



Economic Considerations for Regulation of Chemical Contaminants in the Food Supply

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Disclosures

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Outline

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 - Chemical contaminants in the food supply
 - FDA action levels and guidance
 - Lead guidance example
- Economic framework for chemical contaminants
 - Cost benefit analysis overview
 - Measuring costs and benefits
- Case study: Pesticide policy analysis

Background



Chemical contaminants in the food supply

- Chemical hazards in food are contaminants that can enter food during production and pose a risk to food safety.
- Examples include:
 - Cleaning chemicals and pest control substances
 - Oven and grill cleaners, insecticides, and herbicides
 - Environmental contaminants
 - Heavy metals like lead and mercury, arsenic, and cadmium
 - Natural toxins
 - Aflatoxins
 - Processing contaminants/chemical by-products that can form during food processing
 - Acrylamide and ethyl carbamate

FDA action levels

- The US Food and Drug Administration (FDA) uses action levels as a regulatory tool to help reduce chemical contaminants in food products (including animal feed) when a certain level is unavoidable.¹
 - Action levels are limits that indicate when the FDA considers the food adulterated and when they *may* take legal action.
 - Action levels do NOT establish a permissible level of contamination.
- If there is no established action level, FDA may act against a product if it contains the contaminant at a detectable level.

¹ <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/guidance-industry-action-levels-poisonous-or-deleterious-substances-human-food-and-animal-feed>

Setting action levels

The setting of action levels relies primarily on:

1. Exposure assessment attempts to assess how much lower exposure to the substance would be if the action level were in place.
2. Achievability assessment attempts to gather a representative sample of food products to assess what percentage of those foods would fall above or below the action level.

Lead in food intended for babies and young children

- Even low levels of lead exposure can be harmful to babies and young children.
- In 2021, FDA initiated the *Closer to Zero* action plan
 - Identifies actions to minimize exposure to toxic elements, including lead, from foods eaten by babies and young children
- In January 2023, FDA published draft action levels

Product	Draft action level (parts per billion)	Achievability (%)
Fruits, vegetables (excluding single-ingredient root vegetables), mixtures, yogurts, custards/puddings, and single-ingredient meats	10	96
Root vegetables (single ingredient)	20	88
Dry infant cereals	20	90

Economic Analyses

- FDA guidance does not require a formal benefit cost analysis (BCA) of enforcing the action level, as a regulation would.
- Many state, federal, and local agencies use cost benefit or similar analyses to evaluate the pros and cons of proposed programs, policies, or regulations.
- The Environmental Protection Agency regularly conducts BCA and has guidelines for conducting economic analyses²

²<https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses-2016>

Economic framework for assessing regulation of chemical contaminants

BCA: Stylized overview



Farm-Level Costs

How does the policy affect farm-level costs (e.g., pest management, labor, farm management, capital)?



Market Effects

How does the policy affect the market (crop prices and production)?



Supply Chain Effects

How does the policy affect ancillary businesses (e.g., packagers)?
Impacts to business risk?



Regional Impacts

How does the policy affect regional jobs, income, taxes, vulnerable/disadvantaged communities?



Consumer

How does the policy affect exposure level, risk of exposure, and impact of exposure on health?

How does the policy affect consumer demand (food prices) for affected products?

BCA quantifies the aggregate change in individual well being resulting from a policy decision in monetary terms

BCA parameters



**Percent of market
impacted/market
volume**



**Costs and
technical
feasibility to
reduce/remove
contamination
from products**



**Cost and
availability of
substitutes for
contaminated
inputs or
reformulation**



**Impact of shut
down and product
disappearance**



**Substitution
effects (net +/-)**



**Marginal health
benefits/reduction
in exposure to
contaminants from
proposed changes
to action levels**

Case Study: Pesticide Policy Analysis

Pesticide policy overview

- Pyrethroids and neonicotinoids (neonics) insecticides that are an important part of integrated pest management (IPM) for lettuce growers
- Exposure to high levels of pyrethroids/pyrethrins in air, food, or water can cause a variety of neurological effects³
- The few available alternatives are more costly, less effective, and require additional management by growers and PCAs

³<https://www.atsdr.cdc.gov/toxfaqs/tfacts155.pdf>

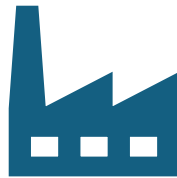
Proposed policy would ban pyrethroids and neonicotinoid in CA

Representative crop: conventional lettuce produced in California



Farm-Level Costs

Stochastic farm budget
Impacts to grower costs, returns, and risk



Supply Chain & Regional Effects

Regional impacts to packing/shipping industries
Input-output economic model



Consumer

Economic model of lettuce market
Impacts to food prices

Increased direct production costs

- Additional direct costs per acre range from \$124 to \$288, plus additional yield/quality decrement, and management costs

Region	Incr. cost w/o pyrethroids	Incr. cost w/o neonics	Incr. cost w/o both	Prod. loss w/o pyrethroids	Prod. loss w/o neonics	Prod. loss w/o both
Coast	\$97	\$135	\$232	5%	10%	15%
Desert	\$124	\$163	\$288	9%	29%	38%
San Joaquin Valley	\$124	-	\$124	5%	-	5%

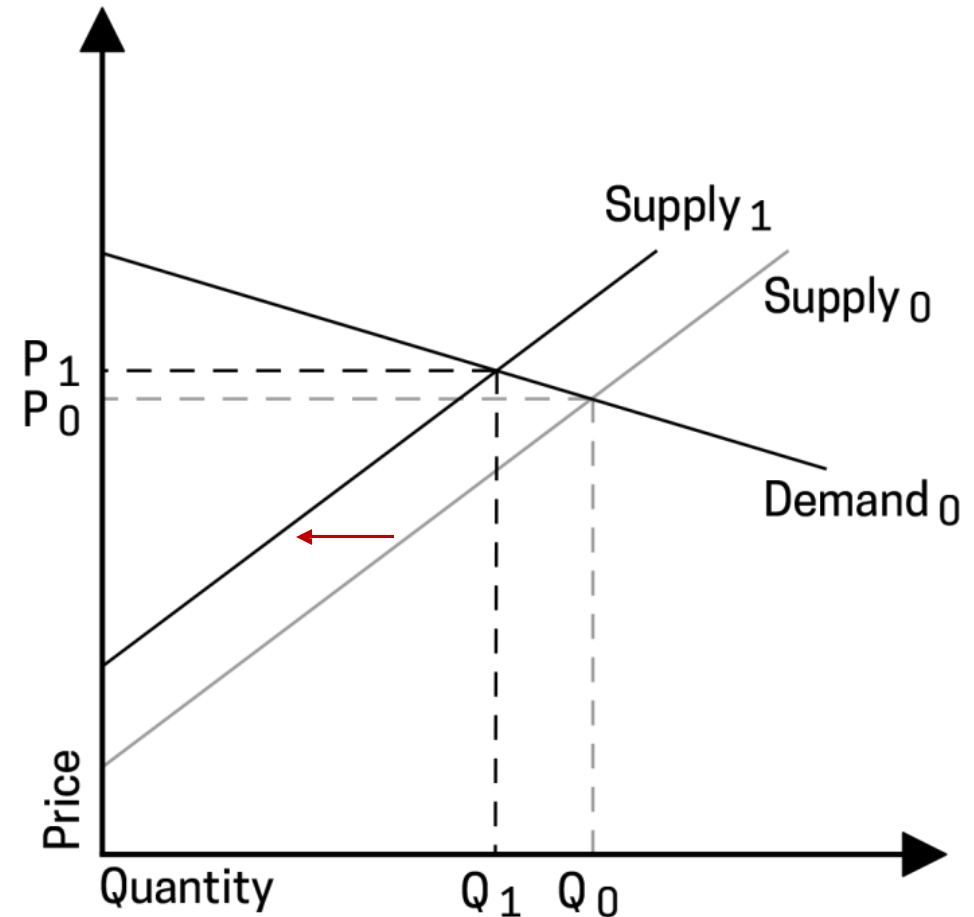
Operating cost effects

- Operating costs for conventional farming increase by approximately 12.3%
 - Includes additional operating costs and yield decrement
 - Does not include additional costs for manager time and crop quality effects



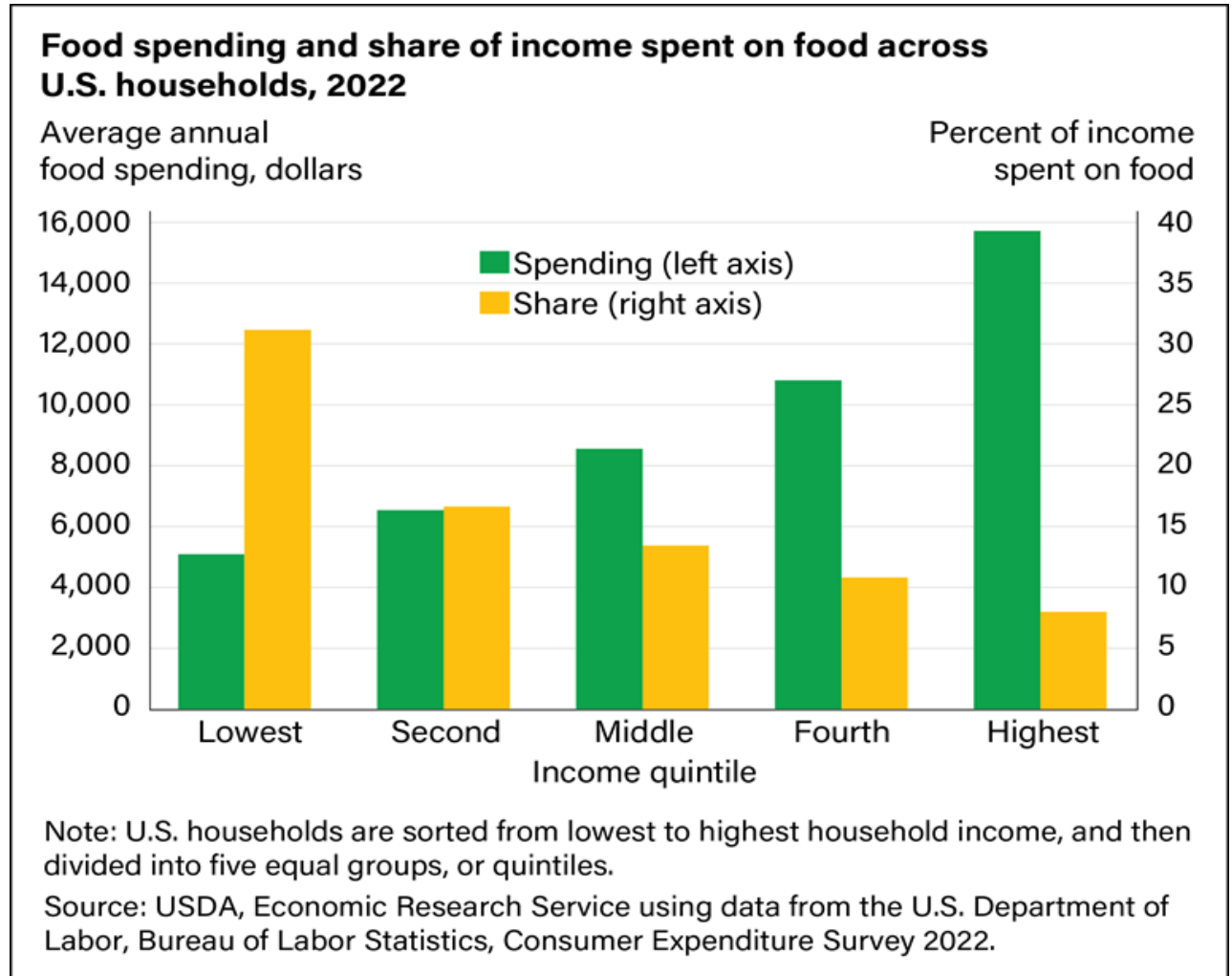
Pesticide policy market implications

- Increasing costs affect growers, buyers, and consumers
 - Some costs are passed on to consumers in the form of higher food prices
 - Short run impacts for growers are greater because crops are grown under contract



Food price impact

- Increases conventional retail prices by 8.2%
- Higher food costs disproportionately impact lower income families



An aerial photograph of a vast, lush green agricultural field, likely a lettuce farm. The rows of crops are tightly packed and stretch across the entire frame. In the center of the image, a small tractor is visible, moving through the field. The lighting is bright, creating a high-contrast scene with deep greens and bright highlights.

Regional effects

- Reduced production results in less economic activity in lettuce producing regions
 - Economically disadvantaged communities
- Each \$1 million reduction in farm revenue results in
 - Loss of 15 full-time equivalent farm jobs
 - Reduces local economic activity (value added) by \$1.09 million
 - Reduces gross regional sales by \$1.53 million

Overview: Measuring benefits



Reduction in exposure to contaminant and affected population



Decrement to health and associated costs to be avoided

Level of exposure and severity health effects
Duration of effect
Impacts on productivity and quality of life
Effects on survival/mortality



Costs of treatment avoided

Acute care costs
Ongoing costs for long term effects

Benefits = Cost of treatment avoided + value of detrimental health effect avoided

Summary

- Some level of chemical contaminants in food products is unavoidable, but there are policy/regulatory measures that can be used to minimize exposure
- There are a wide variety of potential economic impacts of potential food policies/regulations
- Estimating and comparing costs and benefits is an important step in the policy/regulatory design process

Thank you

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