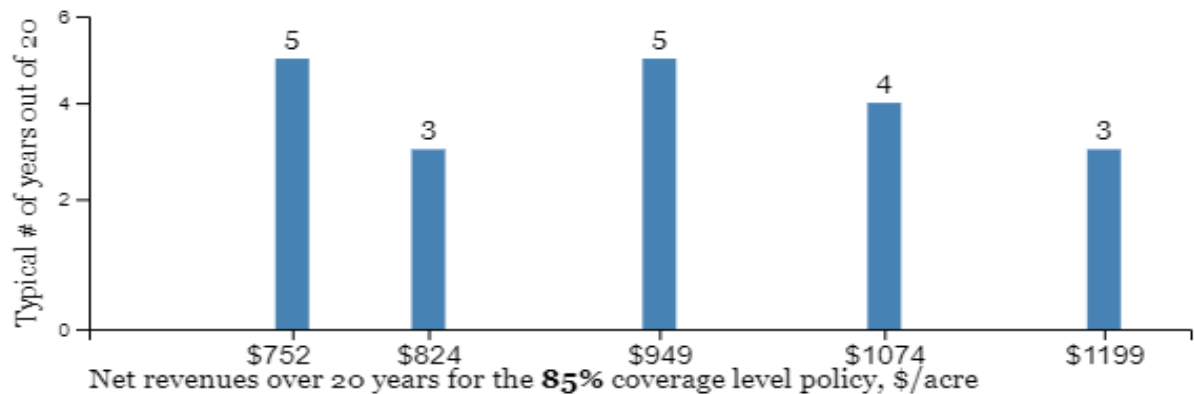
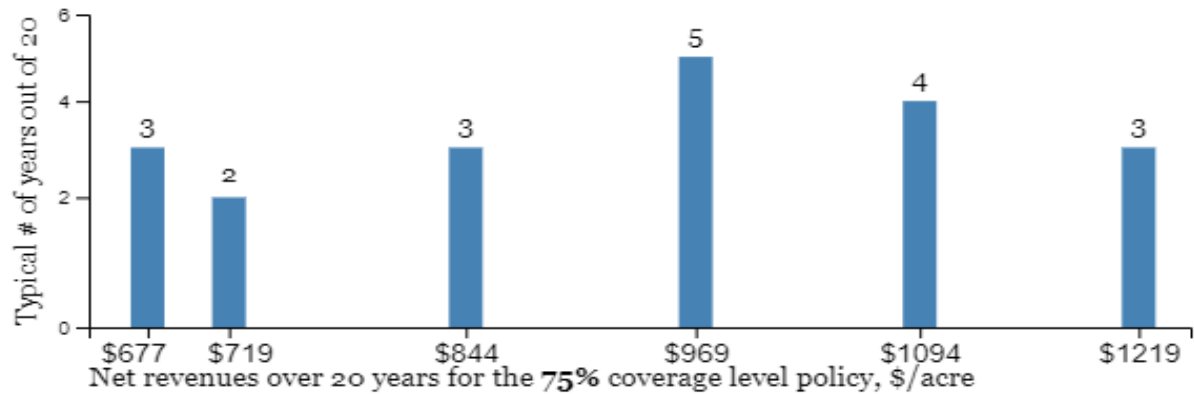


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Broad-Framing Table and Figure

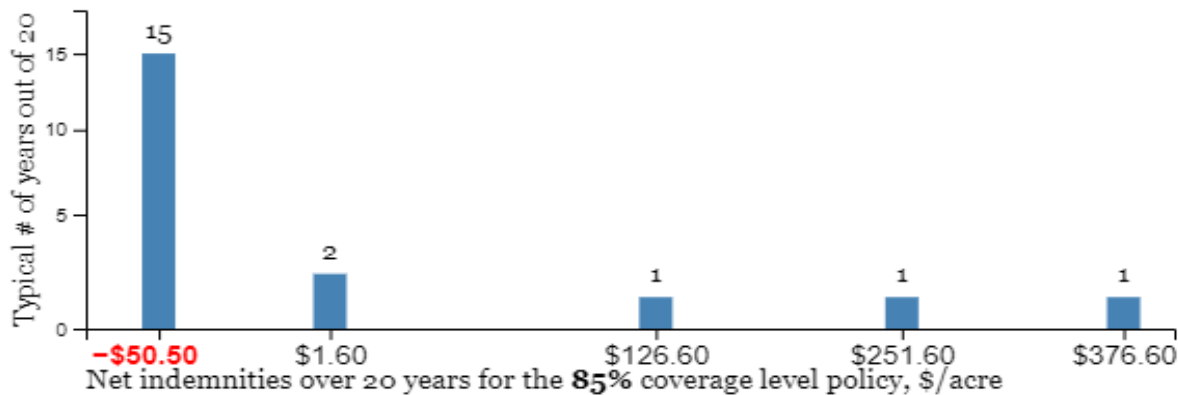
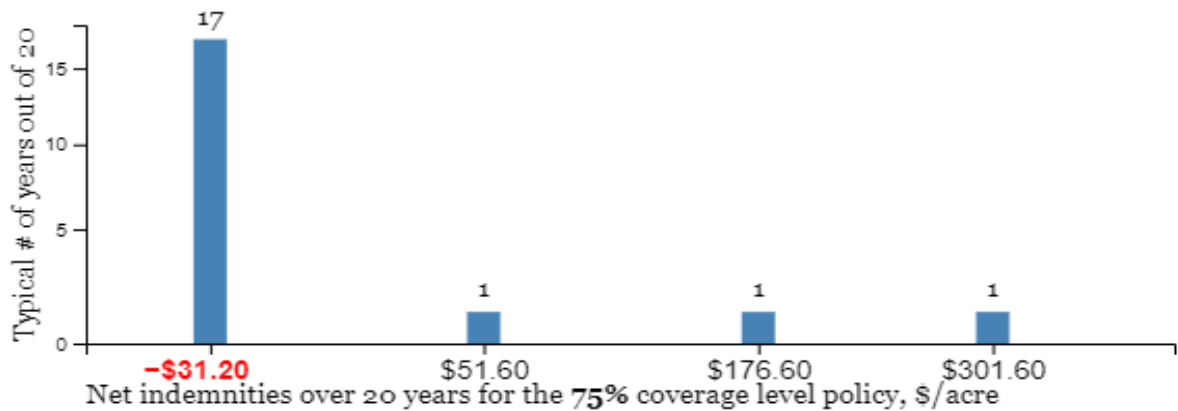
The table below shows two crop insurance policies. It lists the coverage level, out-of-pocket premium, average indemnity over 20 years, and number of years out of 20 with net indemnity greater than 0. The figure below the table plots **the net indemnities over 20 years** for each policy.

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Crop insurance policies: 75% vs 85% coverage level

Coverage level	Out-of-pocket premium	Average indemnity over 20 years	# of years out of 20 with net indemnity >0
(%)	(\$/acre)	(\$/acre)	
75	31.2	31.2	3
85	50.5	50.5	5

Narrow-framing, Table Only

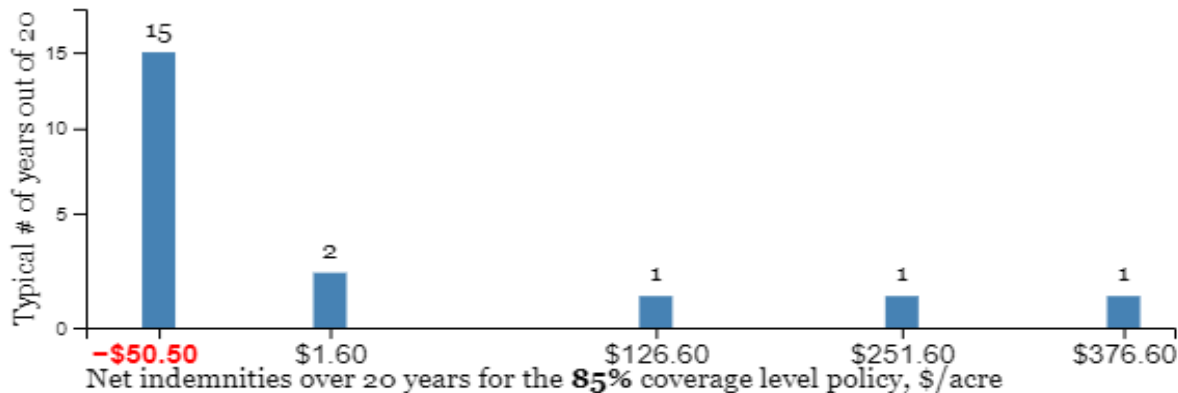
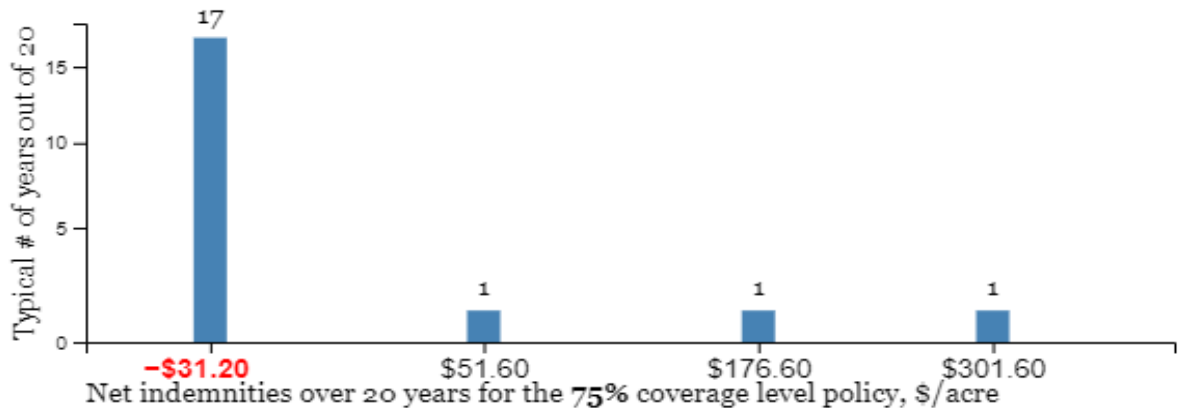


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Narrow-framing, Table & Figure

Asset Insurance Experiment

- At the beginning of the asset insurance experiment, farmers saw this information:

In this section, we will ask you to make insurance decisions for a risky asset whose potential returns are shown in the table below.

For a typical year, the risky asset has three potential returns: \$150 (high), \$100 (medium), and \$20 (low). If you own this asset for 20 years, you can typically expect it to pay out \$150 for 5 out of 20 years, \$100 for 10 out of 20 years, and \$20 for 5 out of 20 years.

The distribution of asset returns over a typical twenty-year period

Asset return	High	Medium	Low
Value for each return	\$150	\$100	\$20
Typical number of years out of 20	5	10	5

Asset Insurance Experiment

- Each farmer evaluates six questions involve three comparisons:

Contract 1

\$5 contract

vs.

Contract 2

\$10 contract

\$10 contract

vs.

\$15 contract

\$15 contract

vs.

\$20 contract

- Each comparison appeared twice:
 - once with unsubsidized actuarially fair premiums, and
 - once with a constant 50% subsidy rate.
- Under EUT, risk-averse farmers should choose the higher-premium contract in each question.

Asset Insurance Experiment

- Baseline Group farmers saw this table

The table below shows two insurance contracts with the respective contract prices and insured return guarantees.

[If you do not remember the asset return distribution table, you can click [here](#) to show/hide it]

Insurance contract	Contract Price	Insured return guarantee
Contract 1	\$15	\$80
Contract 2	\$20	\$100

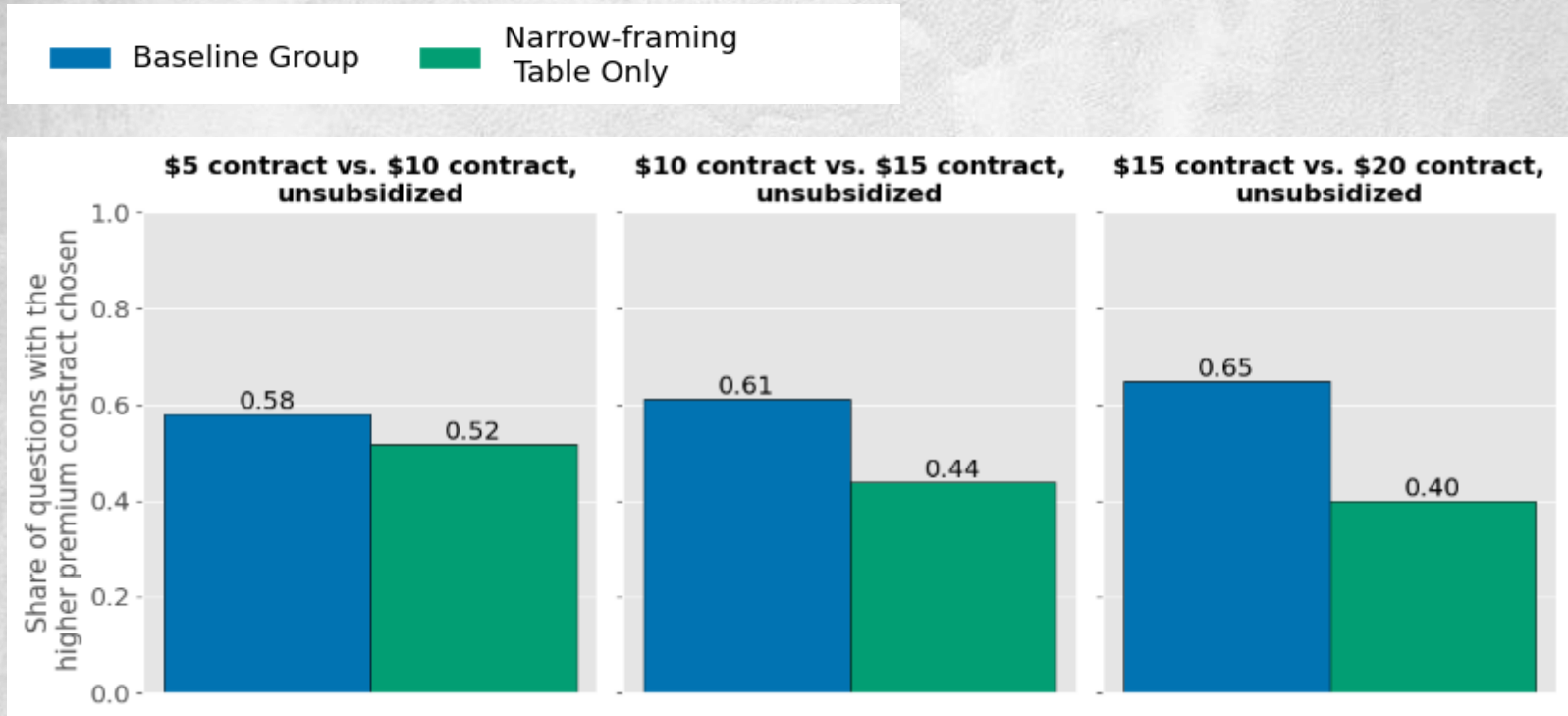
- Narrow-framing Group farmers saw this table

The table below shows two insurance contracts with the respective contract prices, average insurance indemnities over 20 years, and numbers of years out of 20 with net indemnity greater than 0.

[If you do not remember the asset return distribution table, you can click [here](#) to show/hide it]

Insurance contract	Contract Price	Average insurance indemnity over 20 years	# of years out of 20 with net indemnity >0
Contract 1	\$15	\$15	5
Contract 2	\$20	\$20	5

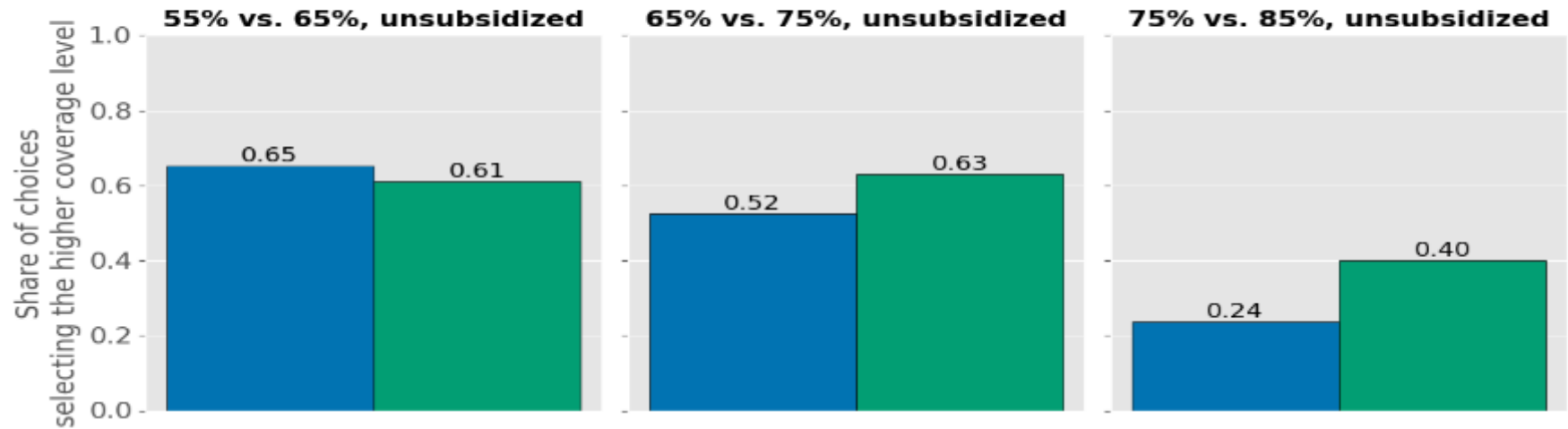
Share of choosing higher cover level— Asset Insurance



Without subsidy
(actuarially fair premium)

Share of choosing higher cover level—crop insurance

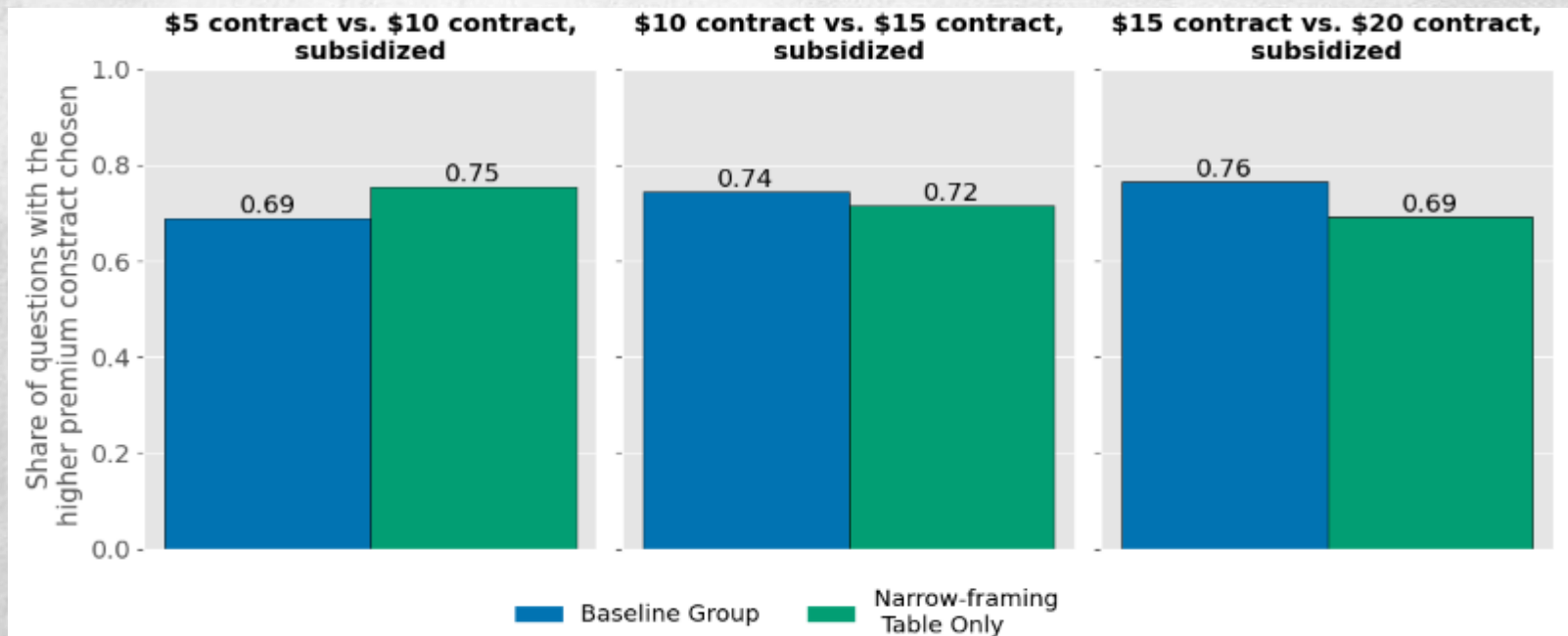
Baseline Group Narrow-framing
Table Only



Without subsidy
(actuarially fair premium)

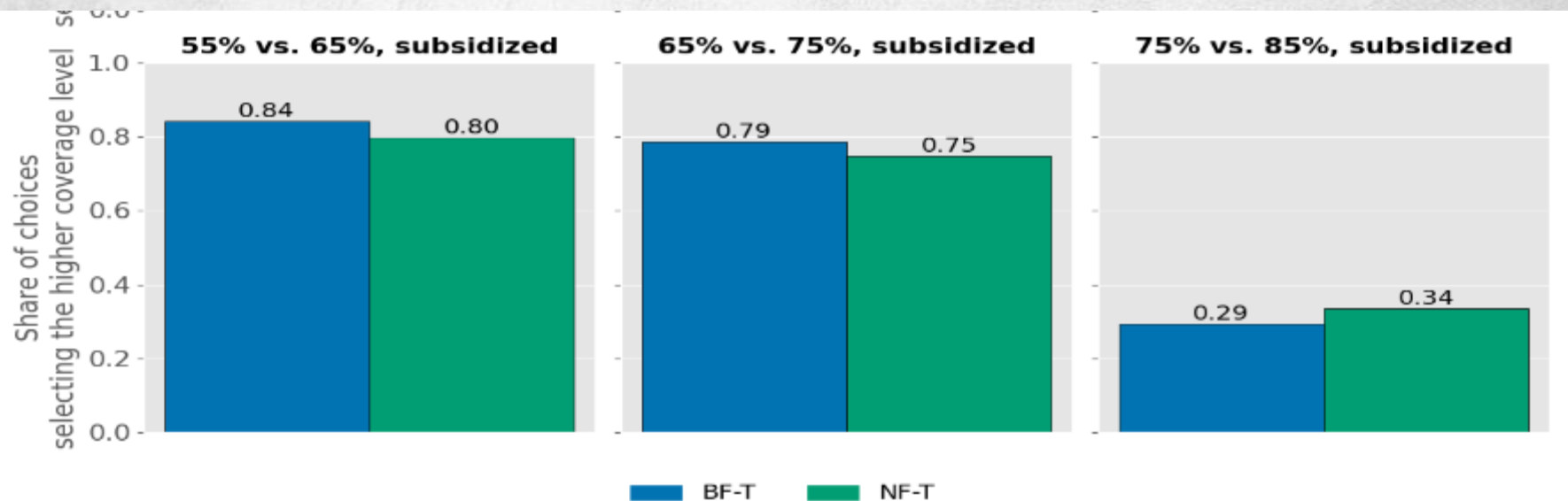
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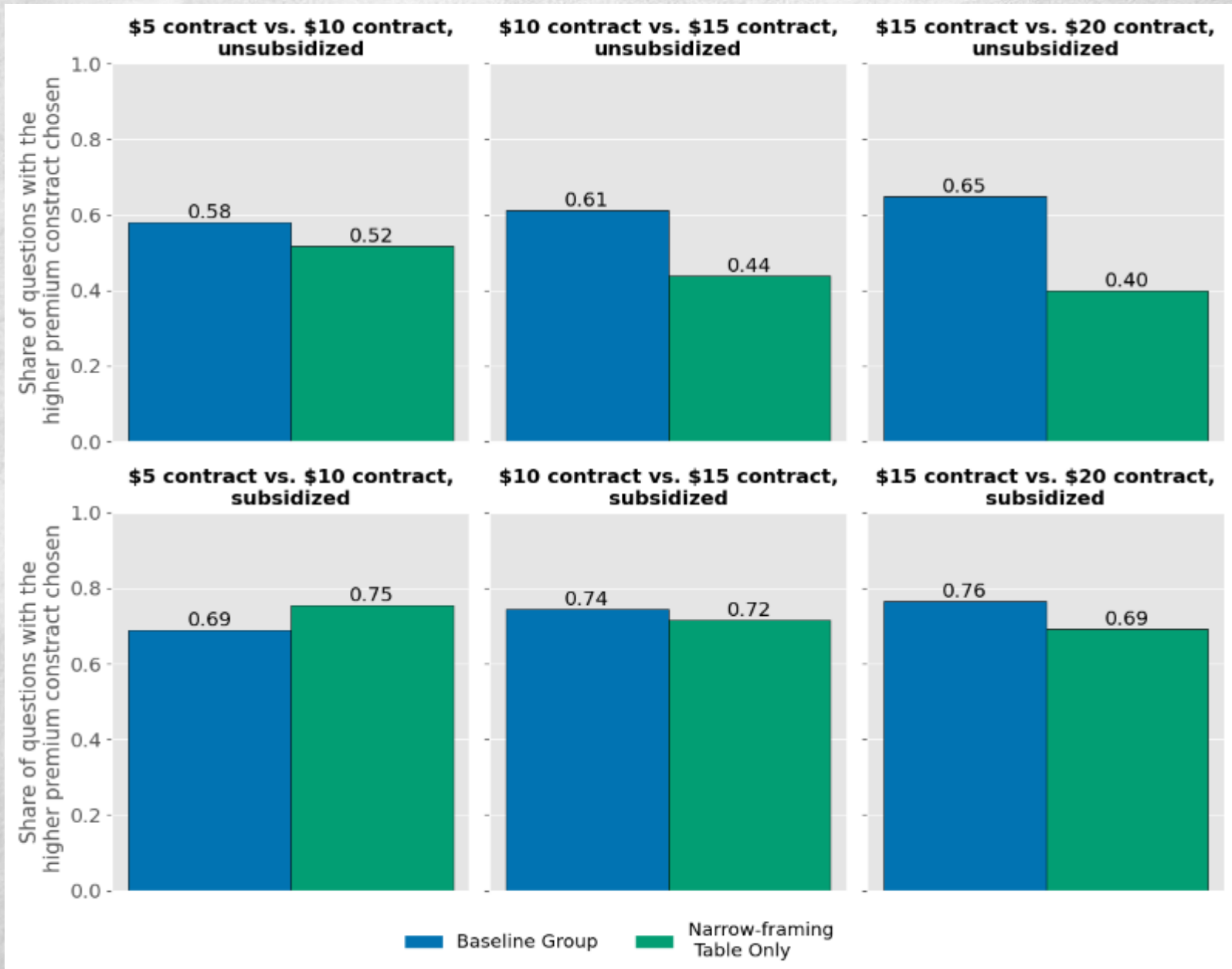


Share of choosing higher cover level—crop insurance

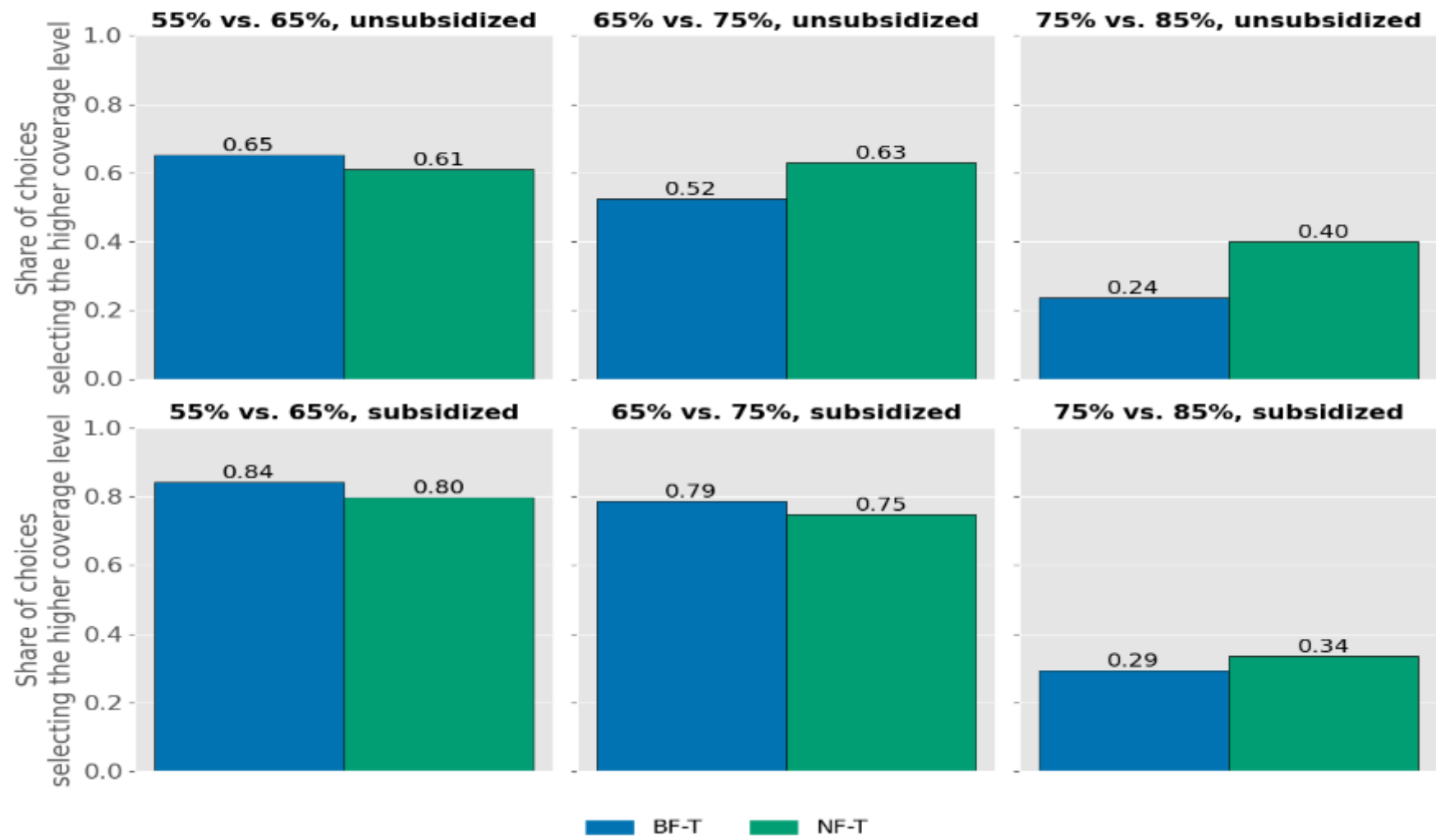
With subsidy
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Share of choosing higher cover level— Asset Insurance



Share of choosing higher cover level—crop insurance



Model

$$High_{i,j} = \alpha_0 + \alpha_1 Group_i + \alpha_2 Comp_j + \alpha_3 Subsidy_j + \alpha_4 X_i + \varepsilon_i$$

i denotes farmer and $j \in \{1, 2, \dots, 6\}$ denotes the j -th question farmer i answers.

- $High_{i,j}$ is a dummy variable which equals 1 if farmer i chose the higher coverage level policy in question j and equals 0 otherwise.
- $Group_i$ is a set of four dummy variables denoting the framing group that farmer i was assigned to.
- $Comp_j$ is a set of three dummy variables denoting the two coverage levels that question j compares: 55% vs. 65%, 65% vs. 75%, and 75% vs. 85%.
- $Subsidy_j$ is a dummy variable which equals 1 if question j involves premium subsidies and equals 0 otherwise.
- X_i is the set of control variables about farmer i as listed in Table 1.
- ε_i is the error term.

Regression results

	y: Choosing the higher coverage level = 1			
VARIABLES	Full sample	55% vs. 65%	65% vs. 75%	75% vs. 85%
Broad-framing Group	-0.017 (0.035)	-0.144*** (0.046)	-0.072 (0.044)	0.153*** (0.044)
Narrow-framing, table only	0.029 (0.032)	-0.042 (0.040)	-0.002 (0.042)	0.119*** (0.041)
Narrow-framing, table & figure	0.089*** (0.034)	0.045 (0.040)	0.029 (0.043)	0.199*** (0.043)
Subsidy	0.138*** (0.013)	0.169*** (0.020)	0.195*** (0.021)	0.033* (0.019)
Comparison: 65% vs. 75%	-0.045*** (0.016)			
Comparison: 75% vs. 85%	-0.358*** (0.022)			
Other farm and farmer characteristics	YES	YES	YES	YES
Observations	3,378	1,126	1,126	1,126

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Factors impacting choices & tendency to choose higher coverage

Framing group	Factor that had the greatest impact on coverage level choices in the exp	# (%) of farmers choosing the factor	Among farmers choosing the factor, % of questions with the higher coverage level being chosen
Baseline Group	out-of-pocket premium	88 (54%)	38%
	revenue guarantee	76 (46%)	76%
Broad-framing Group	out-of-pocket premium	41 (26%)	41%
	revenue guarantee	59 (38%)	67%
	net revenue distribution figure	57 (36%)	53%
Narrow framing, table only	out-of-pocket premium	86 (52%)	47%
	average indemnity over 20 years	59 (35%)	72%
	# of years with positive net indemnity	22 (13%)	70%
Narrow framing, table & figure	out-of-pocket premium	42 (26%)	50%
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Summary of findings

- Many farmers make suboptimal crop insurance choices under Expected Utility Theory (EUT), especially selecting lower coverage levels.
- Narrow framing—viewing insurance as an investment rather than risk management—helps explain these decisions.
- Information that highlights indemnity outcomes (especially with net indemnity figures) significantly reduces suboptimal choices in familiar domains like crop insurance.
- Broad framing using net revenue figures did not improve choices in our experiments.
- In unfamiliar insurance settings, narrow framing decreases demand, aligning with previous findings in the literature.

Policy and design implications

- Information interventions can help—but must be tailored to farmers' familiarity and mental framing of insurance.
- Outreach efforts should consider emphasizing indemnity outcomes, particularly for farmers who focus on premiums.
- Be cautious about applying results from general behavioral literature directly to crop insurance contexts—domain experience matters.
- Future designs could aim to shift perception: from "insurance as a cost" to "insurance as protection plus value."

Thank you!

Questions and suggestions are welcome!

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- Even though crop insurance is a risk management tool, letting farmers believe that it is also an actuarially fair or even favorable investment reduces suboptimal choices
- We find evidence for this hypothesis based on how the information treatment effect varies according to farmers' response to the following question:

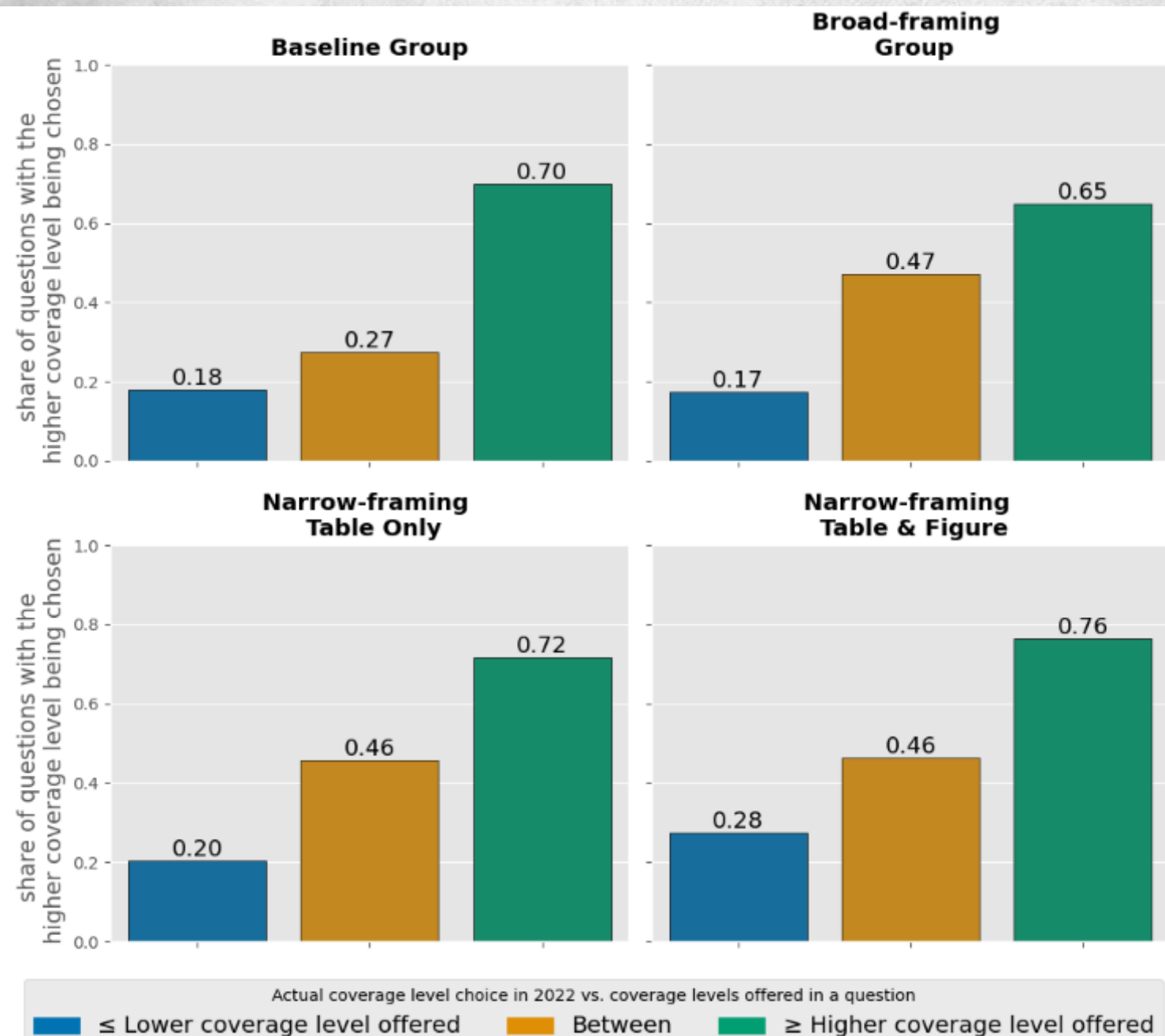
For the years 2018–2022, on average, how much have you received from your insurance for every dollar of out-of-pocket premium you paid? Please select your best estimate.

- | | | |
|---|--|--|
| ☐ Less than \$0.76 | ☐ \$0.76–\$0.95 | ☐ \$0.96–\$1.05 |
| ☐ \$1.06–\$1.25 | ☐ \$1.26–\$1.50 | ☐ \$1.51–\$1.75 |
| ☐ More than \$1.75 | | |

Regression results

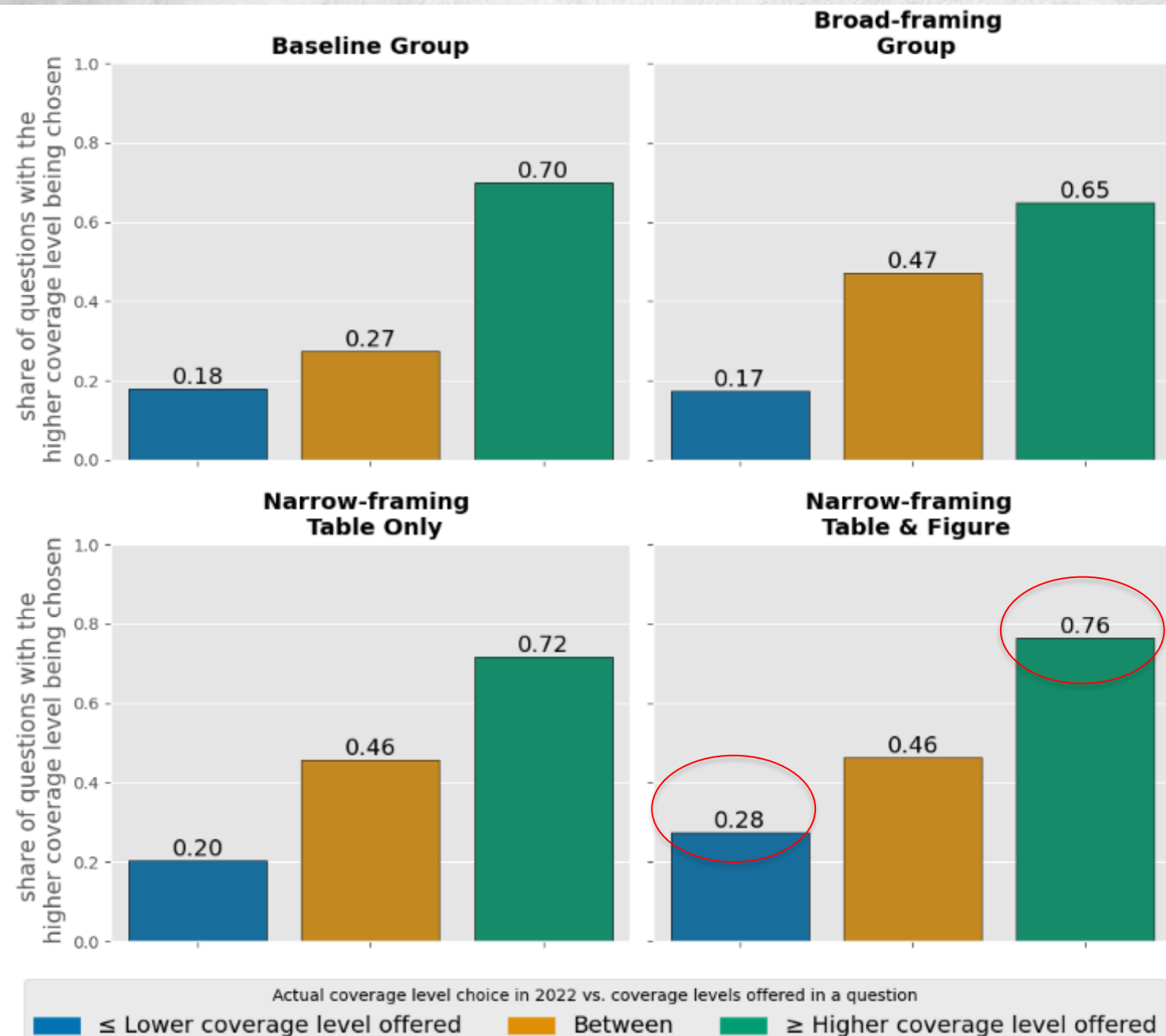
	y: Choosing the higher coverage level = 1			
	Indemnity / Premium :			
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Subsidy	0.151***	0.115***	0.149***	0.111***
	(0.016)	(0.023)	(0.015)	(0.026)
Comparison: 65% vs. 75%	-0.063***	-0.010	-0.062***	0.004
	(0.020)	(0.026)	(0.019)	(0.031)
Comparison: 75% vs. 85%	-0.346***	-0.380***	-0.345***	-0.393***
	(0.027)	(0.037)	(0.026)	(0.041)
Other farm and farmer characteristics	YES	YES	YES	YES
Observations	2,142	1,098	2,376	864
Pseudo R2	0.155	0.168	0.145	0.184

Crop Insurance Choices in Experiment and FCIP



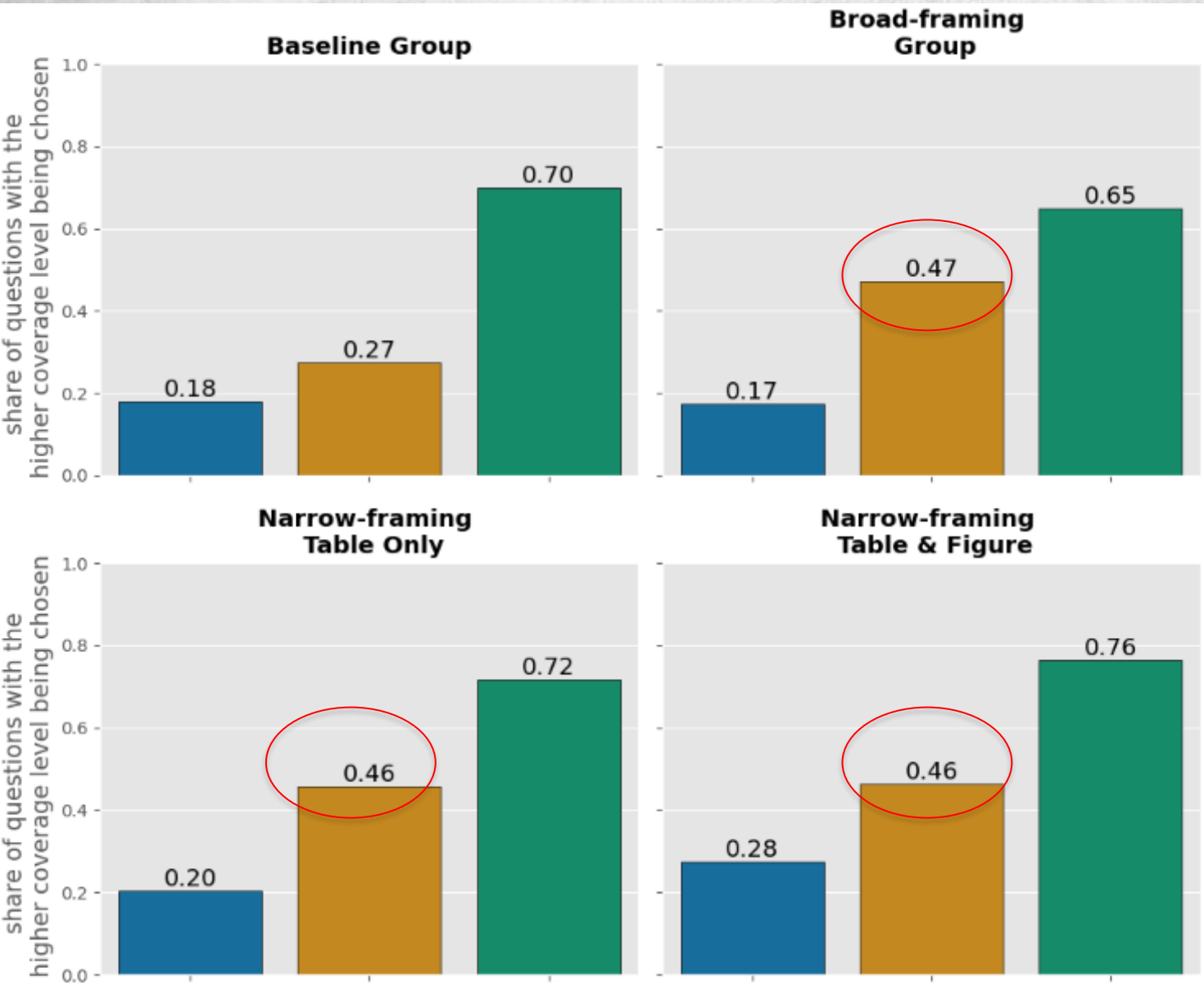
1. Farmers' choices in the experiments related strongly with their FCIP choices

Crop Insurance Choices in Experiment and FCIP



2. Narrow framing with both table and figure still works

Crop Insurance Choices in Experiment and FCIP



Actual coverage level choice in 2022 vs. coverage levels offered in a question

≤ Lower coverage level offered Between ≥ Higher coverage level offered

3. More information nudges farmers to choose higher when lost anchoring point