Is Mass Media an Effective Channel for Conveying Nutritional Information? Welfare Implications of the WHO Classification of Processed Meats as Carcinogenic on Consumers in Israel

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November 7, 2022

[1]Supported by: The Nutricia Research Foundation (NRF), The Center for Agricultural Economic Research, The National Insurance Institute of Israel

Outline

Introduction

On October 26th, 2015 the WHO issued a dramatic announcement:

- Processed meat products were classified as *carcinogenic to humans* (group 1)
- The consumption of red meat was classified as *probably carcinogenic to humans* (group 2A)

Group 1 Carcinogens

- Tobacco smoking
- Asbestos
- Arsenic
- Air pollution

Motivation and Objectives

- Supplying food that adversely affects health, without the consumers' awareness, creates a negative externality. A cost which is not fully accounted by the market equilibrium.
- We measure how science-based nutritional information affects the market, and evaluate the effectiveness of disseminating information in the mass media as a tool for behavior change.

Review of Literature – the WHO Announcement

- **Carrieri and Principe (2022)** – Method: DID; Location: Italy.
  - **Causal effect:** 10% decrease in Processed Meat expenditures. The effect lasted only one month.
  - **Heterogeneity:** Households with higher levels of education and higher health awareness had a stronger and more persistent response.
  - **Drawbacks** Cross sectional data, Expenditures only.
- **He and Lusk (2021)** – Method: Synthetic Control; Location: USA.
  - **Causal effect:** 3% decrease in Bacon sales, lasted 1 year. No effect on Ham sales.
  - **Drawbacks** Aggregated scanner data (no panel).

Contribution:

- **Panel data:** Controlling for unobserved heterogeneity (HH FEs).
- **Prices & Quantities:** Take price changes into account.
- **Welfare Analysis:** The first to examine whether the effect is economically optimal.

Data

- **Purchases Panel Data** – more than 2M observations of processed meat (and other categories) purchases conducted by 2,290 households that represent the population of Israel, for 2014-2017 (Source: Nielsen).
- **Firms advertising expenditures** - all advertisement campaigns conducted by the processed meat producers and of the additional categories producers (Source: Ifat media research)
- **Media-index** - publications associated with health risks regarding meat intake, collected from all media channels (Source: Ifat media research)

All data-sets are available for both pre and post-announcement periods

Identification

Assumption: The WHO announcement was strictly exogenous to the local meat market (sudden rise in the media index).

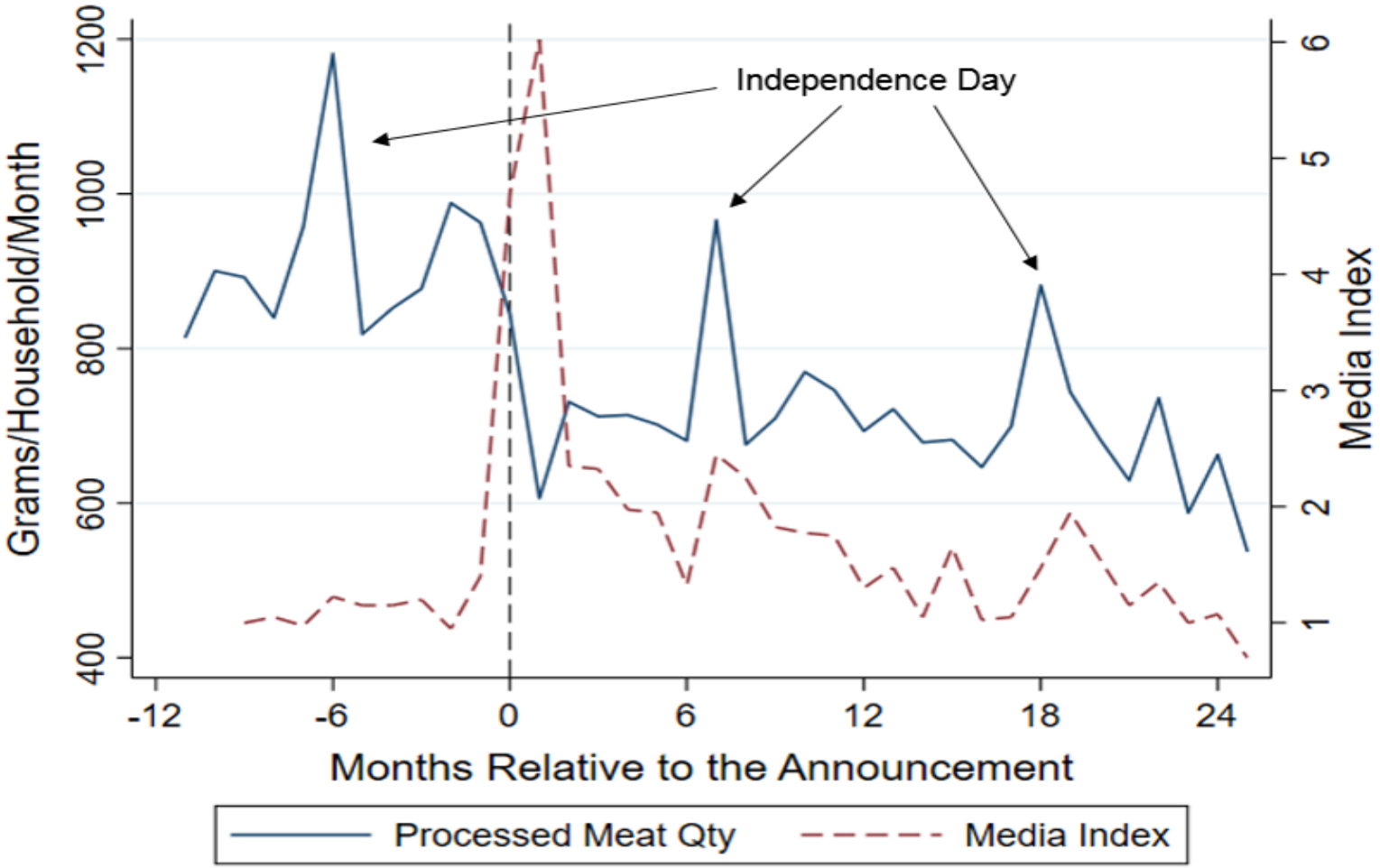


Figure 1: The Story in a Nutshell

Methods

1. **Event Study**
2. **Regression Discontinuity in Time (RDiT):**
   - Time is the running variable
   - Time is not randomly assigned within a neighborhood around the cutoff - may violate the "as good as random" assumption
   - Outcome variable may be correlated with different time points. Controlling for seasonality is crucial.
   - Successfully controlling for seasonality requires longer time series - Relaying on obs. far away from the cut off

Augmented Local Linear RD (Hausman & Rapson 2018)
Cleans out seasonality and exploits the entire sample length

- **Stage 1:** The entire sample (T) is exploited to estimate the effect of seasonality and other variables on quantity. The residues are saved.
- **Stage 2:** A local linear specification is estimated within a narrow bandwidth, where the first stage residuals is the dependent variable.

*Consistent standard errors are retrieved using bootstrapping

*The 1st stage was estimated using PPML due to the non negative nature of the dependent variable

Event Study

The WHO warning effect on processed meat quantities is negative, significant and persistent

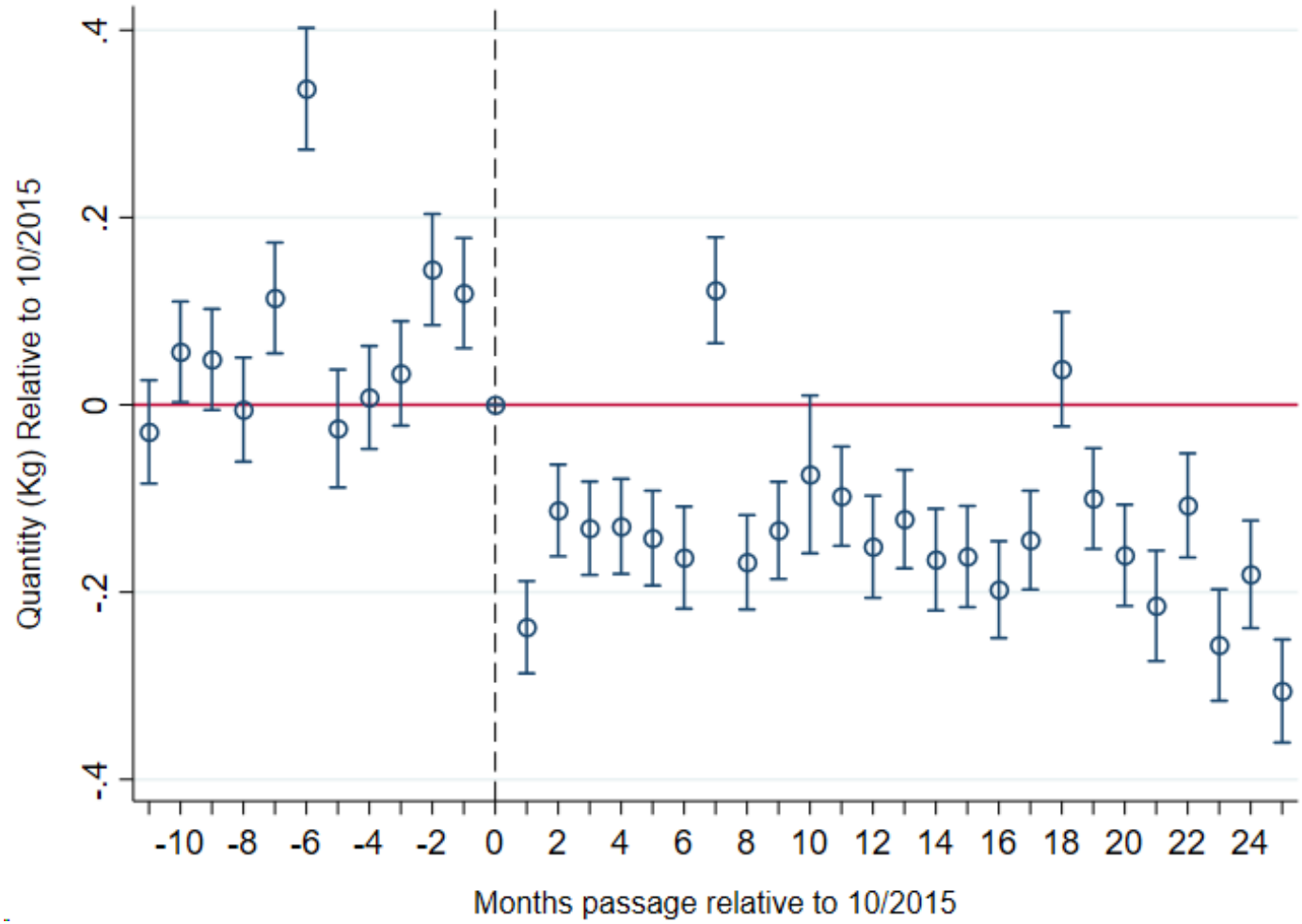


Figure 2: Event Study Analysis

ARD Results – Treatment Effect

- The warning effect on processed meat quantities is significant and negative (-164 gr/household/month, -18%)
- All four processed meat categories were significantly and negatively affected

Table 4: Local linear ARD - Results by Category

	(1)		(2)	
Treatment Effects	g/month	Pct.	g/month	Pct.
Processed Meat	-200.177***	-0.220***	-163.894***	-0.180***
Pastrami & Sausages	-67.679***	-0.184***	-45.625***	-0.124***
Hot Dogs	-53.358***	-0.314***	-42.690***	-0.251***
BBQ Products	-47.994***	-0.227***	-48.453***	-0.230***
Schnitzel	-31.146***	-0.193***	-27.125***	-0.168***
Red Meat	-36.775*	-0.050*	-40.963**	-0.056**
Fresh Red Meat	-59.526***	-0.116***	-48.050***	-0.094***
Frozen Red Meat	22.751*	0.105*	7.087	0.033
Observations	508,380		508,380	
Controls: Months & Holidays	YES		YES	
Controls: Price Ix & Advertising	NO		YES	
Household-Category FEs	YES		YES	
Bandwidth	12 Months		12 Months	
Kernel	Epanechnikov		Epanechnikov	

ARD Results - Heterogeneity

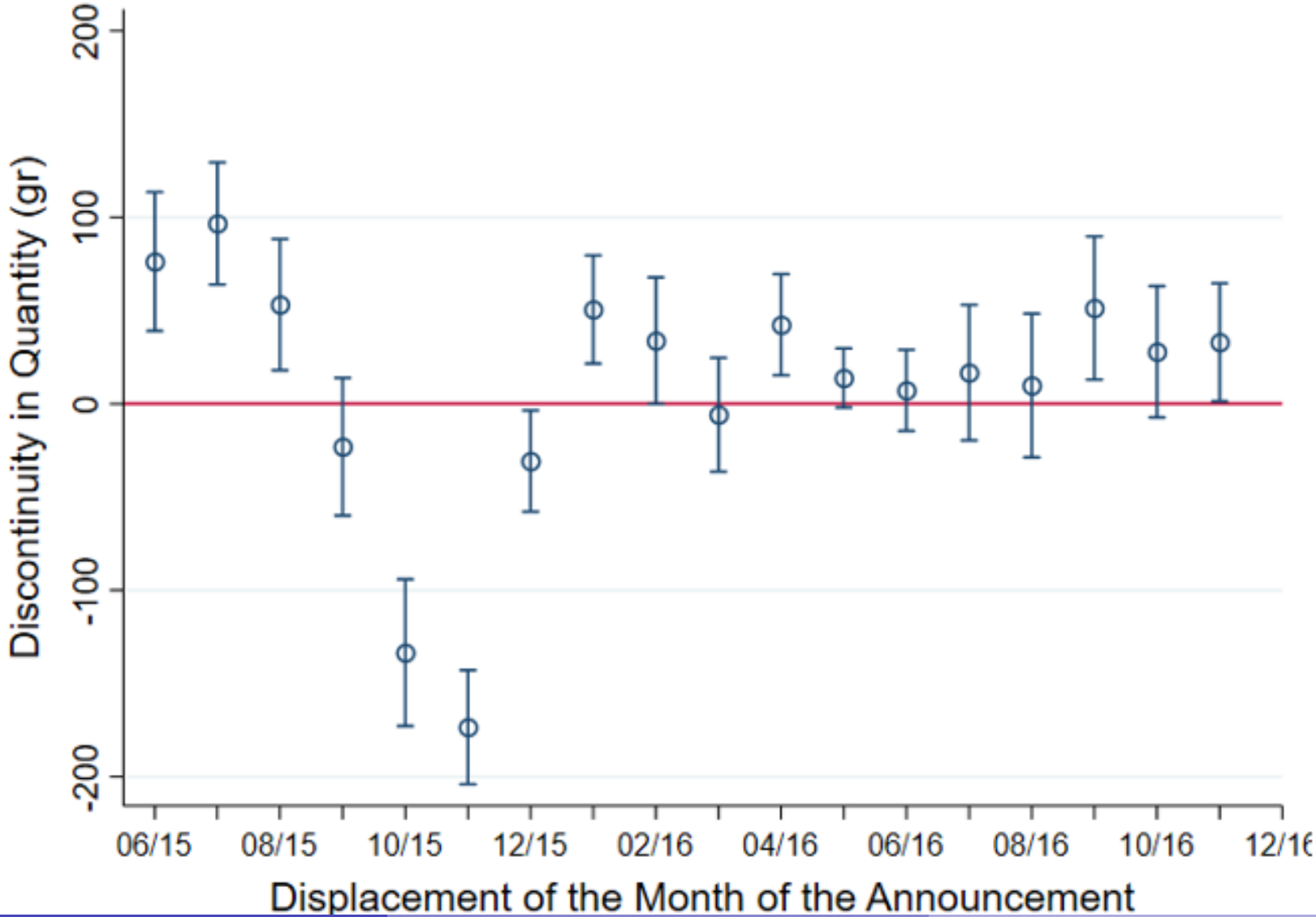
- Low-income and Former USSR immigrants did not significantly respond to the announcement
- No evidence to the effect of education on the response to the announcement

Table 6: ARD Results by Product Categories and Demographic Groups

	Processed Meat									
	Total		Pastrami & Sausages		Hot Dogs		BBQ Products		Schnitzel	
Average Treatment Effects	g/month	Pct.	g/month	Pct.	g/month	Pct.	g/month	Pct.	g/month	Pct.
All	-163.894***	-0.180***	-45.625***	-0.124***	-42.690***	-0.251***	-48.453***	-0.230***	-27.125***	-0.168***
Low Income	-36.436	-0.075	23.025	0.133	-55.214***	-0.503***	17.365	0.116	-21.612	-0.423
Medium and High Income	-175.691***	-0.185***	-51.979***	-0.135***	-41.531***	-0.236***	-54.545***	-0.252***	-27.636***	-0.161***
Difference	139.255**	0.110	75.004***	0.267**	-13.683	-0.266	71.910**	0.368	6.024	-0.262
Russian Immigrant	33.859	0.035	43.573	0.096	3.548	0.017	16.701	0.098	-29.964	-0.207
Non-Russian Immigrant	-201.390***	-0.224***	-62.538***	-0.178***	-51.458***	-0.315***	-60.807***	-0.278***	-26.587***	-0.161***
Difference	235.248***	0.259***	106.111***	0.274***	55.005**	0.332***	77.509***	0.376***	-3.376	-0.046
Academic Educ.	-144.582***	-0.154***	-43.464***	-0.114***	-36.892***	-0.214***	-29.369**	-0.148**	-34.856***	-0.185***
No Academic Educ.	-178.864***	-0.201***	-47.300***	-0.132***	-47.185***	-0.280***	-63.247***	-0.286***	-21.132**	-0.150**
Difference	34.283	0.048	3.836	0.018	10.293	0.066	33.878	0.138	-13.724	-0.035
Elementary Educ.	-368.239**	-0.507**	-202.883	-0.810	-106.028*	-0.557*	-31.667	-0.158	-27.660	-0.325
Educ. Higher than Elementary	-159.891***	-0.175***	-42.544***	-0.115***	-41.449***	-0.244***	-48.782***	-0.231***	-27.115***	-0.166***
Difference	-208.348	-0.332	-160.339	-0.695	-64.579	-0.313	17.115	0.073	-0.546	-0.159
Has Kids	-245.089***	-0.197***	-53.321***	-0.125***	-81.900***	-0.322***	-76.732***	-0.243***	-33.136**	-0.133**
Has No Kids	-126.733***	-0.167***	-42.103***	-0.123***	-24.745***	-0.188***	-35.511***	-0.218***	-24.375***	-0.201***
Difference	-118.356***	-0.029	-11.218	-0.002	-57.155***	-0.134	-41.222*	-0.025	-8.761	0.068
Lives in the Periphery	-158.225***	-0.157***	-15.843	-0.038	-40.377***	-0.194***	-69.432***	-0.296***	-32.573***	-0.224***
Lives in the Center	-166.851***	-0.194***	-61.159***	-0.179***	-43.897***	-0.292***	-37.511***	-0.189***	-24.284***	-0.143***
Difference	8.626	0.036	45.316**	0.141***	3.521	0.098	-31.922	-0.107	-8.289	-0.082
Orthodox Jew	-236.614***	-0.328***	-50.304**	-0.316**	-93.465***	-0.557***	-84.207*	-0.246*	-8.639	-0.166
Non-Orthodox Jew	-154.741***	-0.166***	-45.036***	-0.114***	-36.300***	-0.213***	-43.953***	-0.226***	-29.452***	-0.168***
Difference	-81.873	-0.162*	-5.268	-0.202	-57.165**	-0.344**	-40.254	-0.020	20.813	0.001

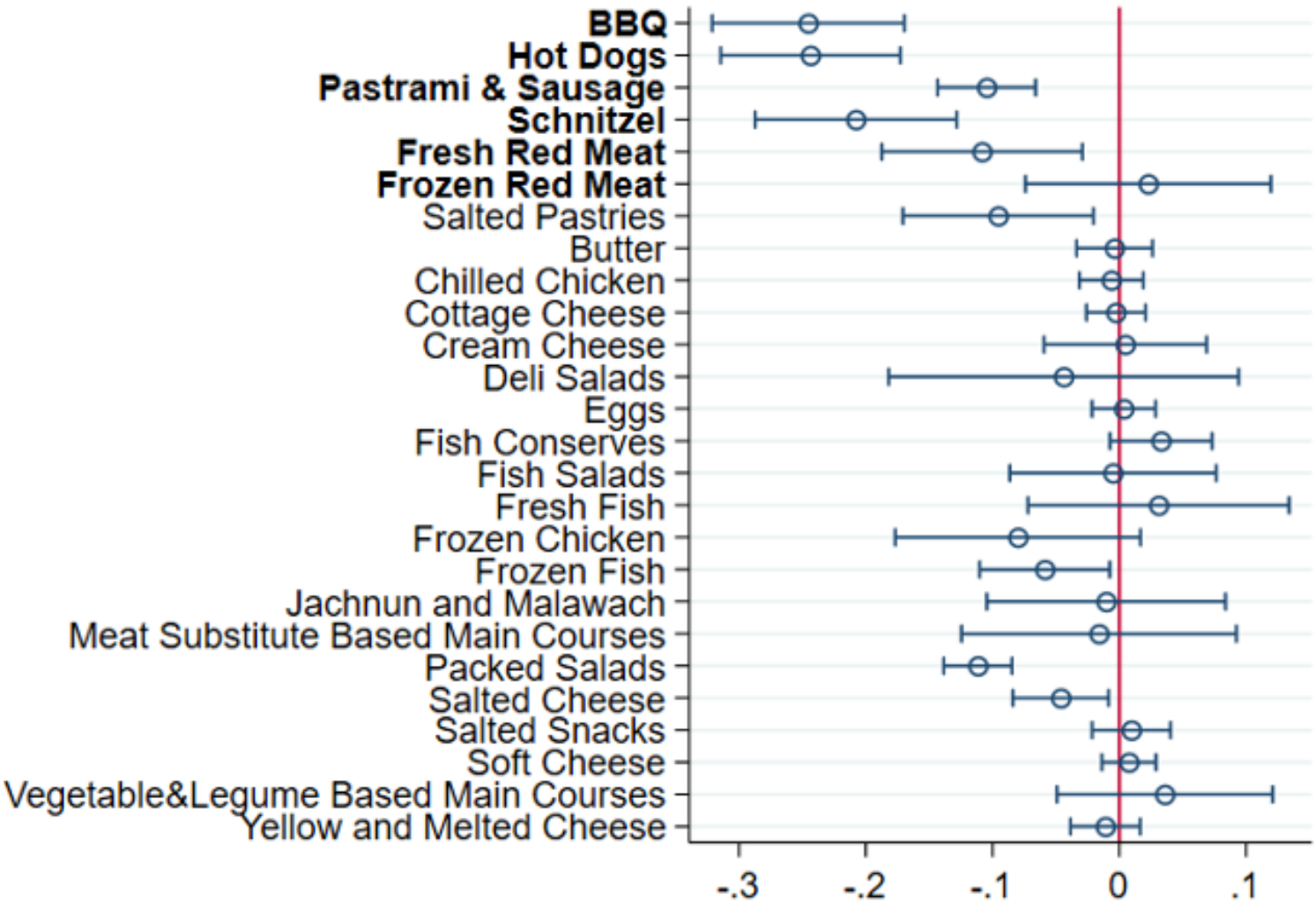
Placebo – Replacing the Announcement Month

- A significant decrease in quantities is found only in the announcement months (10-12.2015)



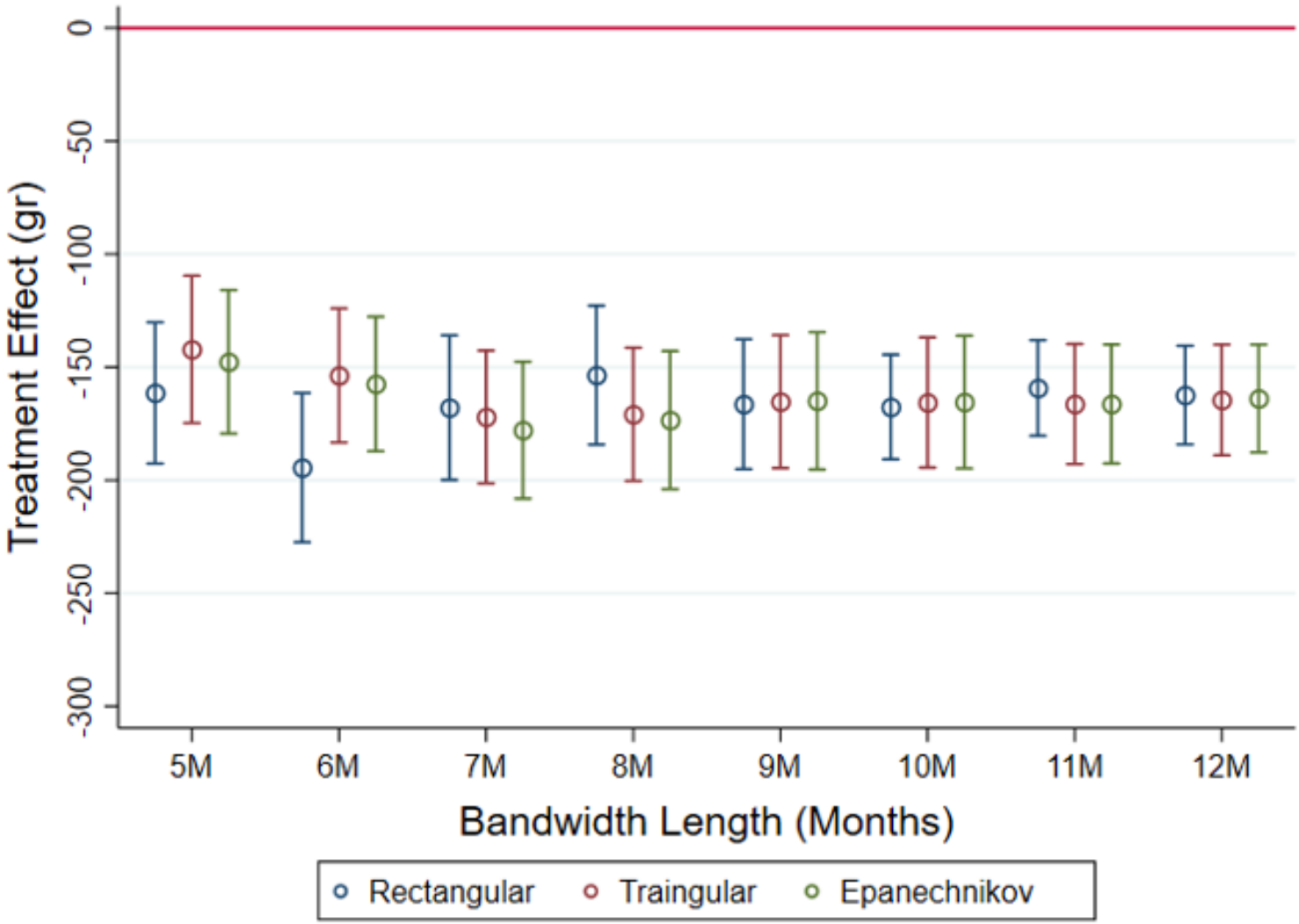
Placebo – Replacing the Announcement Category

- Besides the processed and red meat categories (in bold), only a handful of categories experienced negative and significant discontinuity in the first month following the warning.



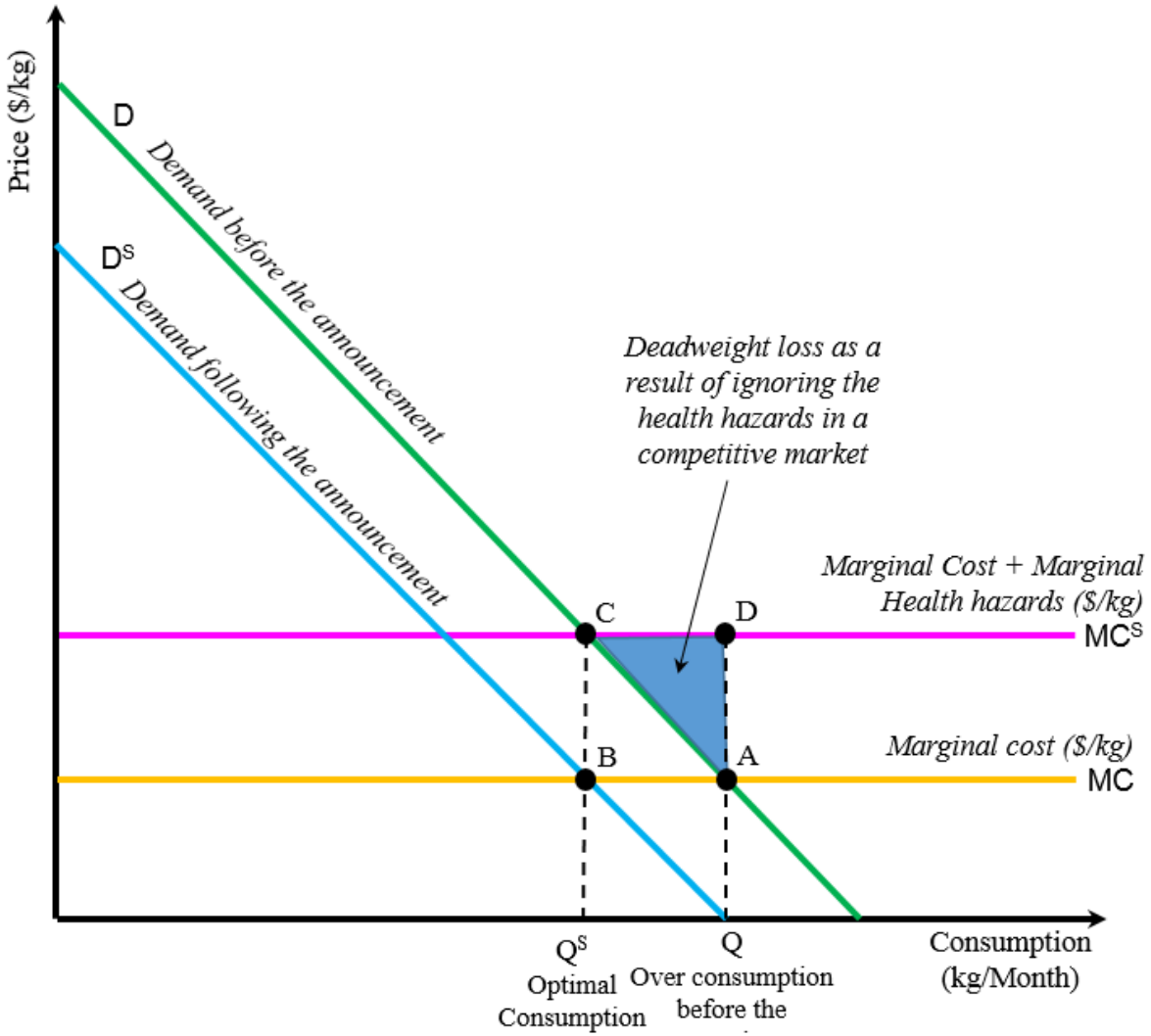
Robustness Check

- The TEs estimated in all specifications are similar, indicating the robustness of the results



Internalization via Change in Consumers' Tastes

A full internalization is achieved if the drop in demand leads to equilibrium quantities equal to those that would have been achieved when the prices reflect the true cost of processed meat (including indirect health hazards).



The Actual Indirect Cost of Processed Meat ($/Kg)

- The indirect health costs of processed meat intake in Israel are estimated at 2.76 $/Kg (ranges between $1.37 - $2.99)

Table 9: Indirect Cost Estimation of Processed Meat Consumption ($/kg)

	Jewish		Arab		All		
	Male	Female	Male	Female	Male	Female	All
Indirect cost of YPLL due to consumption of processed meat ($/kg) (a)							
Preferred estimate	2.85	2.08	3.48	3.16	2.93	2.25	2.53
Lower bound	1.43	1.05	1.75	1.59	1.48	1.14	1.28
Upper bound	2.91	2.13	3.56	3.24	3.00	2.31	2.59
Illness indirect Cost due to consumption of processed meat ($/kg) (b)							
Preferred estimate	0.26	0.22	0.24	0.18	0.26	0.21	0.23
Lower bound	0.11	0.09	0.10	0.07	0.10	0.08	0.09
Upper bound	0.45	0.37	0.42	0.32	0.45	0.36	0.40
Total indirect Cost due to consumption of processed meat ($/kg)							
Preferred estimate	3.11	2.29	3.72	3.35	3.19	2.46	2.76
Lower bound	1.54	1.13	1.85	1.67	1.58	1.22	1.37
Upper bound	3.37	2.50	3.98	3.56	3.45	2.67	2.99

The Perceived Indirect Costs of Processed Meat ($/Kg)

Perceived Indirect Health Cost of Processed Meat Consumption

	Price Elasticity		
	1.60	1.771	2.29
Equivalent price change (pct.)	0.112	0.102	0.078
Perceived cost ($/kg)	1.69	1.53	1.18

- Price elasticities were estimated based on the DGN-2014 demand model
- The perceived indirect cost of processed meat intake is 1.53 $/Kg (ranges between $1.18 to $1.69)
- In the absence of the WHO warning, a -18% drop in demand could be achieved through a 10% price increase

The health Costs of Processed Meat Consumption

- We cannot reject the null hypothesis that the equilibrium following the WHO announcement is economically optimal.

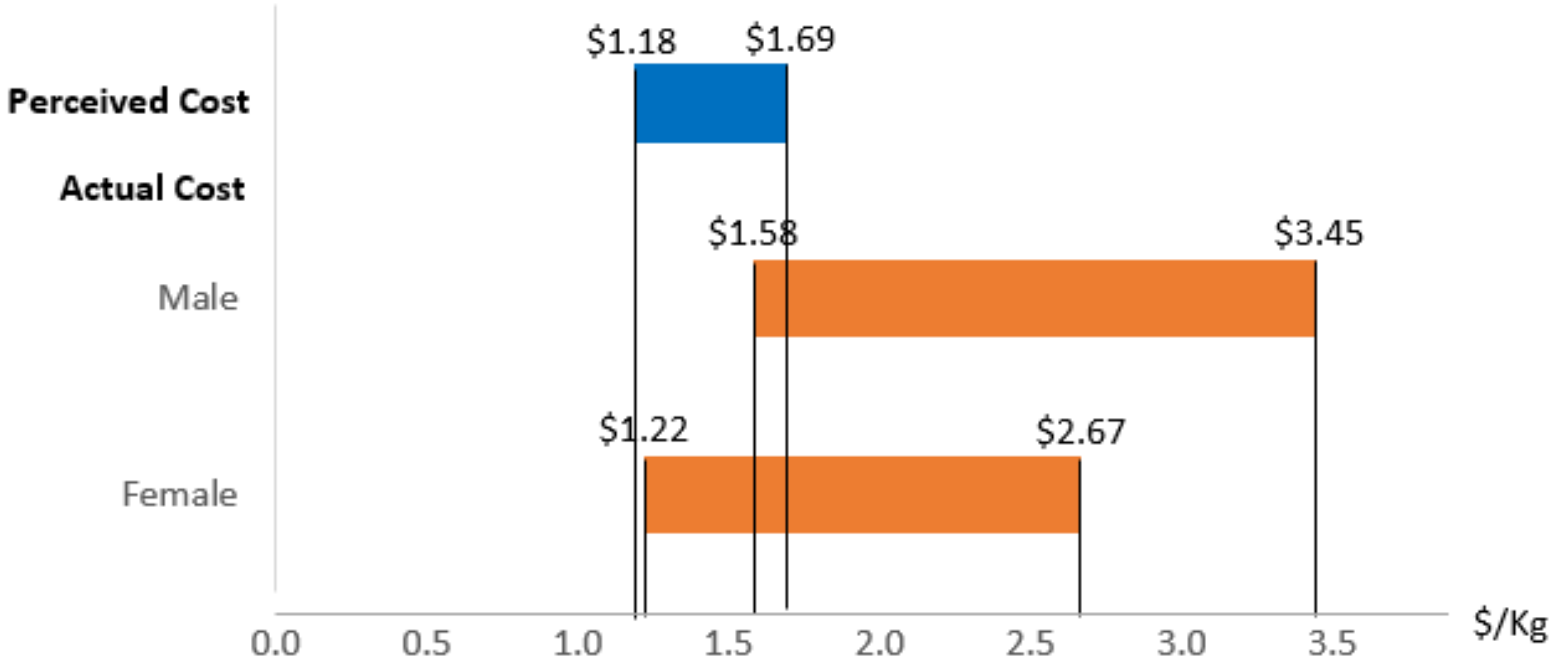


Figure 4: Perceived vs. Actual Health Costs of Processed Meat Consumption

Notes: The results were calculated based on the panel ARD results of Table 5. The price elasticities were estimated based on the DGN-2014 demand model.
The Acual Costs are calculated based on a VSL estimate of \$6.15M (\$3.1M - \$6.3M) and CRC illness cost of \$48.2K (\$19.7K - \$83.8K).
Epidimiological measures were calculated based on a life expectancy tables. The CP to develop\die from CRC is 3.9%\1.75%. YPLL per CRC death is 15.7 years. Pop. mean of YPLL is 0.276 (~100 days).

Thank you for listening