Eating to Save the Planet

Evidence from a Randomized Controlled Trial Using Individual-Level Food Purchase Data

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Eating Meat– Determinants, consequences and interventions
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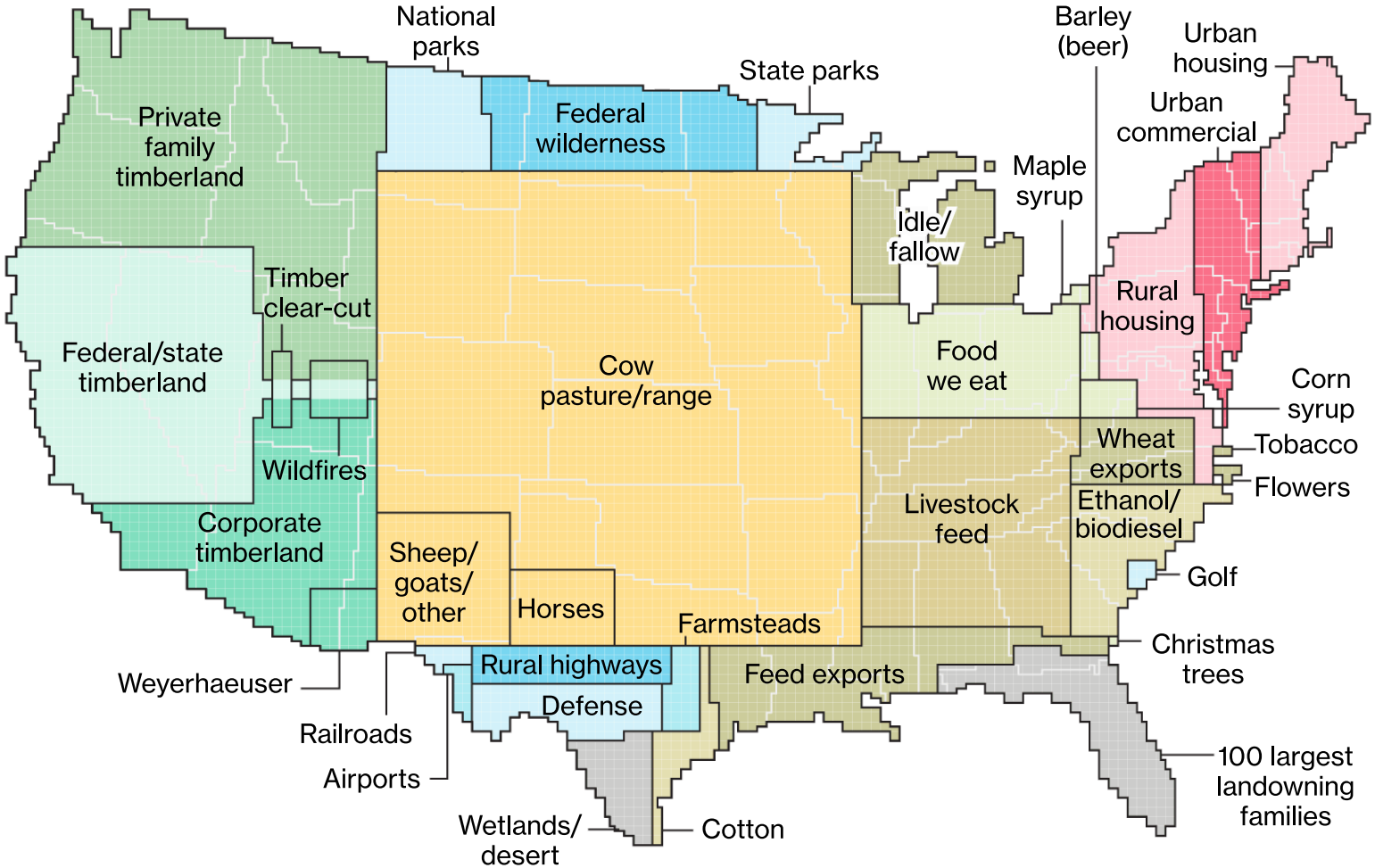
Motivation

Many are unaware of the impact of animal-based diets on the environment. 41% of the contiguous US is used for livestock https://www.bloomberg.com/graphics/2018-us-land-use/



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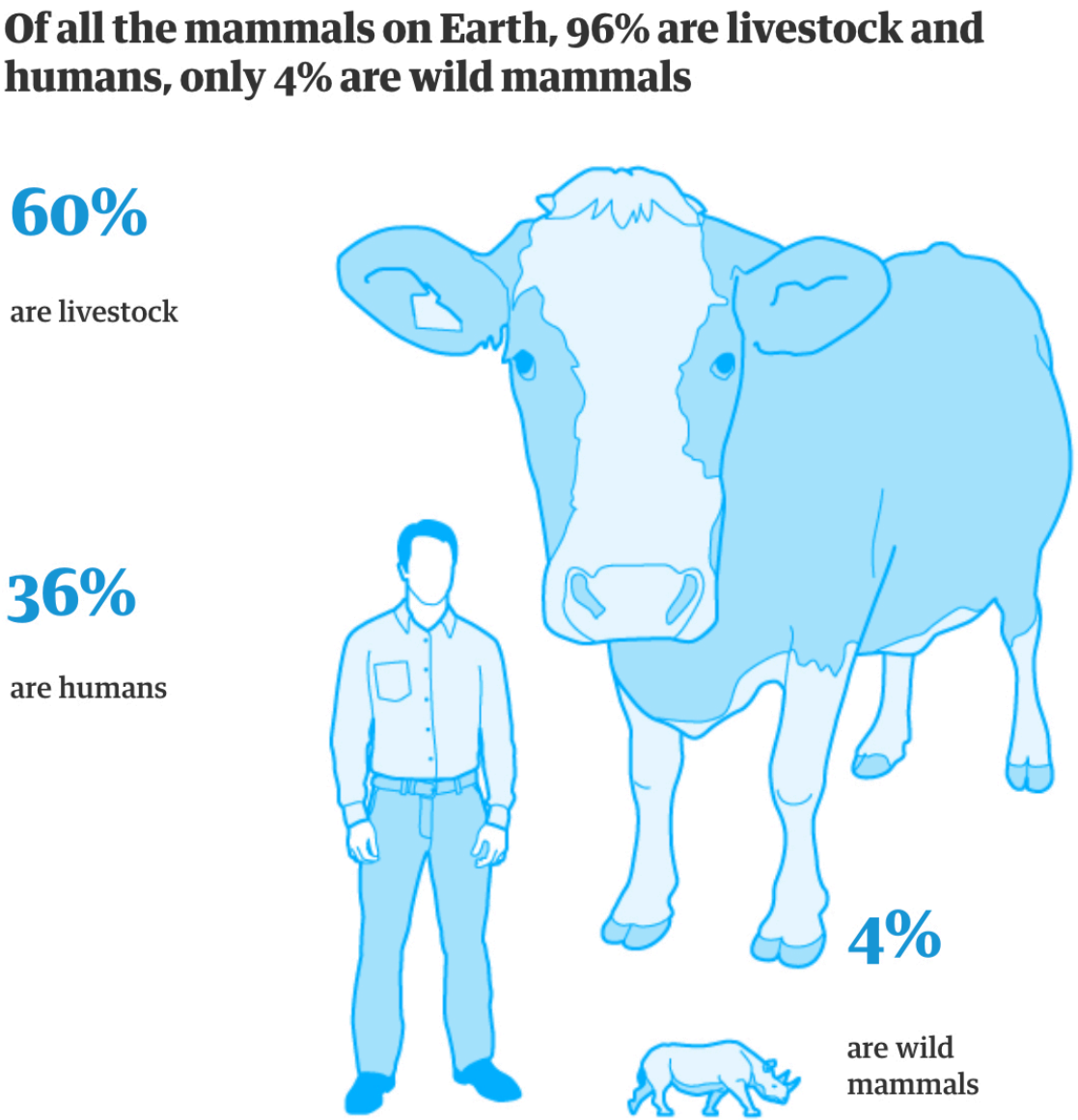
Bar On, Philips and Milo (2018)



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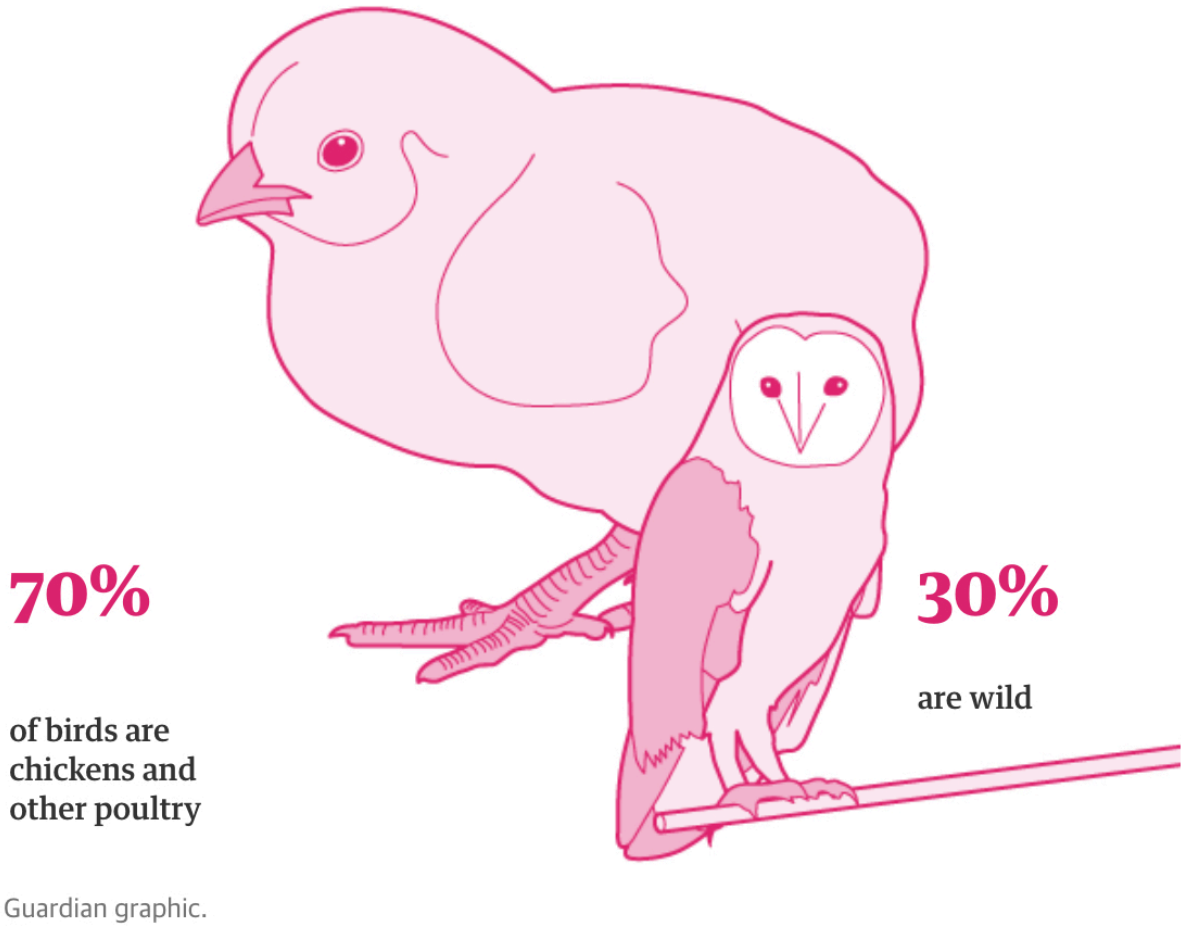


Animal ag. has a large environmental impact

- Food and Agriculture Organization (FAO) of the United Nations : Estimated 14.5% of all anthropogenic GHG is from livestock. Larger than the entire transportation sector!
- Animal agriculture is responsible for 20%-33% of fresh water consumption (Gerbens-Leenes, Mekonnen, and Hoekstra, 2013).
- It is estimated that 70% of destroyed Amazon forest has been converted for grazing (FAO, 2006) and another 21% is used for animal feed (Margulis, 2004).

Animal ag. has a large environmental impact

- Given existing trends, by 2050 greenhouse gases from food production (i.e. methane emissions) and land clearing are projected to grow by 80% (Tilman and Clark, 2014).
- The impact on the environment extends to the oceans as well. An estimated 2.7 trillion animals are pulled from the ocean each year (Mood and Brooke, 2010). Many fisheries are in decline due to overfishing while demand is increasing.
- In contrast, plant agriculture for human consumption is vastly more efficient, producing anywhere from 2$\times$ to 167$\times$ less C02 equivalents per gram of protein produced (Poore and Nemecek, 2018).

Win-Win

- Finding ways to effectively reduce demand for meat consumption would
  - reduce the carbon output to the atmosphere,
  - reduce the degradation of the natural environment,
  - reduce the suffering of billions of farm animals raised in factory farms,
  - combat the obesity epidemic and high incidence of chronic diseases such as cardiovascular disease and type II diabetes.

- The challenge on the demand side is to change deeply ingrained habits.

Related Literature

- Little direct evidence on the effectiveness of interventions to decrease the demand for meat.
- No papers with RCT and individual-level food purchase data.
- Most existing research has relied on self-reported outcomes or selections in virtual settings to gauge the response of consumers – yet, such measures may provide inaccurate indicators of actual behavior due to recall bias and an inclination among study participants to offer socially desirable responses.
- Reviews: Bianchi et al., 2018a; Bianchi et al., 2018b

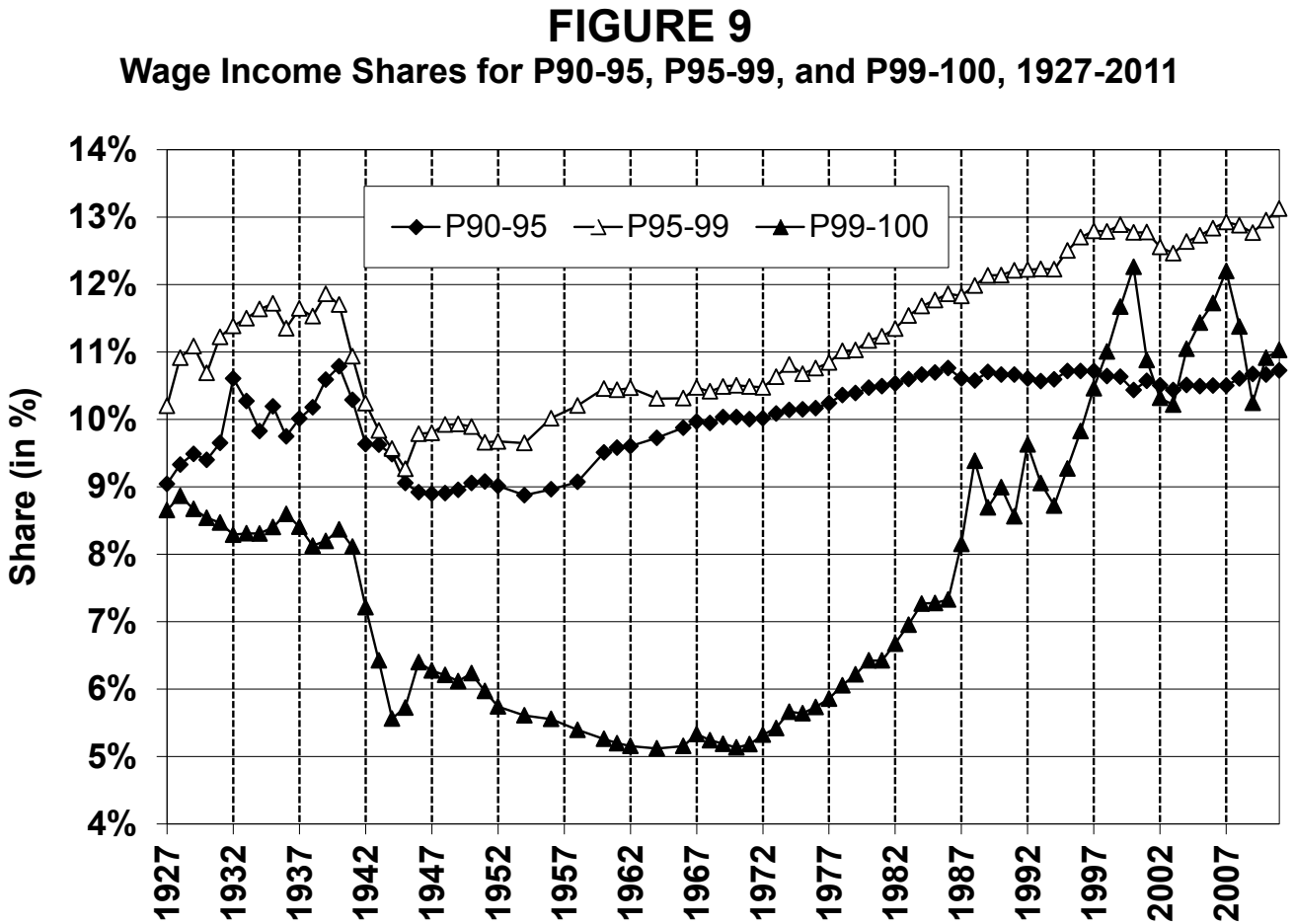
Design

- We conducted a guest lecture at a college in Econ 1 class, randomized at the classroom level, the week of Oct 17, 2017. This is 1 month into the Fall Semester which establishes a baseline diet.
- 10 classes: 5 control, 5 treatment. 215 students total with about 220 purchases per student.
- Control Lecture: A guest lecture on inequality.
- Treatment Lecture: A guest lecture on the effects of one's diet on climate change

Design

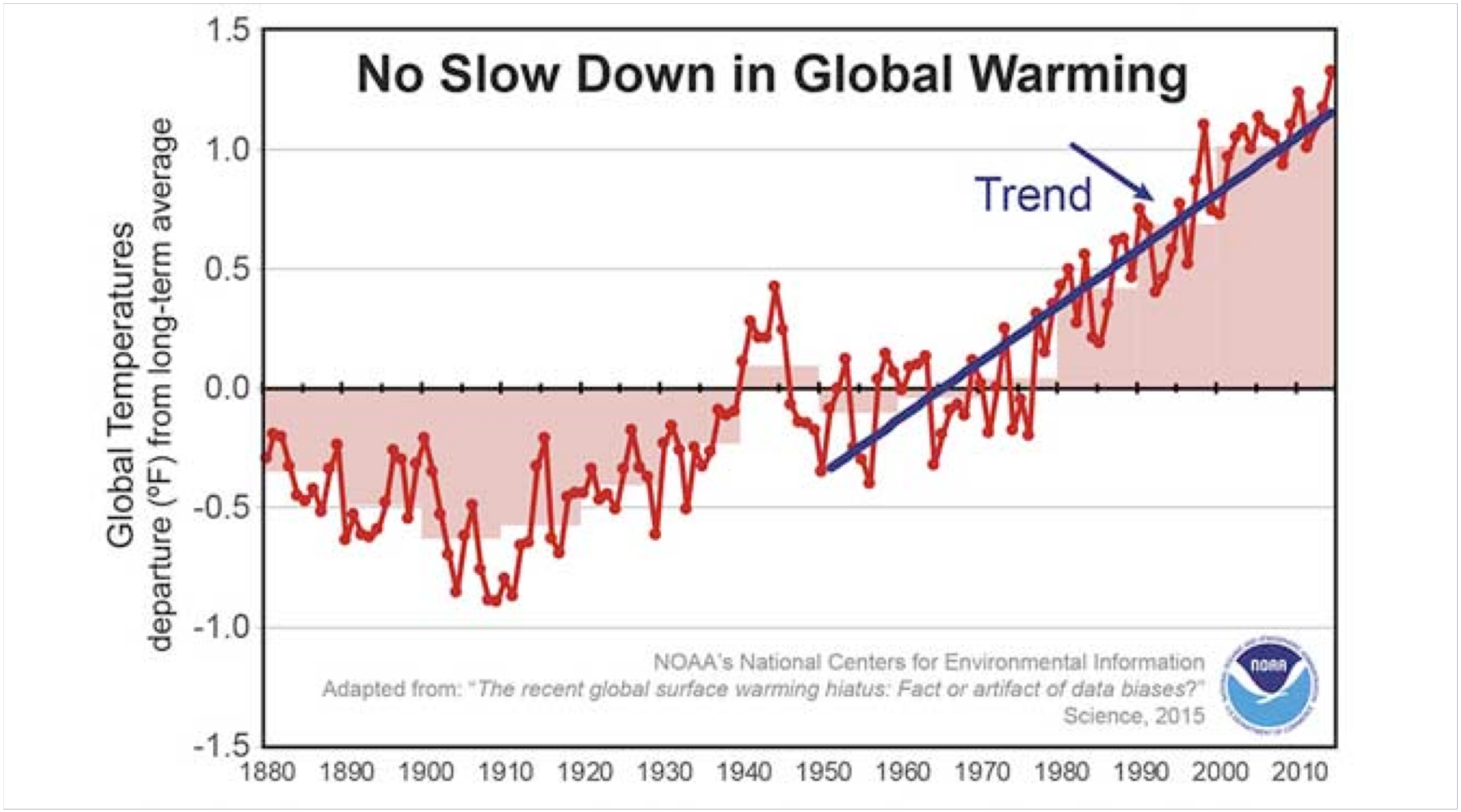
- Subjects signed consent forms. They knew they were in a study but weren't sure what it was about.
- Both conditions filled out initial surveys. Treatment condition was asked additional questions and received an additional follow-up survey 1 month later.
- Survey designed to better understand mechanism.

Example: Control Slide



Source: Piketty and Saez, Figure 9 (2016 update). Figure shows the share of wage income going to various fractiles.

Example: Treatment Slides

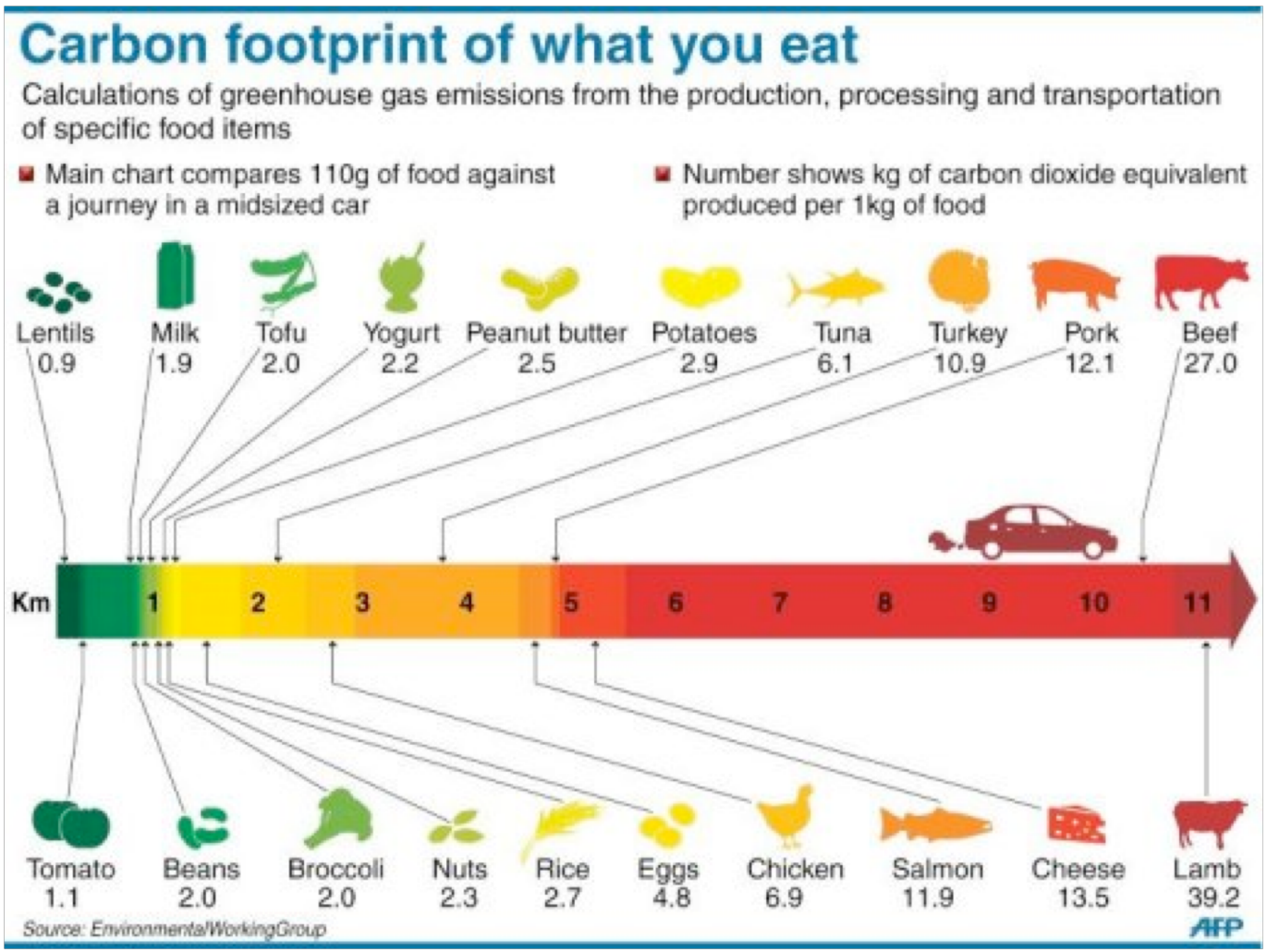


Example: Treatment Slides

Drought

Example: Treatment Slides

Carbon Footprint of Food



Example: Treatment Slides

Interviews with experts:
BBC Podcast interview with Tara Garnett (Oxford University), the Director of the Food Climate Research Network

Example: Treatment Slides

#3: Homestyle

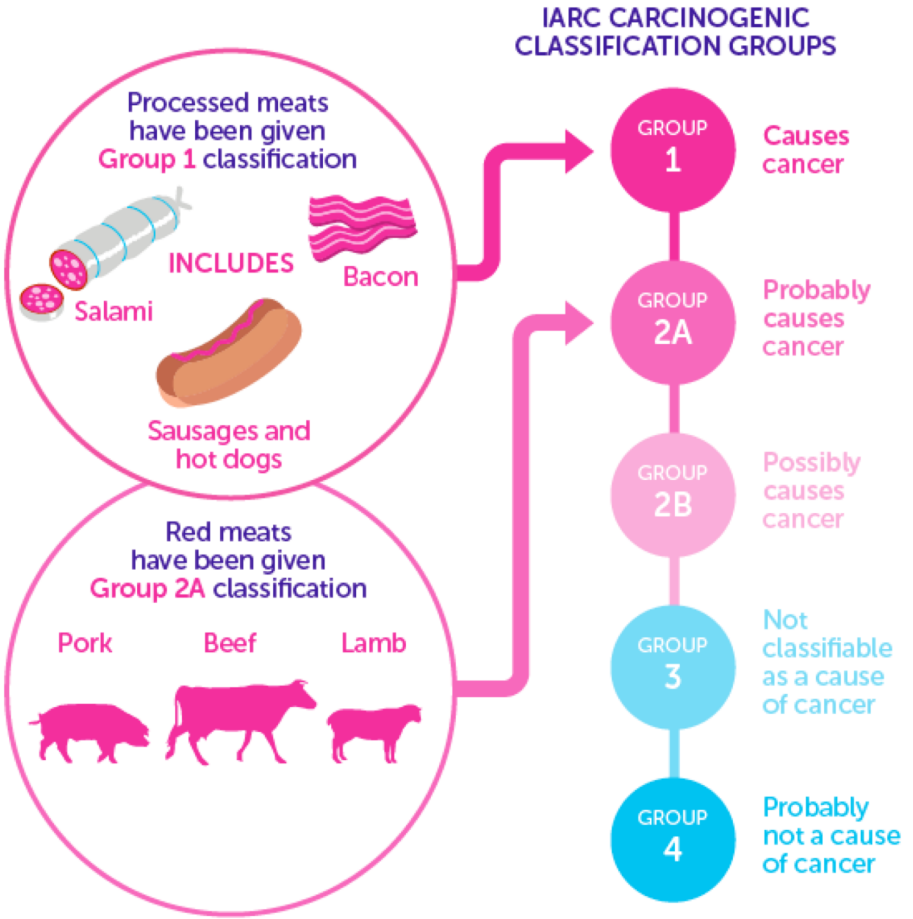
Left Option

- Portobello Mushroom
- Mashed Potatoes
- Broccoli

Right Option

- Steak
- Mashed Potatoes
- Broccoli

MEAT AND CANCER
HOW STRONG IS THE EVIDENCE?



These categories represent how likely something is to cause cancer in humans, not how many cancers it causes.

WE WILL BEAT CANCER SOONER
cruk.org

CANCER RESEARCH UK

Example: Treatment Slides

Example: Treatment Slides

Data

- Students purchases meals with ID card swipes. We track all purchases in the main dining hall over the course of the year.
- There are several places to get food but most of the lunch and dinner activity happens at the central dining hall.
- All purchases are a la carte.
- We collaborated with the dining services. Staff were trained to visually inspect whether they purchased the veg or non-veg option. Asked the customer if they couldn't decipher. Cash registers were equipped with a new "veg" button.
- Context: Vegetarian options are always available which makes eating veg doable.

Randomization: Differences between treatment and control

	Means		
Variable	Control	Treatment	p-value
Female	0.354	0.431	0.319
	(0.480)	(0.498)	
Non-white	0.425	0.373	0.493
	(0.497)	(0.486)	
Age	19.1	19.1	0.859
	(1.55)	(1.25)	
# students	113	102	

Randomization: Differences between treatment and control

Variable	Means Pre-Intervention Control	Pre-Intervention Treatment	p-value
Beef	0.190	0.166	0.095
	(0.392)	(0.372)	
Poultry+Fish	0.464	0.422	0.128
	(0.499)	(0.494)	
Meat	0.653	0.588	0.096
	(0.476)	(0.492)	
Veg	0.187	0.211	0.506
	(0.390)	(0.408)	
# meals	6,559	5,998	

Constructed Variable Definitions

- climatecare = principal factor of four questions.

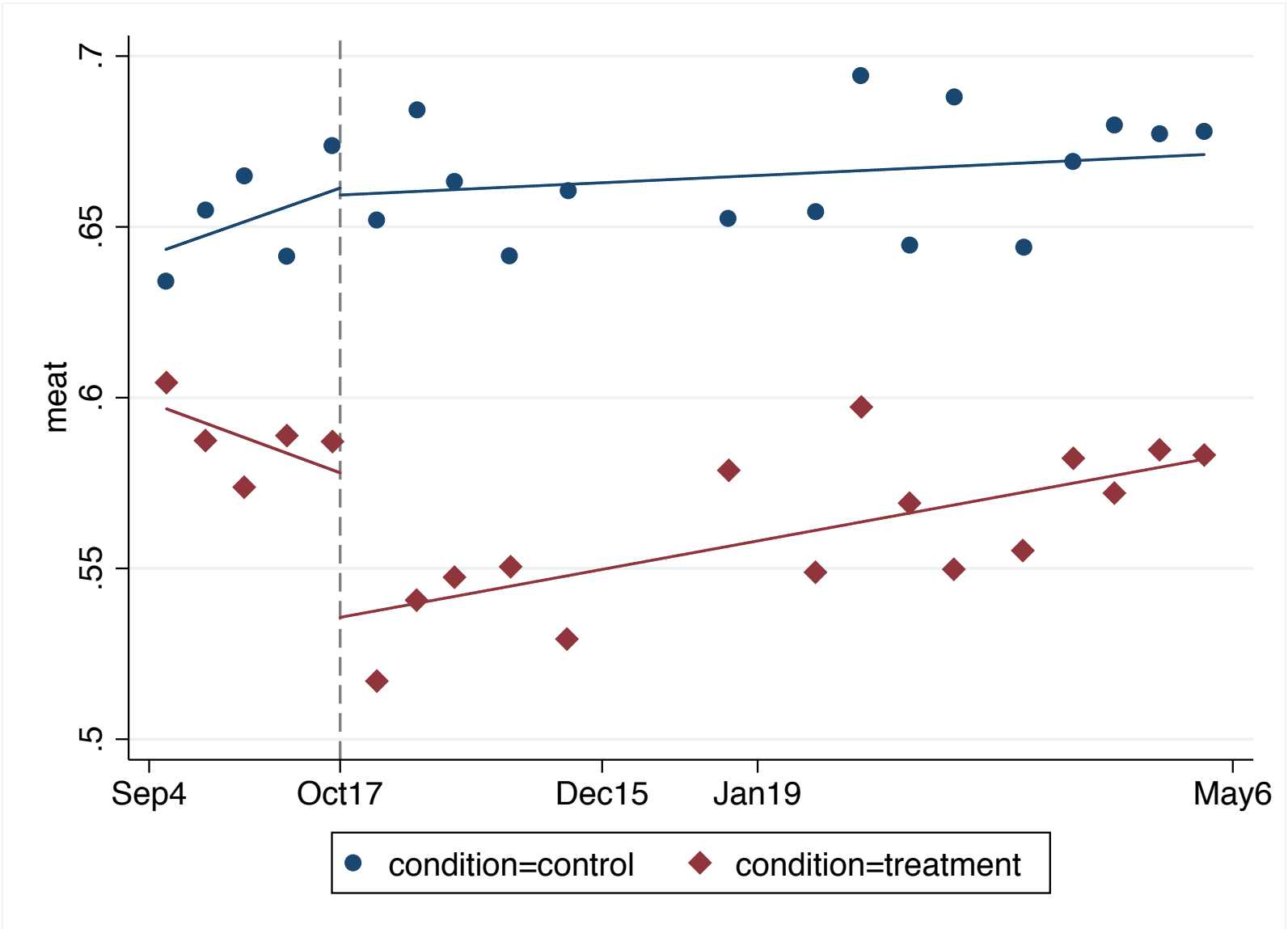
    1. In your view, how important is it that the government takes actions to address global warming?
    2. In your view, how important is it that people take individual actions to reduce their personal contribution to global warming?
    3. How willing are you to make lifestyle changes to reduce your contributions to global warming?
    4. Do you believe you have a clear understanding of the specific actions you can take to reduce your contribution to global warming?

Constructed Variable Definitions

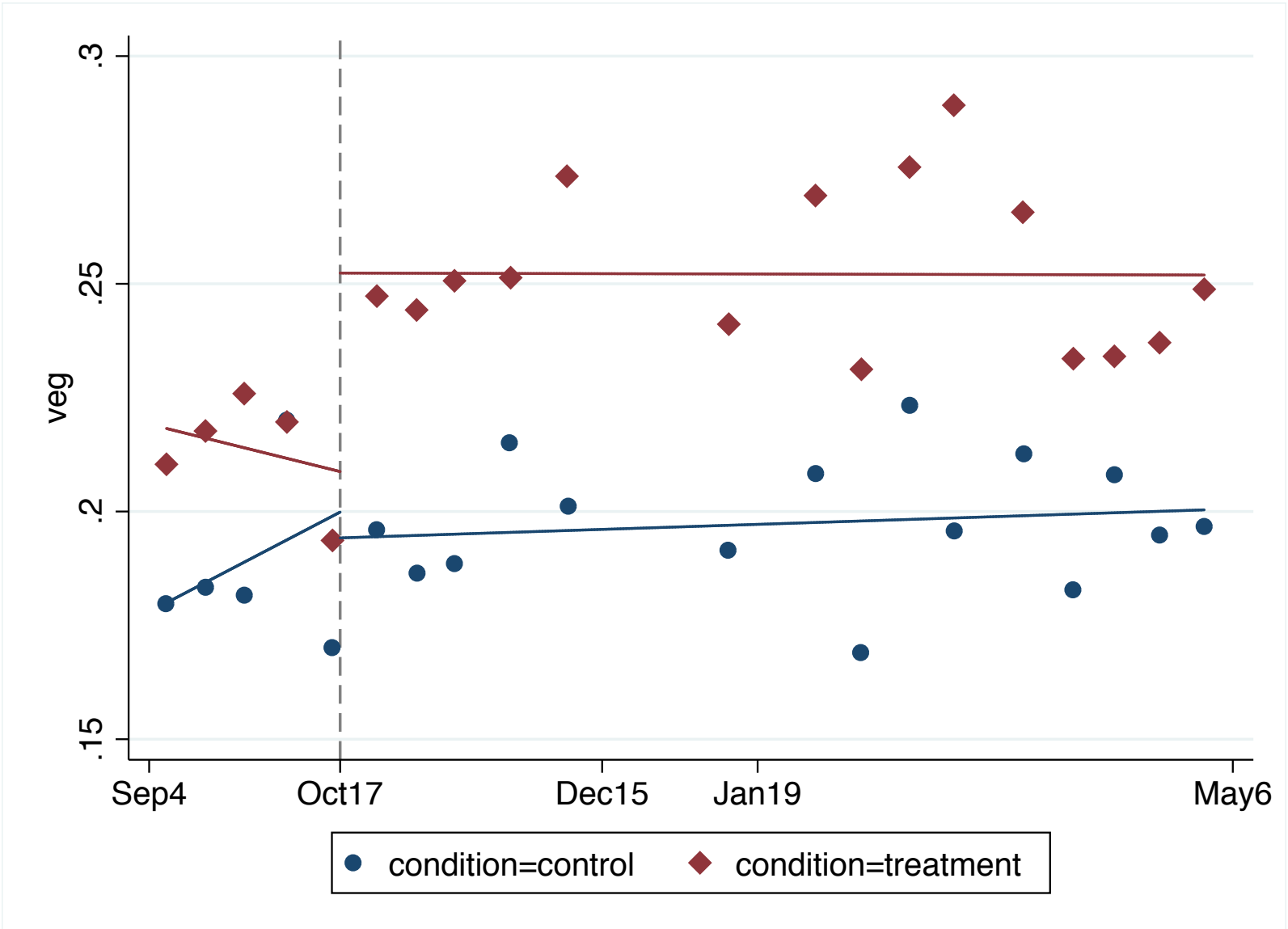
- newinfo = avg of "How much of the material from the presentation on climate change did you already know?" and "How much of the material from the presentation on health did you already know?"

- taughtme, persuadedme, motivatedme: self-report of reason why they wanted to reduce consumption of animal products.

The Results in One Figure: Treatment reduces meat consumption



Vegetarian Option: Treatment causes substitution to vegetarian option



Treatment Reduces Meat Consumption

Full Sample. Logit / Average Marginal Effects

All models use individual, date, and hour FE. SE are clustered by class.

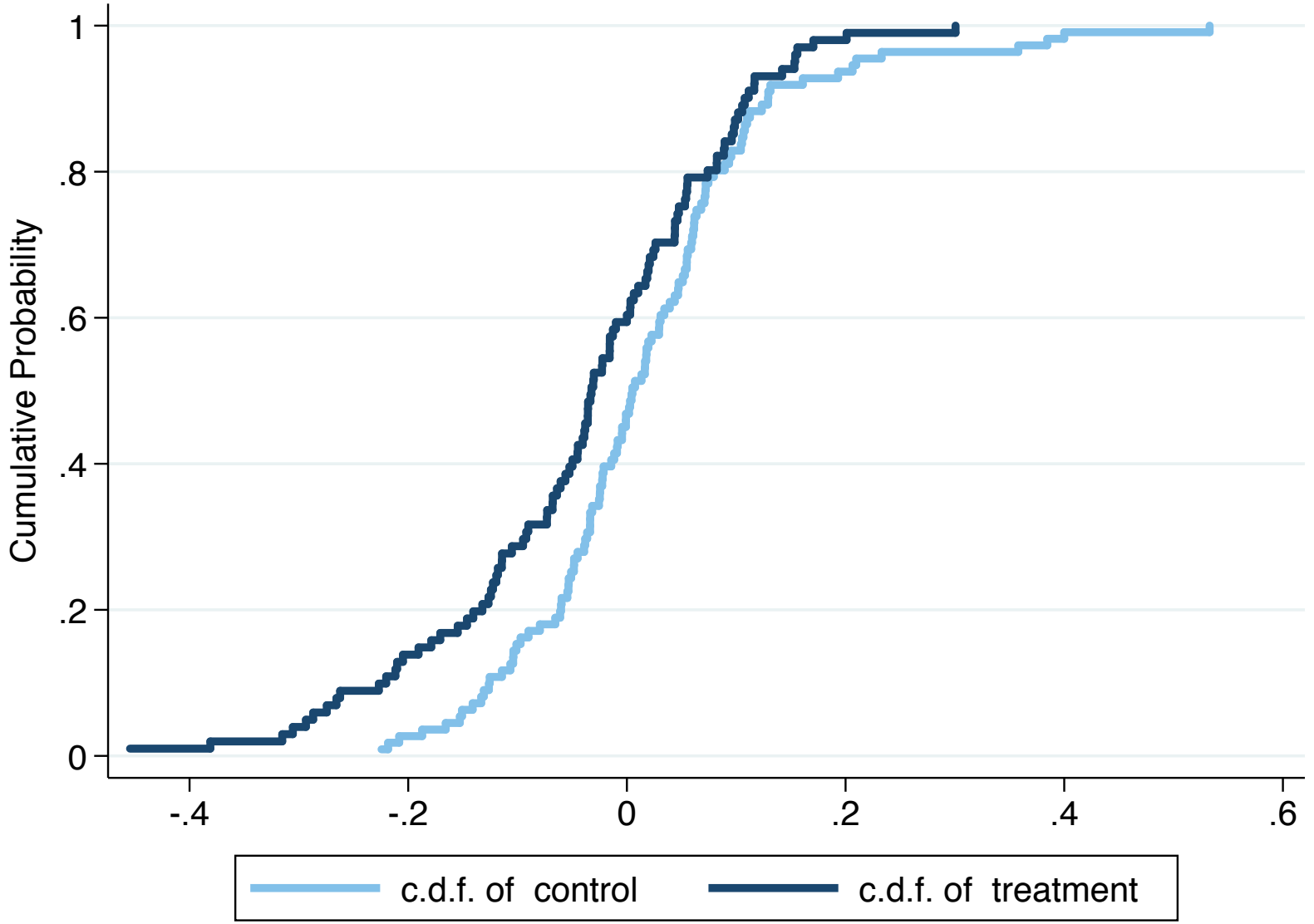
	Both Semesters			
	(1) Beef	(2) Poultry+Fish	(3) Meat	(4) Veg
Treated	-0.023*	-0.025**	-0.046***	0.042**
	(0.013)	(0.010)	(0.016)	(0.020)
Mean DV	0.165	0.450	0.615	0.219
Pseudo R2	0.111	0.100	0.149	0.145
# meals	49,293	49,293	49,289	49,221

Effect are bigger in first semester

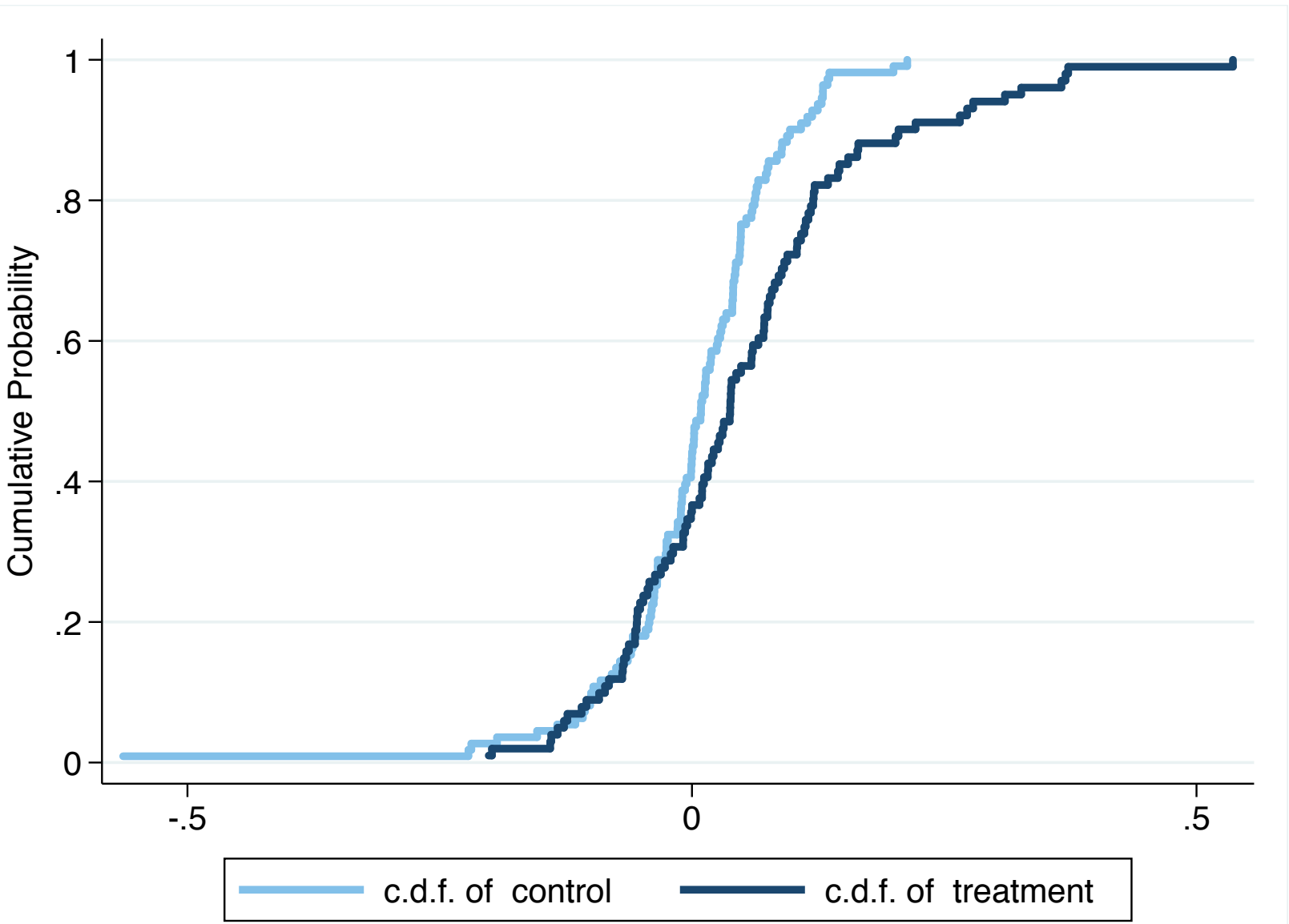
Disaggregated by Semester. Logit / Average Marginal Effect

	(1) Beef	(2) Poultry+Fish	(3) Meat	(4) Veg
Fall (Sep-Dec)				
Treated	-0.033***	-0.032***	-0.061***	0.037*
	(0.012)	(0.011)	(0.017)	(0.021)
Mean DV	0.168	0.442	0.610	0.213
Pseudo R2	0.118	0.095	0.143	0.142
# meals	25,328	25,505	25,499	25,442
Spring (Jan-May)				
Treated	-0.011	-0.026**	-0.035**	0.045**
	(0.014)	(0.012)	(0.017)	(0.022)
Mean DV	0.167	0.454	0.621	0.216
Pseudo R2	0.109	0.103	0.152	0.152
# meals	36,035	36,344	36,344	36,295

Change in Avg. Cons. by Individual — Meat



Change in Avg. Cons. by Individual — Veg



Heterogeneous Treatment Effects by Sex and Race — Logit / Average Marginal Effect

	(1) Beef	(2) Poultry+Fish	(3) Meat	(4) Veg
Gender				
Male	-0.034*** (0.011)	0.004 (0.010)	-0.034* (0.017)	0.034 (0.021)
Female	0.002 (0.028)	-0.071*** (0.020)	-0.063*** (0.024)	0.048* (0.025)
Male=Female p-value	0.138	0.002	0.260	0.531
Pseudo R2	0.111	0.100	0.149	0.145
# meals	49,293	49,293	49,289	49,221
Race				
White	-0.031** (0.013)	-0.044* (0.023)	-0.067*** (0.025)	0.048*** (0.019)
Non-White	-0.013 (0.019)	0.006 (0.012)	-0.015 (0.018)	0.029 (0.023)
White=Non-White p-value	0.325	0.137	0.088	0.324
Pseudo R2	0.111	0.100	0.149	0.146
# meals	49,293	49,293	49,289	49,221

Mechanisms — Logit / Average Marginal Effect. (Meat)

	(1)	(2)	(3)
Treated	-0.046***	-0.042***	-0.041
	(0.016)	(0.015)	(0.037)
Treated x ClimateCare		-0.034*	-0.024*
		(0.019)	(0.015)
Treated x NewInfo			0.003
			(0.016)
Treated x Taught			0.100***
			(0.019)
Treated x Persuaded			-0.106*
			(0.055)
Treated x Motivated			-0.054***
			(0.014)
Pseudo R2	0.149	0.149	0.150
# meals	49,289	49,289	23,701

Policy Implications

- Underinvestment in resources rather than low efficacy explains lack of research.
- Public awareness campaigns, like those conducted on tobacco, may shift demand.
- Research fits into a class of interventions that can be referred to as "boosts": a policy designed to foster peoples competencies to make better choices.
- In addition to prompting individual-level dietary changes, education-based interventions could lead to increased support for policy change.
- Why not bigger effects? (1) Satiety (2) Lack of options (3) Social factors – isolation, family

Contributions

1. Despite the challenge of changing deeply ingrained habits with self-interested appeals, we show that a 1-hour informational intervention with a pro-social message is effective at changing diet.

2. We present evidence on who responds to the message and how.

Conclusion

- Behavior change via pro-social messaging can work
- Limitations: didn't compare messages, only one presenter
- Future work: leaflets, expand to more ambitious multi-treatment experiments.