The Inelasticity of Meat Consumption?

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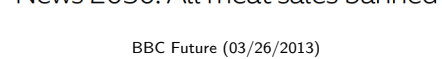
Motivation



Which brings us to meat-eating. Its extinction will, I believe, ultimately come. And be largely market-driven, as well. Science will find dietary substitutes that can be produced at infinitely less cost and effort. At which point, meat will become a kind of exotic indulgence, what the cigar (of Cigar Aficionado) is to the dying tobacco culture of today.

– Charles Krauthammer (National Review 05/08/2015)

Snapshot: Few Americans Vegetarian or Vegan

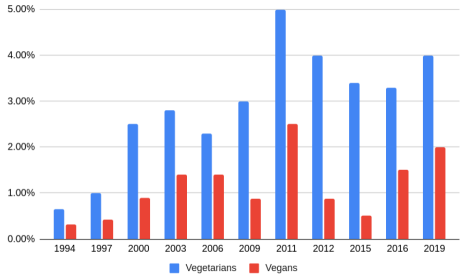
Gallup (08/01/2018)

America's Obsession With Cheap Meat

Meat-eating is part of the American identity, a tradition that underlies efforts to keep slaughterhouses open despite coronavirus outbreaks.

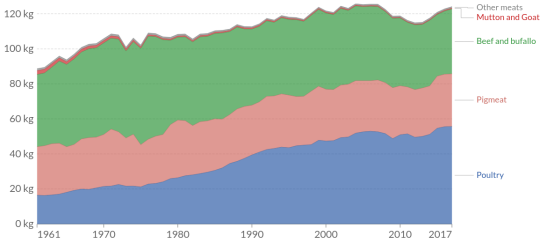
NYTimes Opinion (05/15/2020)

Share of Vegetarians and Vegans in the US population

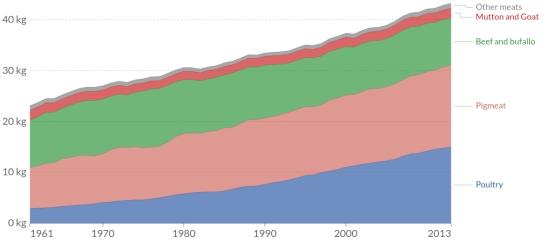


Motivation

Per Capita Meat Consumption USA



Per Capita Meat Consumption World



Source: ourworldindata.org/UN Food and Agricultural Organization (FAO)

Presentation Overview literature

- **Research Question:** Have recent cultural shifts and technological innovation increased meat avoidance?
- **Conceptual Framework:** Briefly sketch a model identifying economic and social drivers of meat consumption.
- **Empirical Strategy:** Document 15-year trends in grocery purchases in the National Consumer Panel; implement event studies around exposure to novel substitutes, media events, and changes in residence.
- **Results:** Trends suggest some growing meat avoidance and acceptance of alternatives with potential social drivers.

Conceptual Framework

Consumer maximizes (adapted from Hestermann, Le Yaouanq, Treich (2020)):

$$\max_{c} U(c) - pc - wec \tag{1}$$

where

- c denotes a consumption vector consisting of animal product c_{animal} and plant-based product c_{plant}
- p denotes a price vector consisting of prices p_{animal} and p_{plant}
- e denotes vector of perceived externalities generated by consumption, and weight w is the weight placed on externalities by the consumer.

Data

- Consumer Panel Data – NielsenIQ
  - Representative panel of U.S. households (40,000-60,000 each year)
  - Information on demographic and geographic variables
  - Purchasing behavior from 2004-2019 (currently)
- Retail Scanner Data – NielsenIQ
  - 35,000-50,000 participating stores covering $>$ 50% of total sales volume of US grocery and drug stores
  - Weekly product data from 2006-2019 (for now)
- Label Insight – NielsenIQ
  - Data from machine-scanned product labels: ingredients, detailed categories, animal welfare claims (not currently using), and more for subset of the data

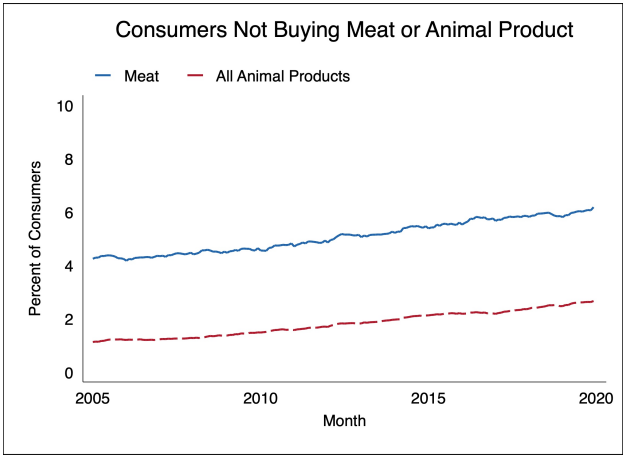
Classifying and Aggregating

- Classify subsample using data from Label Insight. Count as animal products:
  - Products with a matching ingredient
  - Products in a relevant category (e.g. Deli - Turkey) without ingredients
  - Substitutes identified by category and ingredient check
- For products not in the subsample, impute the likelihood of being a given product type (e.g. chicken) based on category.
- Count products with over a 50% chance of being a certain product type.
- Weighted average across households by month:
  - Quantity purchased (money, ounces) divided by household size
  - Budget share
  - Indicator for any purchased

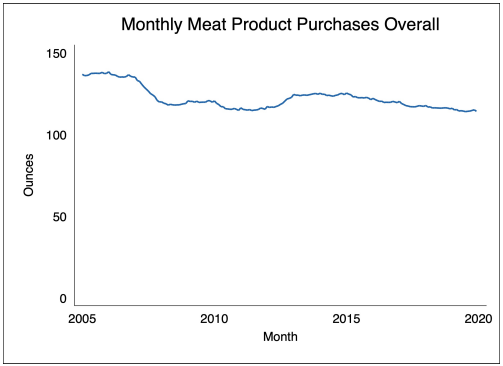
Trends: Overview

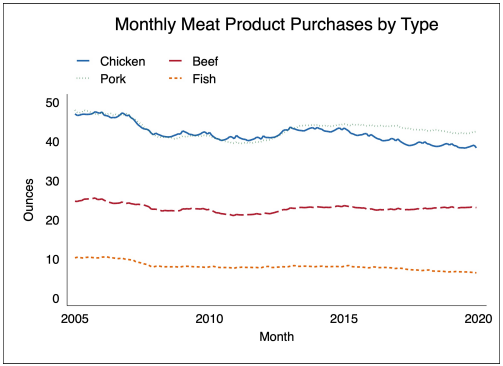
- The rate of meat and animal product avoidance appears to be rising.
- An important complication for our data is that there has been a broad trend toward eating out more.
  - Our setting: just grocery data
  - Restaurant meals typically emphasize meat.
- However, budget shares show that some consumers are spending less of their grocery budget on meat (and some more).
- Data are consistent with growing meat avoidance and an offsetting trend on the intensive margin.

Trends: Households Not Purchasing Meat/Animal Products



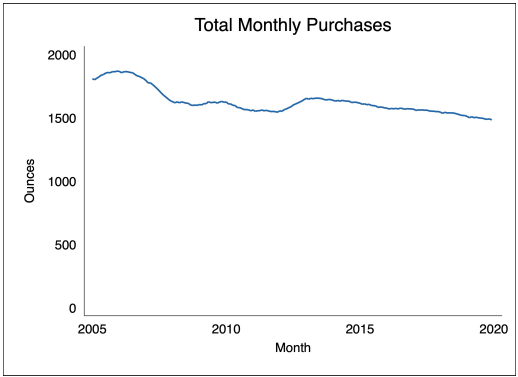
Trends: Monthly Meat Purchases Overall budget share



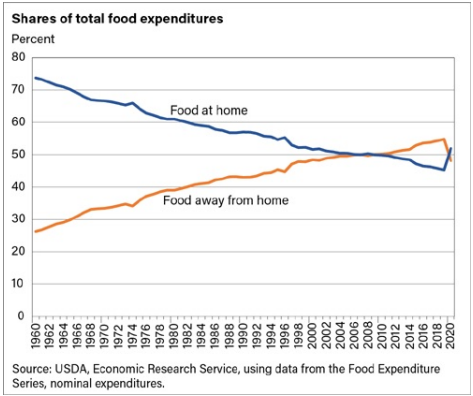


Trends: All Monthly Grocery Purchases

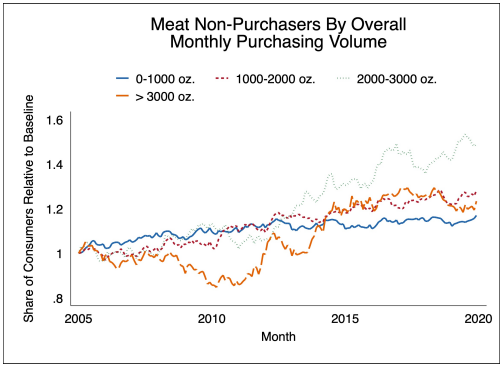
Purchases in Nielsen data:

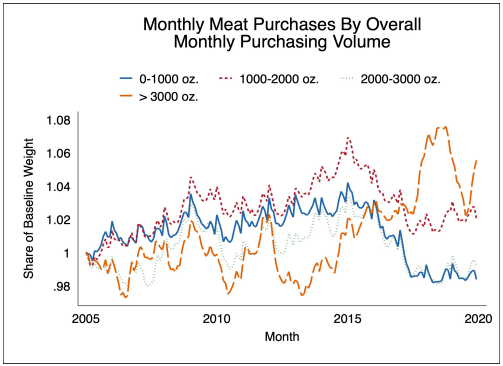


Expenditure shares in USDA data:

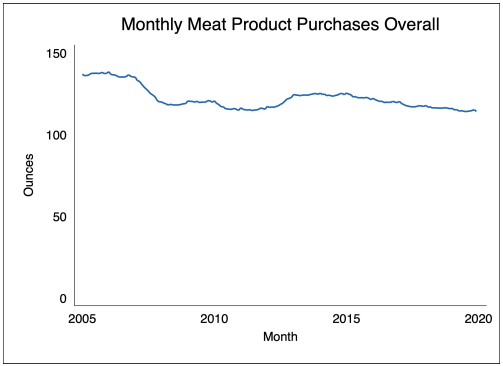


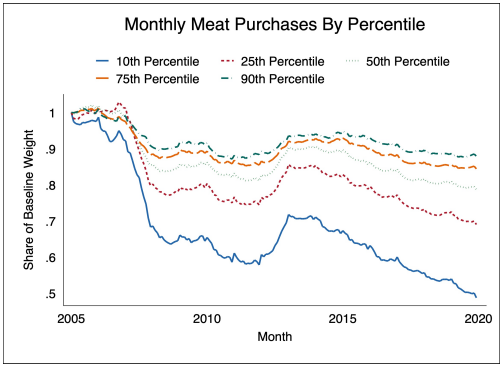
Trends: Monthly Meat Purchases by Grocery-Purchase Bins



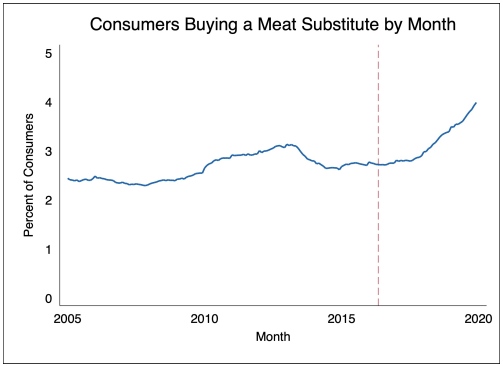


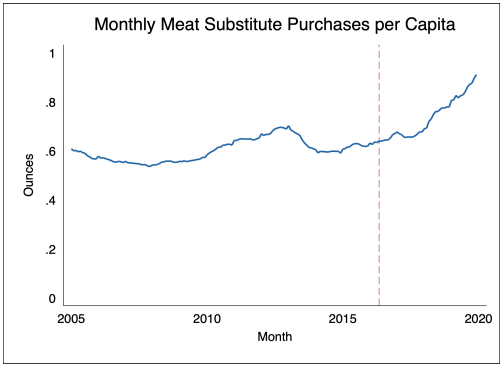
Trends: Monthly Meat Purchases by Percentile budget share



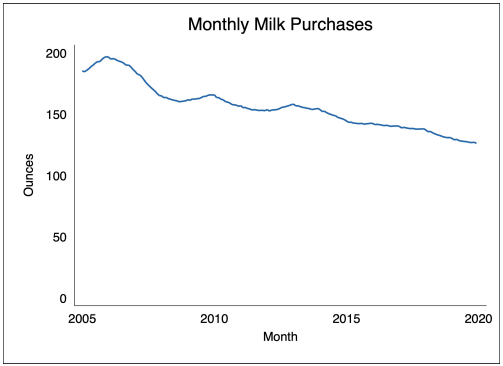


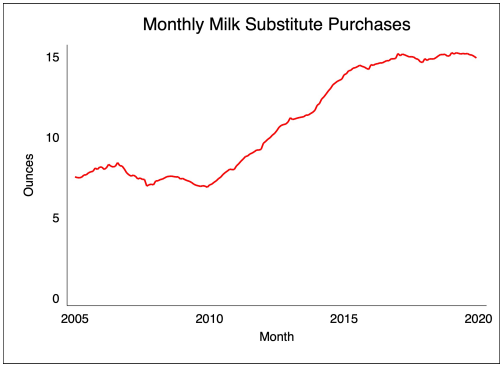
Trends: Meat Substitutes shares



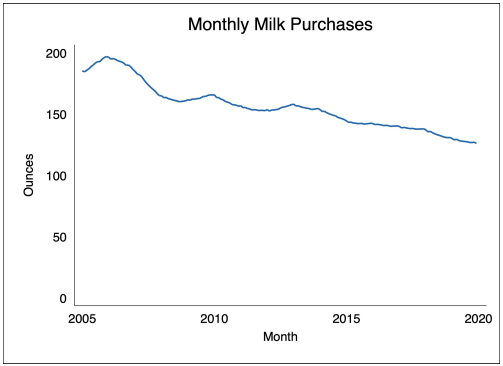


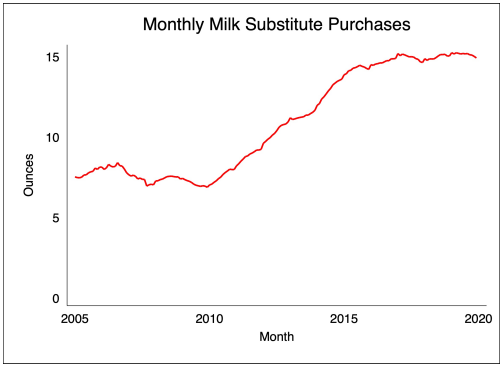
Trends: Milk shares



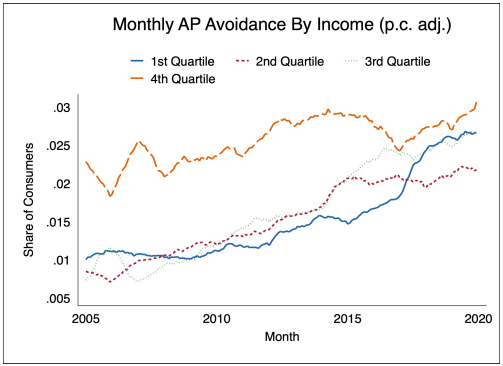


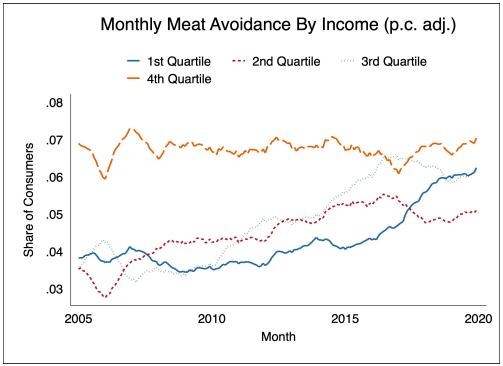
Trends: Milk shares



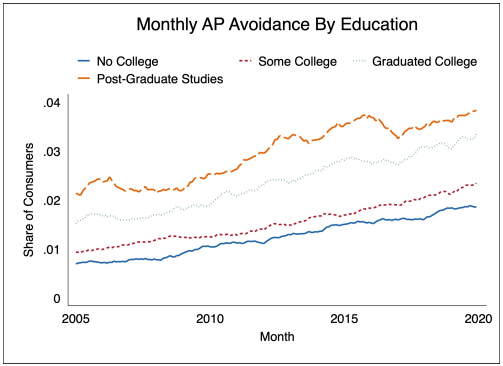


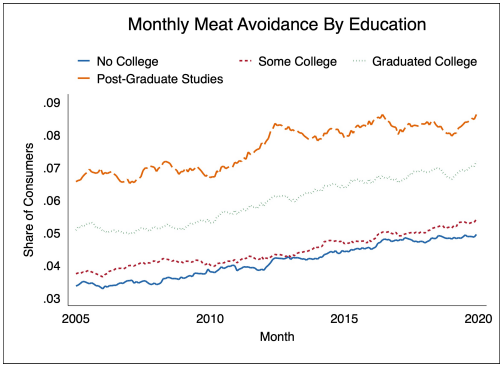
Trends: Monthly Animal Product Avoidance by Income adjusted



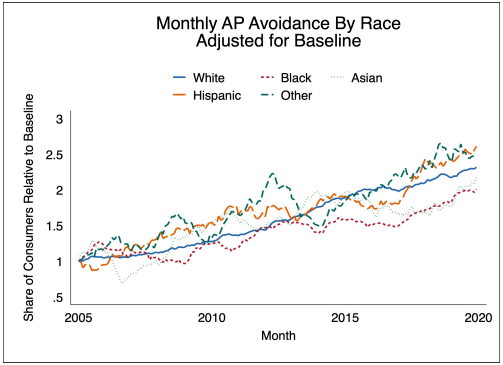


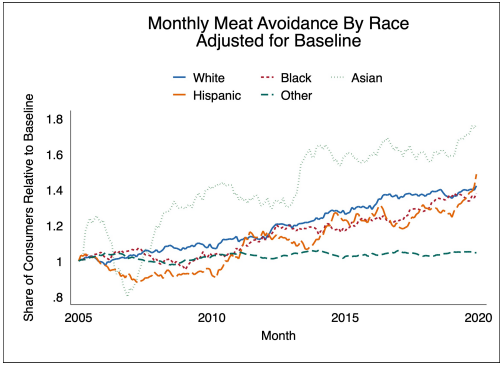
Trends: Monthly Animal Product Avoidance by Education adjusted



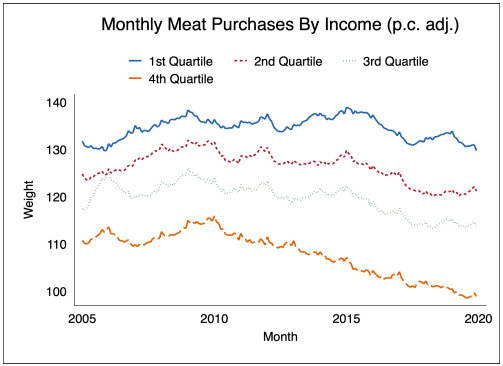


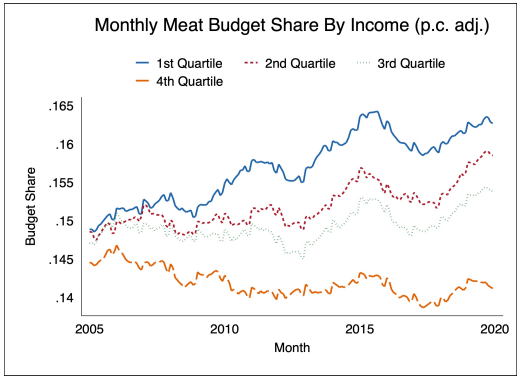
Trends: Monthly Animal Product Avoidance by Race adjusted



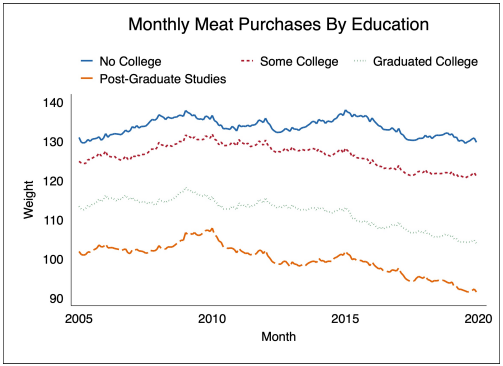


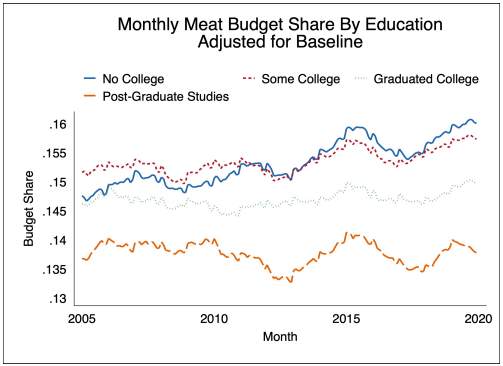
Trends: Monthly Animal Product Avoidance by Income



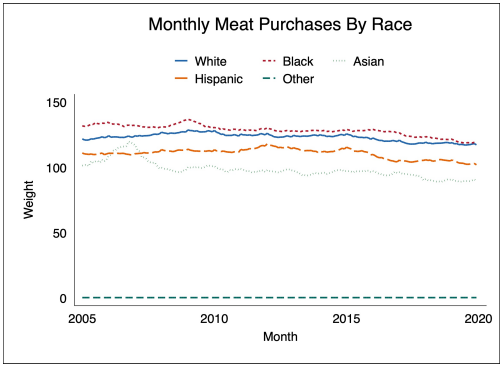


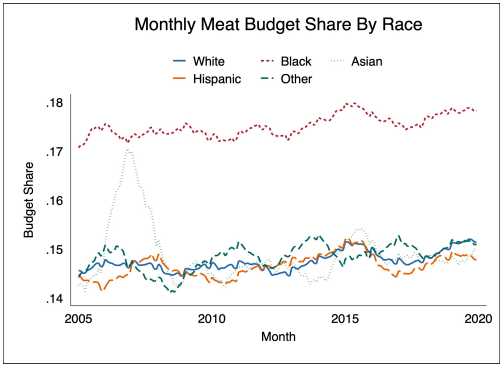
Trends: Monthly Animal Product Avoidance by Education





Trends: Monthly Animal Product Avoidance by Race



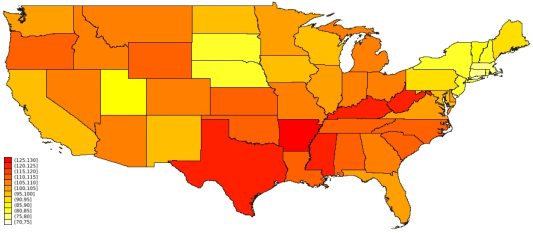


Movers: Overview

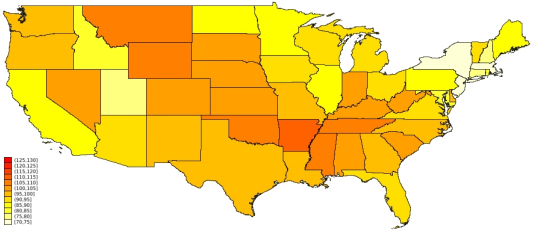
- How elastic is meat consumption to one's social surroundings (others' consumption, attitudes, marketing, etc.)?
- Useful as a bound of sorts on what a big push can do.
- Find each panelist who moves from one Designated Market Area to another and study how purchases change as a function of the change in nearby consumers' purchases.
- Prior literature finds mixed responsiveness to new residences' consumption (Allcott et al. 2019, Atkin 2013, 2016, Bronnenberg et al. 2012)
  - 60%-70% response to brand preferences (Bronnenberg et al. 2012)
  - 0% response to nutritional health index (Allcott et al. 2019).

Movers: Meat Consumption Heatmap

Average Per Capita Meat Consumption in 2004



Average Per Capita Meat Consumption in 2019



Movers: Estimation

Estimate the following equation:

$$(y_{it} - \bar{y}_{\ell_{origin},t_i-1}) = \beta_{0,t-t_i}(\bar{y}_{\ell_{dest.},t_i-1} - \bar{y}_{\ell_{origin},t_i-1}) + \beta_{1,t-t_i}\bar{y}_{\ell_{origin},t}$$
$$+\beta_{2,t-t_i}(\bar{p}_{\ell_{dest.},t_i-1} - \bar{p}_{\ell_{origin},t_i-1}) + \alpha_{\{\text{birth decade}_i\}} + \delta_i + \gamma_t$$

- t_i = year in which i moves.
- ℓ_{origin} and $\ell_{dest.}$ = origin and destination locations.
- Omit $t = t_i - 1$.

Movers: Estimation

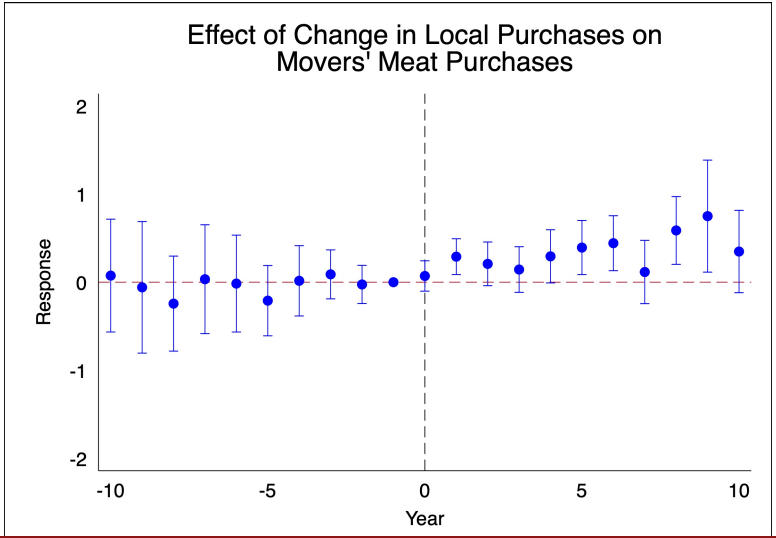
Estimate the following equation:

$$(y_{it} - \bar{y}_{\ell_{origin},t_i-1}) = \beta_{0,t-t_i}(\bar{y}_{\ell_{dest.},t_i-1} - \bar{y}_{\ell_{origin},t_i-1}) + \beta_{1,t-t_i}\bar{y}_{\ell_{origin},t} + \beta_{2,t-t_i}(\bar{p}_{\ell_{dest.},t_i-1} - \bar{p}_{\ell_{origin},t_i-1}) + \alpha_{\{\text{birth decade}_i\}} + \delta_i + \gamma_t$$

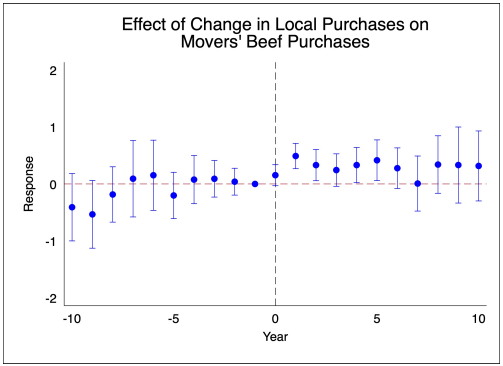
- y_{it} = outcome for person i in period t.
- $\bar{y}_{\ell,\tau}$ = average outcome in geographic area ℓ in period τ.
- $\bar{p}_{\ell,\tau}$ = average price in geographic area ℓ in period τ.
- δ_i and γ_t = unit and period fixed effects.

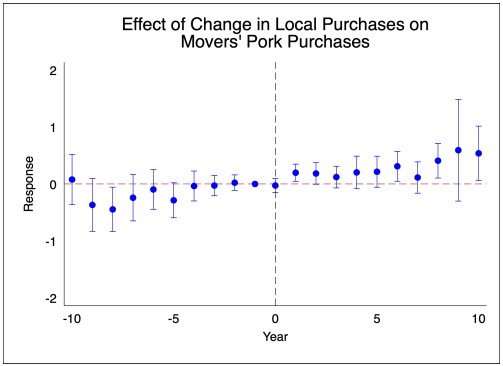
Key assumption: Within-individual trends identical except for timing relative to move.

Movers: Meat Overall

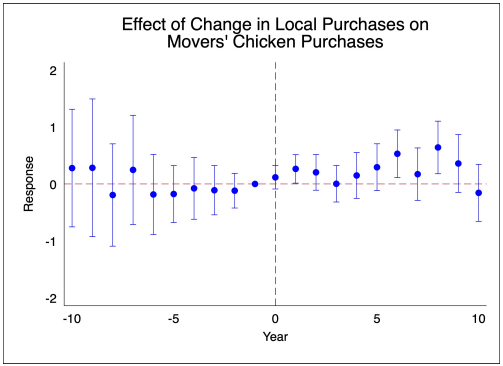


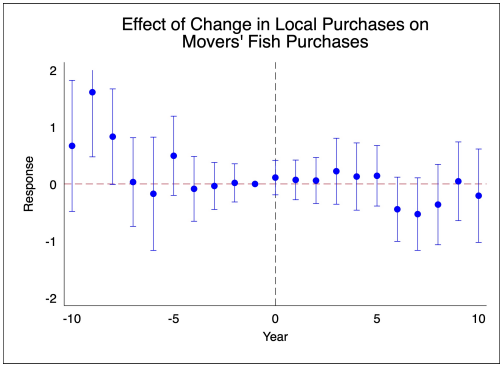
Movers: Cow and Pig Meat details



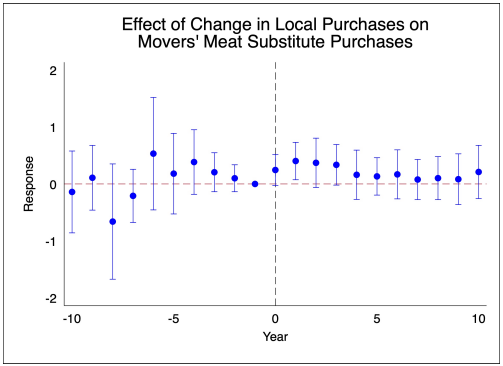


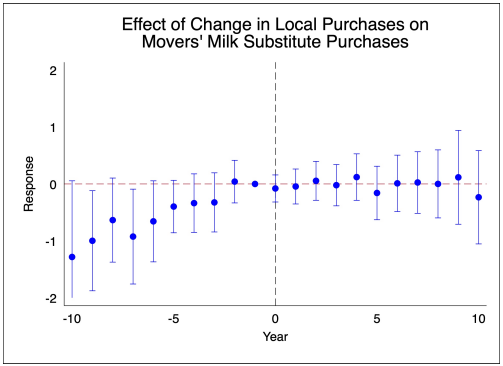
Movers: Chicken and Fish details





Movers: Substitutes details avoiders





Relevant Events: Overview news pets

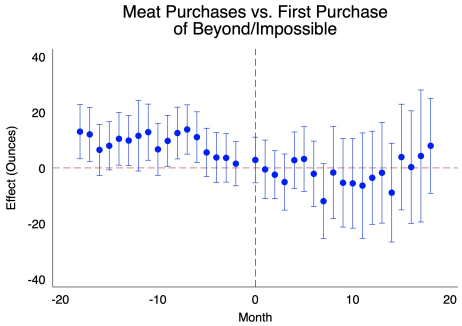
- Which changes affect consumers' animal product purchases or avoidance?
  - Introduction to plant-based meat
  - Introduction to plant-based milk
  - Undercover investigations and pet adoption (appendix)
- Estimate the following equation:

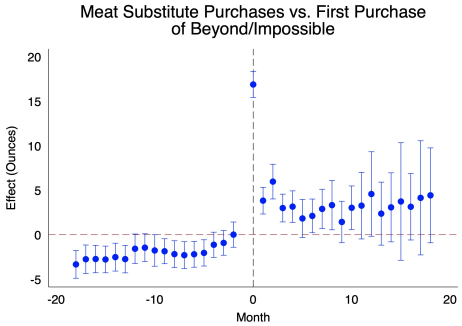
$$y_{it} = \beta_{t-t_i} + \delta_i + \gamma_t$$

  - t_i = month of the event
  - δ_i and γ_t = unit and period fixed effects
- Identifying assumption is similar to before. Eventually, switch to synthetic DID.
- Note that a propensity score matching approach yields quite different results but appears quite poorly identified.

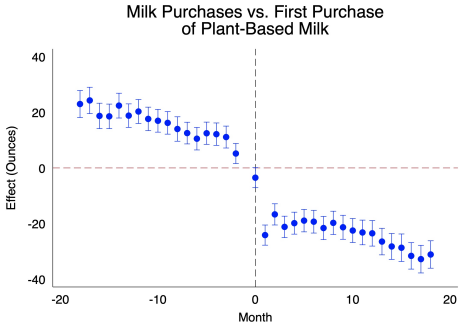
Relevant Events: First Beyond/Impossible Purchase

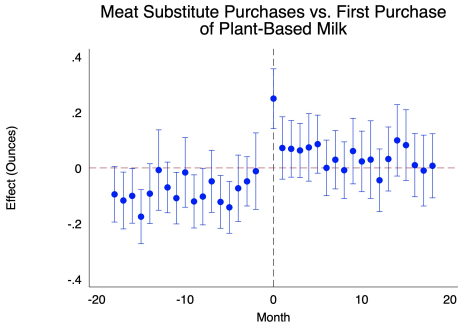
more





Relevant Events: First Plant-Based Milk Purchase more





Conclusion

- Percentiles and the extensive margin suggest a potential rise in meat avoidance.
- Meat purchases appear to respond significantly to *something* in one's surroundings.
- Substitutes and news events might have some effects but face important confounders; current results not particularly robust.
  - Some indication that those who respond substitute away from chicken, fish, pork, and milk more than beef.

Next Steps

- Further analyses:
  - Ice cream and/or yogurt substitutes
  - Separate investigations' impacts by animal species
  - Improved price elasticities
- Improve events analysis using synthetic differences-in-differences.
- Potentially implement structural model.
  - Learning model á la Bronnenberg and Dubé (2016).

Thank you!

Appendix

Include same graphs as above with different classification for what counts as meat and milk

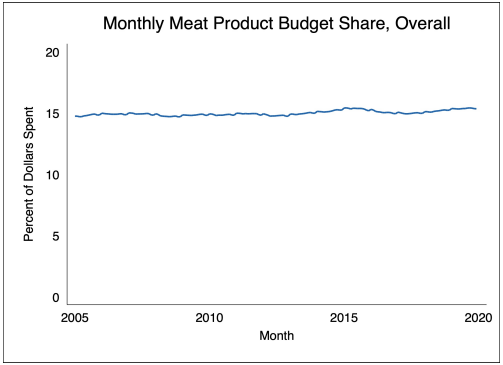
Related Literature - Animal Welfare and Economics

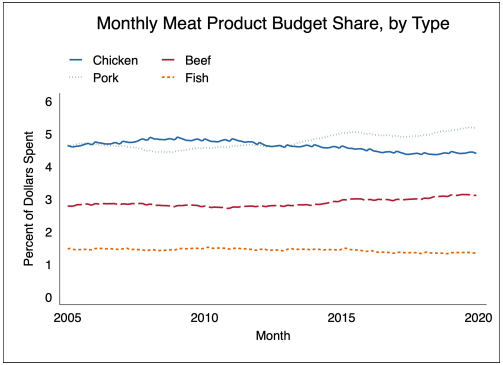
- One mention of animal welfare or rights ever in a top-5 economics journal, in a footnote (Blackorby, Bossert and Donaldson 1995)
- Substantial research in agricultural economics (e.g. Norwood and Lusk 2011)
  - WTP for animal welfare (Allender and Richards 2010, Clark et al 2017)
  - Effects of various policies (Malone and Lusk 2016, Mullallyand Lusk 2018)
  - Surveys and experiments on consumer behavior (Norwood 2018, Paul et al. 2019)
- Recent work on directly incorporating animal welfare in economics (e.g. Fleurbaeyand Van der Linden 2018) and related empirical work (Treich 2021, Espinosa forthcoming)

Related Literature - Animal Welfare and Nielsen Data

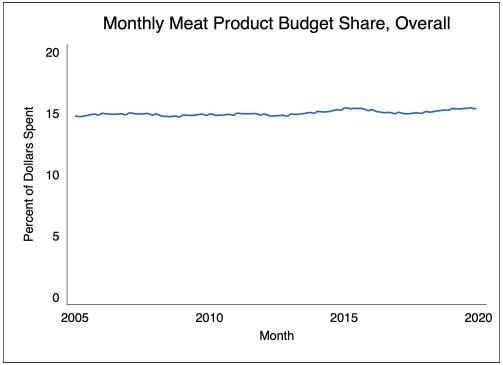
- Data on individual animal product consumption based on self-reports (Peacock 2018)
- Recent interest in how introduction of plant-based meat alternatives (PBMAs) changes consumption behavior
  - Zhao et al. (2022) use Nielsen data to study demand for PBMAs based on an almost ideal demand system model.
  - Cuffey et al. (2022) use Nielsen data to study how consumption changes around the first purchase of PBMAs.

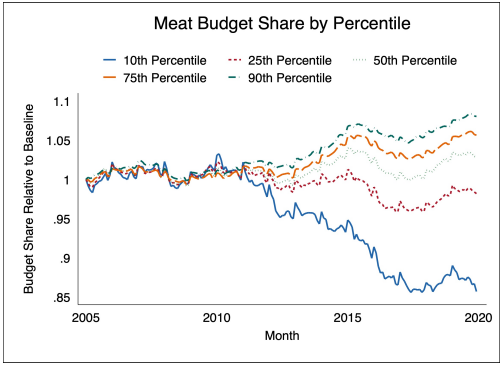
Trends: Meat Purchases (Shares)



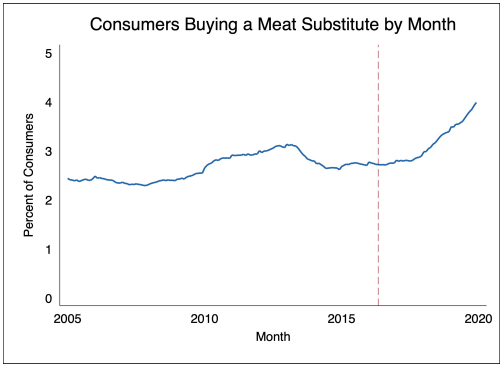


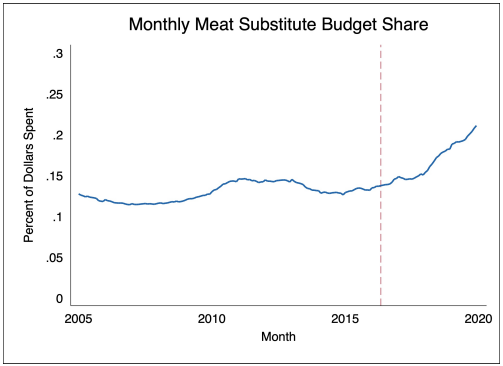
Trends: Meat Budget Share



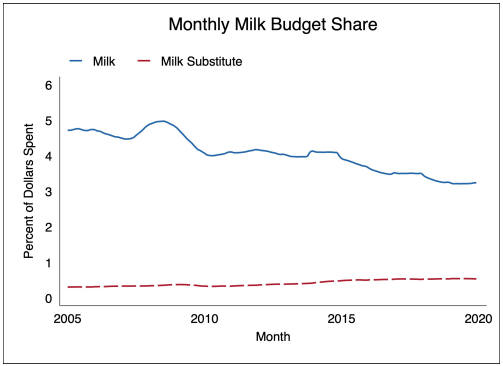


Trends: Meat Substitutes (Shares)

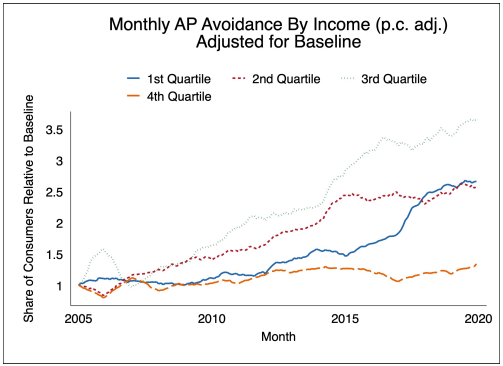


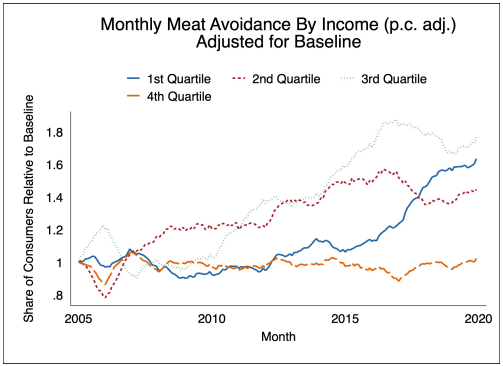


Trends: Milk (Shares)

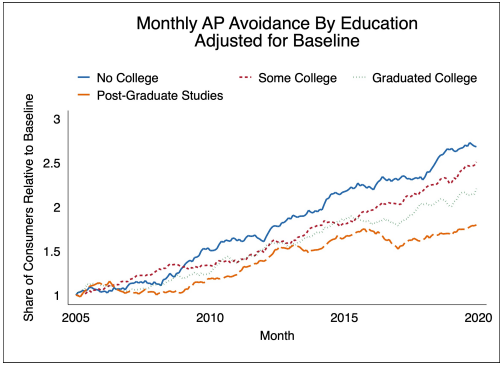


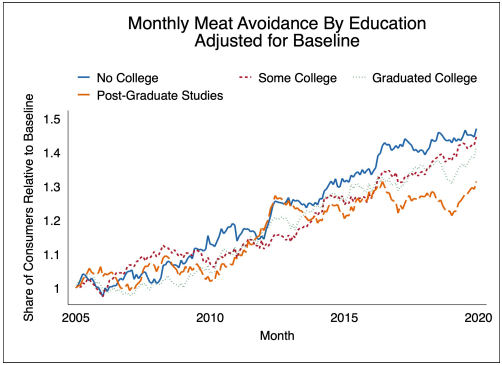
Trends: Monthly Animal Product Avoidance by Income



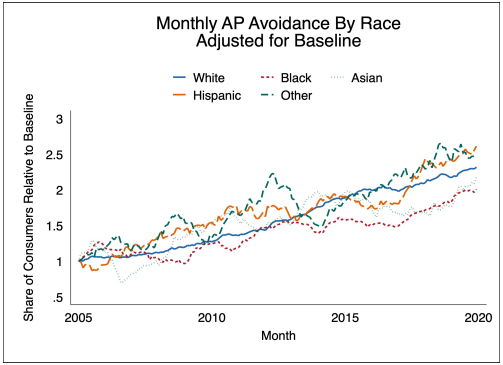


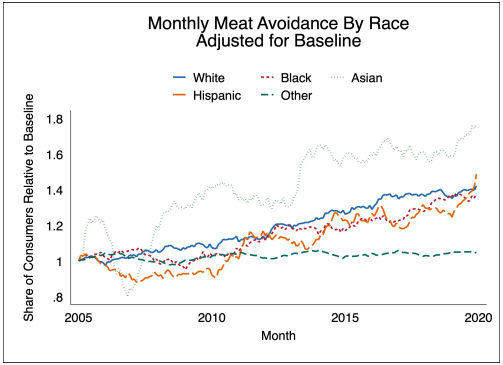
Trends: Monthly Animal Product Avoidance by Education



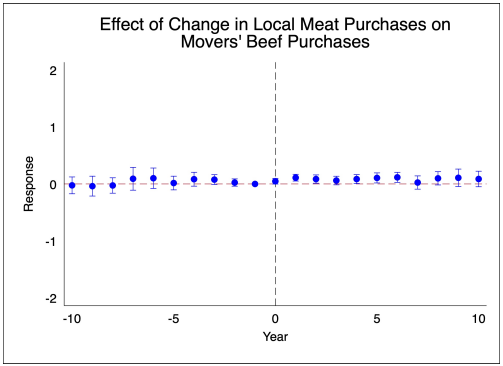


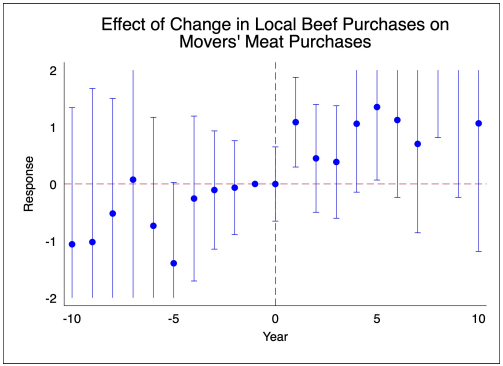
Trends: Monthly Animal Product Avoidance by Race



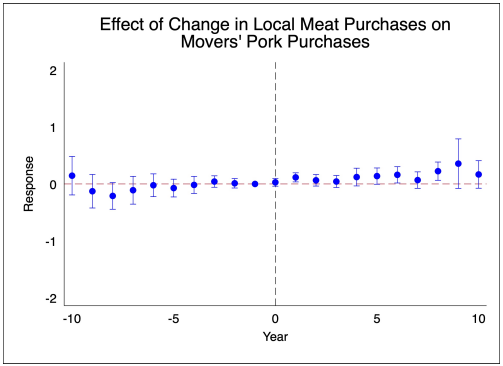


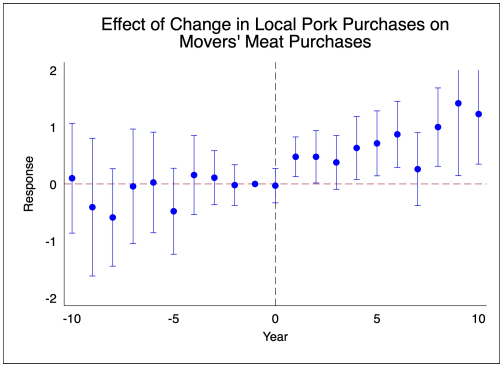
Movers: Cow Meat, Independent vs. Dependent Variable



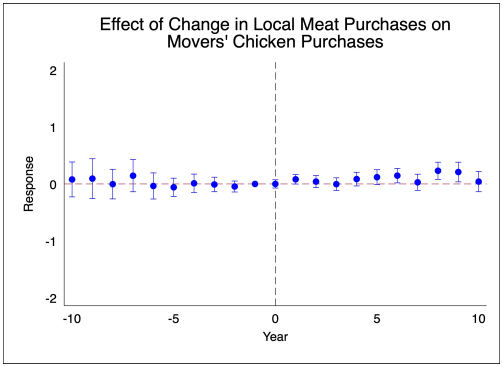


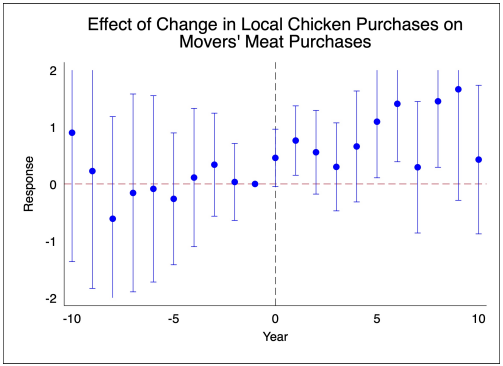
Movers: Pig Meat, Independent vs. Dependent Variable



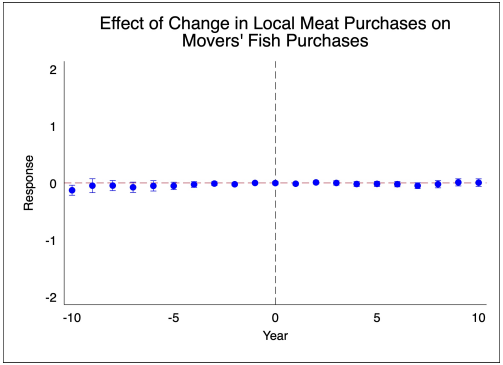


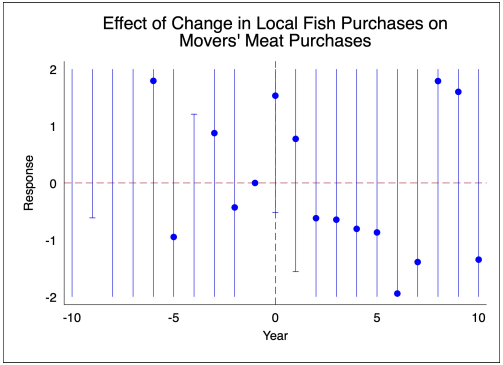
Movers: Chicken, Independent vs. Dependent Variable



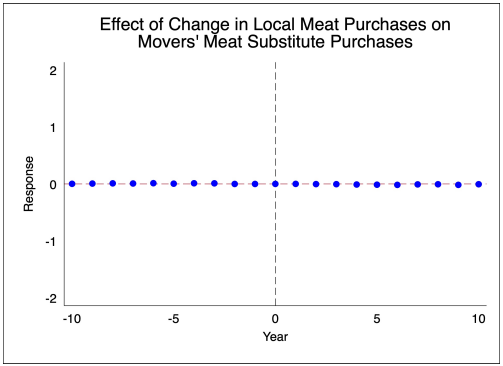


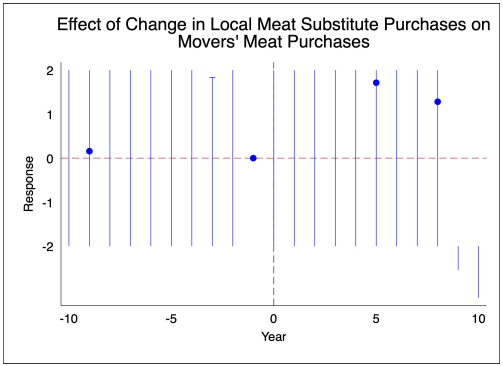
Movers: Fish, Independent vs. Dependent Variable



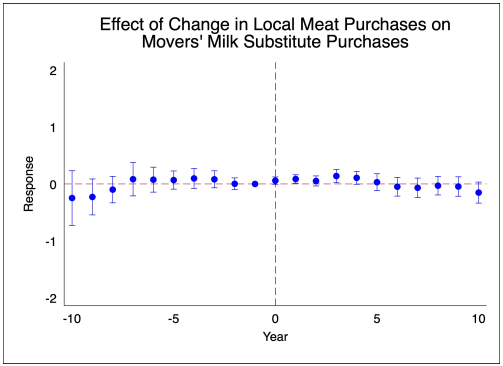


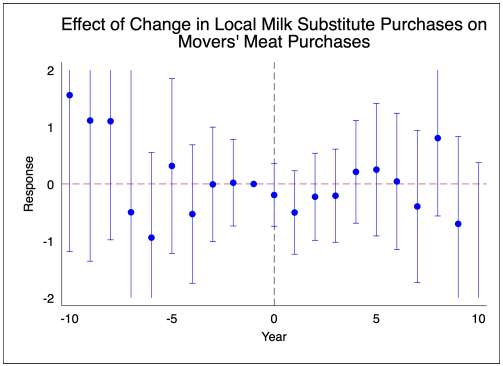
Movers: Meat Substitutes, Independent vs. Dependent Variable



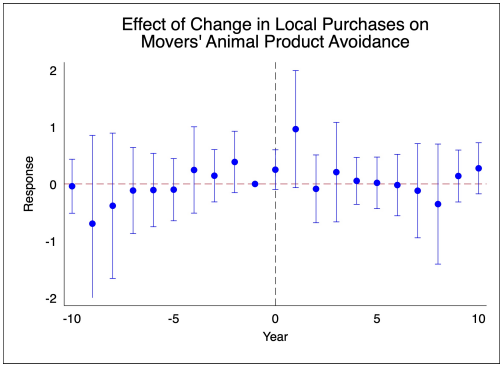


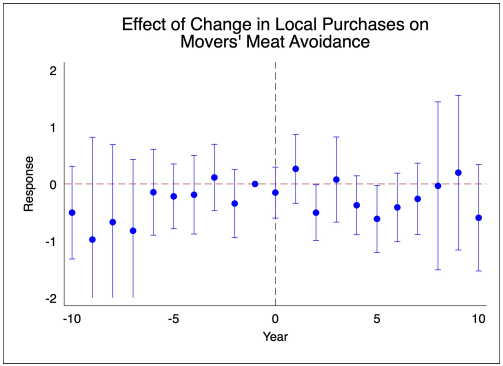
Movers: Milk Substitutes, Independent vs. Dependent Variable



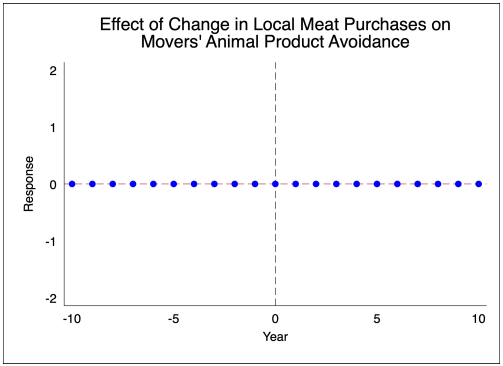


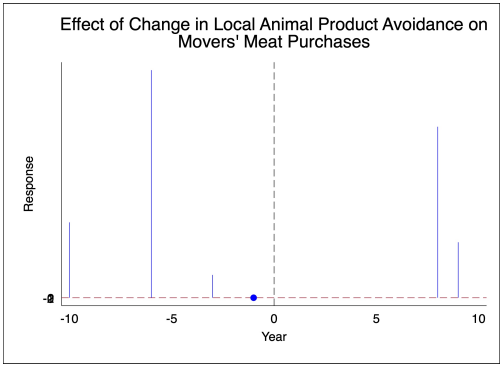
Movers: Meat and Animal Product Avoidance



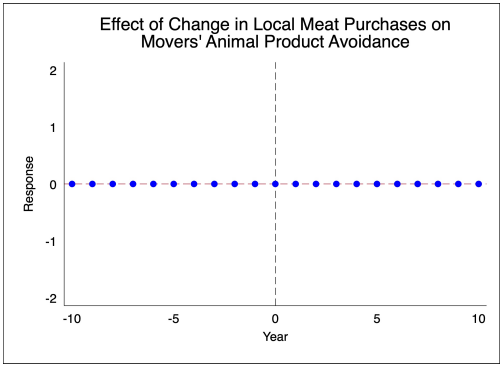


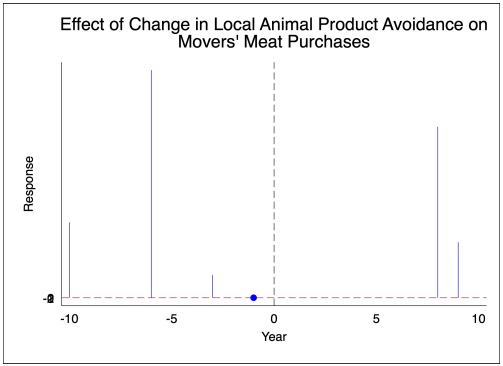
Movers: Animal Product Avoidance, Indep. vs. Dep.



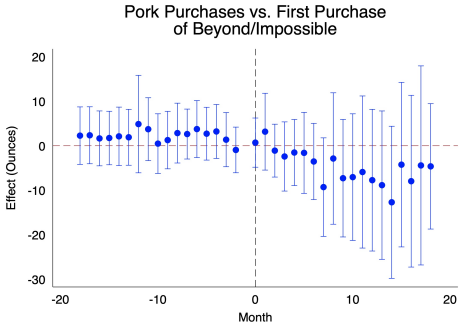


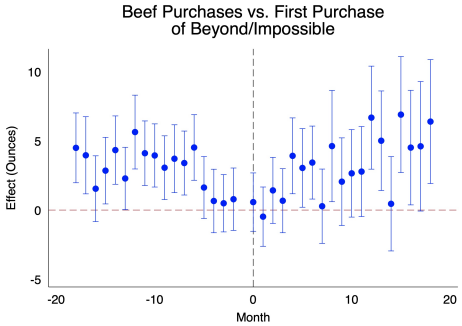
Movers: Meat Avoidance, Indep. vs. Dep.



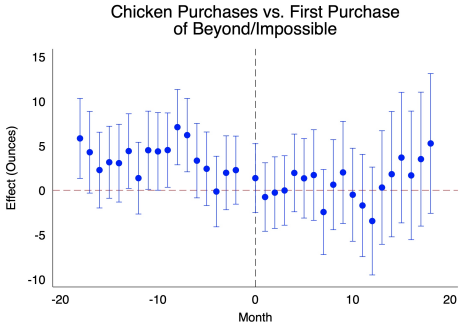


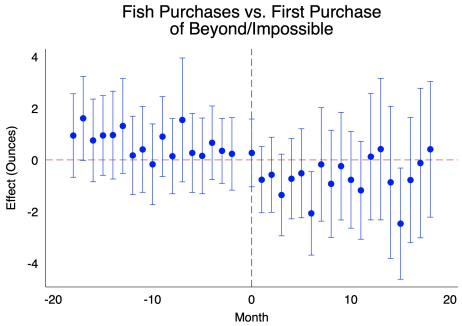
Relevant Events: First Beyond/Impossible Purchase



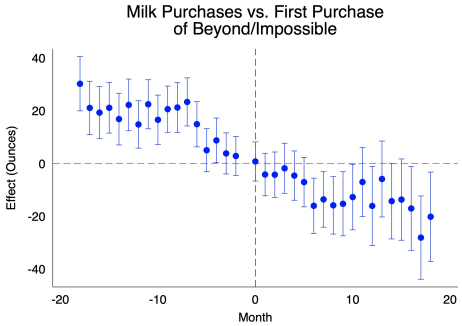


Relevant Events: First Beyond/Impossible Purchase

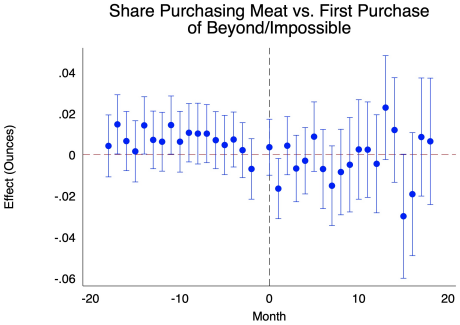


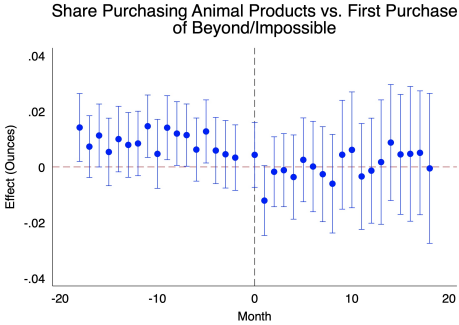


Relevant Events: First Beyond/Impossible Purchase

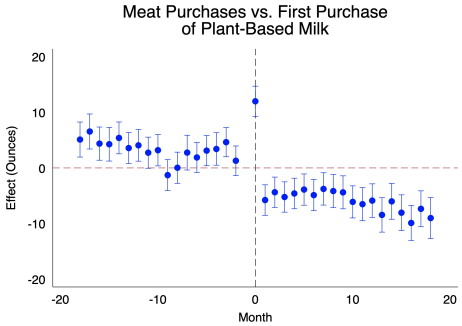


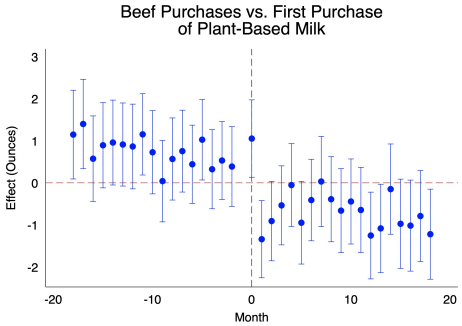
Relevant Events: First Beyond/Impossible Purchase



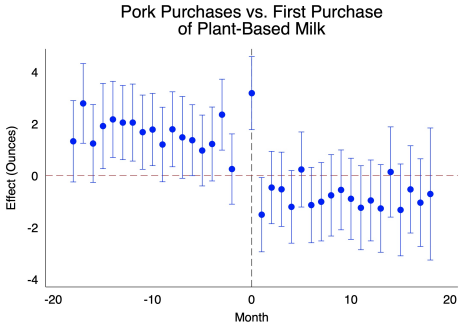


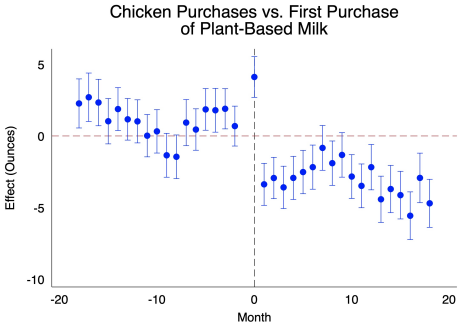
Relevant Events: First Plant-Based Milk Purchase



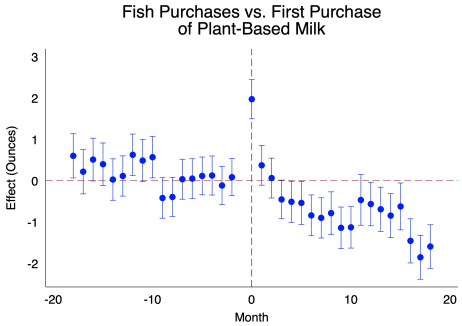


Relevant Events: First Plant-Based Milk Purchase

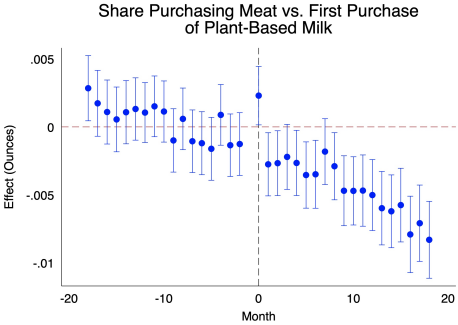


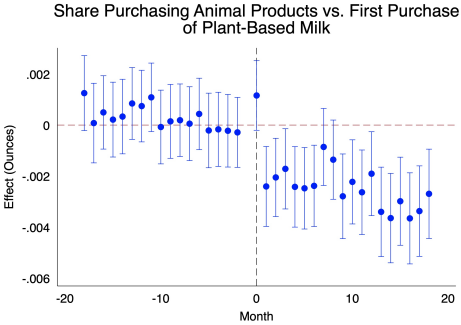


Relevant Events: First Plant-Based Milk Purchase

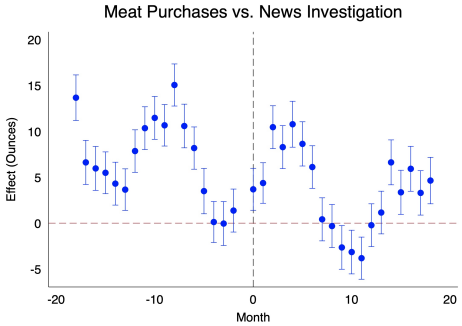


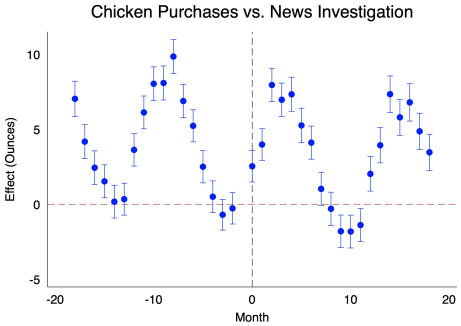
Relevant Events: First Plant-Based Milk Purchase



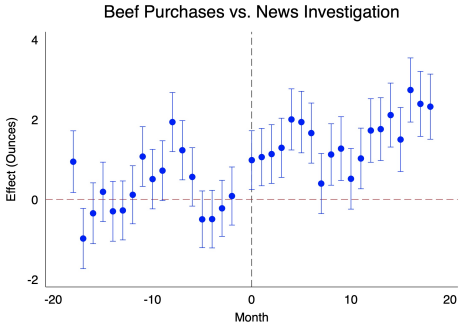


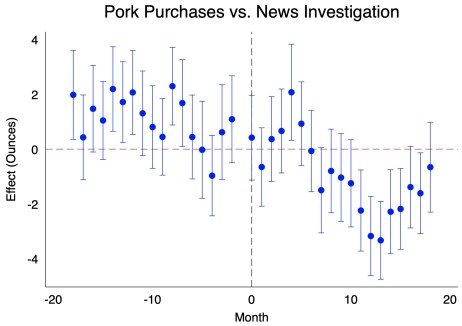
Relevant Events: Undercover Investigation



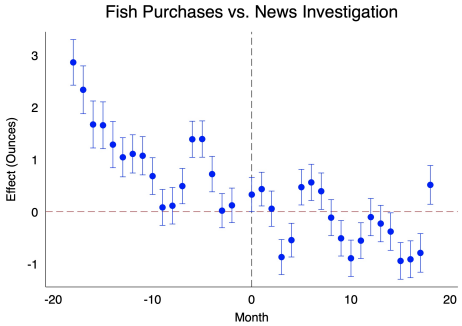


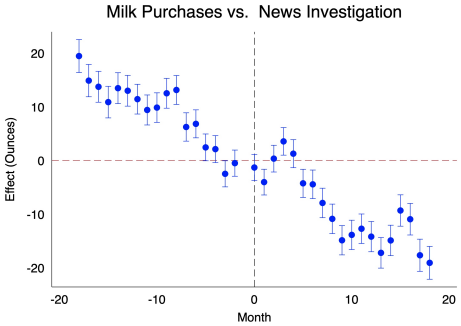
Relevant Events: Undercover Investigation



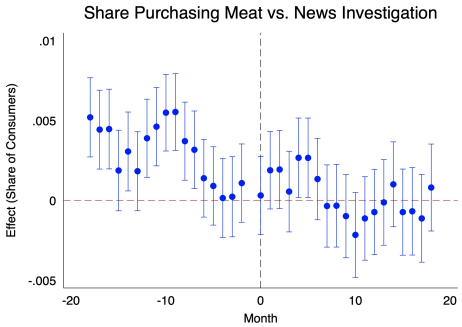


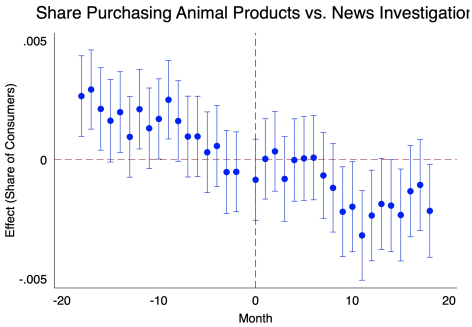
Relevant Events: Undercover Investigation



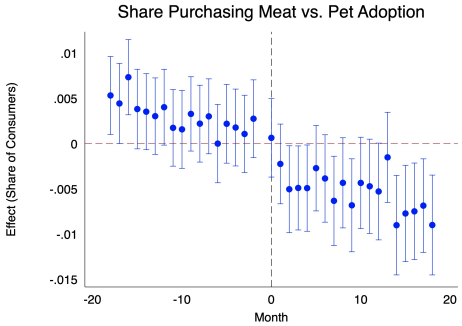


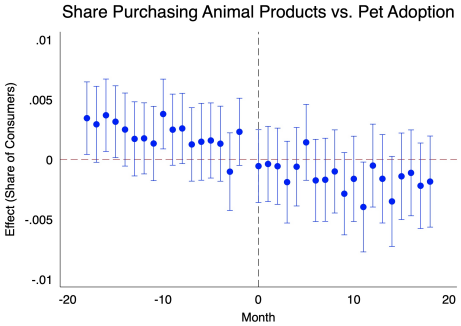
Relevant Events: Undercover Investigation





Relevant Events: Pet Adoption





Relevant Events: Pet Adoption