Implications of the Food Safety Modernization Act
Produce Safety Rule

John Bovay

Department of Agricultural and Resource Economics
University of Connecticut

Cornell University
Dyson School of Applied Economics and Management
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1 Motivation and background

2 Food Safety Modernization Act

3 Market Effects of FSMA

4 Conclusions and lessons
Private incentives for food safety

- Many standards are already in place as the result of buyer standards or voluntary grower agreements.
- Why do producers adopt food-safety standards voluntarily?
  - Reduce the risk of outbreaks and subsequent recalls, lawsuits, harm to reputation.
  - Protect reputation of firm or industry.
  - Set precedent for pending or anticipated regulation.
Voluntary adoption of food-safety standards

- California/Arizona Leafy Greens Marketing Agreement
- California/Florida fresh tomato “Good Agricultural Practices”
- Buyer requirements for food-safety practices
  - Walmart, Costco, etc.
- Labeling and branding
  - “Triple washed”
Why is the regulation of food safety important?

- Private incentives for producers and marketers to improve food safety, but an externality does exist because of imperfect information
  - Producers know more about food safety than buyers
- Poor food safety cannot always be detected before consumption
- Food-borne illness is unpleasant (at best) and potentially deadly
### Confirmed foodborne illness outbreaks arising from fruit and vegetable consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Food commodity</th>
<th>Pathogen</th>
<th>Number of illnesses</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Peppers</td>
<td><em>Salmonella</em></td>
<td>1500</td>
<td>2</td>
</tr>
<tr>
<td>2008</td>
<td>Peanut butter</td>
<td><em>Salmonella</em></td>
<td>714</td>
<td>9</td>
</tr>
<tr>
<td>2008</td>
<td>Watermelon</td>
<td><em>Salmonella</em></td>
<td>594</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>Alfalfa sprouts</td>
<td><em>Salmonella</em></td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>Melon</td>
<td><em>Salmonella</em></td>
<td>53</td>
<td>1</td>
</tr>
<tr>
<td>2010</td>
<td>Tomatoes; bread</td>
<td><em>Shigella sonnei</em></td>
<td>314</td>
<td>1</td>
</tr>
<tr>
<td>2011</td>
<td>Cantaloupe</td>
<td><em>Listeria</em></td>
<td>147</td>
<td>33</td>
</tr>
<tr>
<td>2012</td>
<td>Cantaloupe</td>
<td><em>Salmonella</em></td>
<td>261</td>
<td>3</td>
</tr>
<tr>
<td>2012</td>
<td>Cantaloupe</td>
<td><em>Salmonella</em></td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>Cucumber</td>
<td><em>Salmonella</em></td>
<td>275</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>Salsa</td>
<td><em>Shigella sonnei</em></td>
<td>269</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>Caramel apples</td>
<td><em>Listeria</em></td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>2015</td>
<td>Cucumber</td>
<td><em>Salmonella</em></td>
<td>907</td>
<td>6</td>
</tr>
<tr>
<td>2015</td>
<td>Tossed salad</td>
<td><em>Salmonella</em></td>
<td>252</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Data reflect outbreaks with at least 30 confirmed cases.

Food safety regulation in the United States

- USDA Food Safety and Inspection Service (FSIS) oversees most meat, poultry, catfish, processed egg products
- FDA oversees everything else (including some meat products)
  - All plant-based products
- EPA establishes standards for acceptable levels of pesticide residues
- Customs and Border Protection (CBP) works with FDA and FSIS to inspect import shipments
Food Safety Modernization Act: Overview

- FSMA expands regulatory authority of FDA
  - New regulatory requirements for producers and sellers of FDA-regulated food to be sold in the United States
  - Expand requirements for imports
  - Mandatory recalls of food
Component rules of FSMA

- Produce Safety Rule
- Hazard Analysis and Risk-Based Preventive Controls Rules (for Human/Animal Food)
- Foreign Supplier Verification Program
- Third-Party Accreditation Rule
- Sanitary Transport, Intentional Adulteration

Compliance dates:

- As early as September 2016 (Preventive Controls)
- Produce Safety Rule is being phased in over Jan 2017–Jan 2022
  - Farms with sales more than $500k must come into compliance by this Friday
Who is covered by FSMA?

- Producers, processors, shippers, handlers, importers of many foods for sale in the United States
  - FDA-regulated commodities
- “Not covered” if sales below
  - $25k per year (farms) or
  - $250k per year (processors)
Who is covered by Produce Safety Rule?

- Applies only to growers of fruits, vegetables, mushrooms, sprouts, peanuts, tree nuts, and herbs
- Specifically excluded: grains, potatoes, pumpkins, sweet corn, winter squash, others “rarely consumed raw”
- Does not apply to produce designated for processing that involves a “kill step”
“Qualified” exemptions from Produce Safety Rule

- Partial exemption criteria:
  - Less than $500k per year in annual revenue AND
  - More than half of sales directly to consumers OR restaurants or retailers within the same state or within 275-mile radius
    - “Retailers” includes vertically-integrated retailers such as Wal-Mart
“Qualified” exemptions from Produce Safety Rule
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- Partial exemption criteria:
  - Less than $500k per year in annual revenue AND
  - More than half of sales directly to consumers OR restaurants or retailers within the same state or within 275-mile radius

- Only a requirement for labeling with name and address of company, visible at point of sale

- Exemption may be revoked if an outbreak is associated with farm or if FDA determines farm practices or conditions are public health risk
What does Produce Safety Rule require?

- Agricultural water inspected at the beginning of each “growing period”
- Fertilizer and compost of animal origin must be processed, handled, and stored properly
- Health and hygiene measures, including having toilets and hand-washing stations in the fields
- Prevent animal feces from contaminating produce
- New sanitary standards for equipment, tools, and buildings
- Specific requirements for growers of sprouts from beans and seeds
Estimated costs of complying with FSMA

  - Coarse accounting of costs as they vary by farm size
  - $368 million/year for domestic farms
- Adalja and Lichtenberg (2018)
  - Survey 394 growers to estimate cost of complying with FSMA Produce Safety Rule components as a function of acreage
  - Compare costs of compliance for conventional and “sustainable” growers
- My work draws on FDA, complements Adalja and Lichtenberg
Research agenda

- FSMA will increase costs of growing produce
  - What are the implications for market prices?
  - Who gains and who loses?
Specific research questions

1. FSMA will cost farmers $368m/year. Will buyers be willing to pay more for safer food?
2. How will effects of FSMA implementation vary by size of farm?
3. How will New York farmers be affected, relative to farmers in other regions?
4. How will prices received by farmers change?
5. How will price effects vary by crop?
6. How will consumer prices change?
7. How will FSMA affect trade?
8. How will early adopters of food-safety practices be advantaged?
Review of microeconomics

\[ S = MC \]
Review of microeconomics

\[ S = MC \]

\[ D = MWTP \]

Price vs. Quantity graph with points

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Review of microeconomics

In microeconomics, the demand curve (D) and the supply curve (S) are used to illustrate market dynamics. The demand curve (D) represents the relationship between the price of a good and the quantity demanded by consumers, while the supply curve (S) represents the relationship between the price and the quantity supplied by producers. The market equilibrium occurs where the demand and supply curves intersect, indicating the price at which the quantity demanded equals the quantity supplied.

The diagram shows the market price (MWTP) at which the market clears. The price is on the y-axis, and the quantity is on the x-axis. The demand curve (D) and the supply curve (S) are shown, with the supply curve (S’) being a hypothetical shift in the supply curve due to factors such as changes in production costs or technology.

The market equilibrium price is where the demand and supply curves intersect, and the corresponding quantity is indicated on the graph. This point represents the competitive market outcome, where no significant excess supply or demand exists.
EDM mechanics
EDM mechanics
1. Do buyers value the adoption of food-safety practices?

- 1990–2006: many major food-safety problems in fresh-market tomato industry
- Florida law mandated it in 2008
1. Do buyers value the adoption of food-safety practices?

- Did improvements in food-safety practices affect *wholesale* demand for fresh tomatoes?
- No evidence that wholesale demand was affected by adoption of food-safety practices
- Relative price of California/Florida tomatoes did not increase after 2007
- Demand system estimation: demand curves did not shift out for California/Florida tomatoes after 2007
Why is compliance relatively costly for small farms?

- Hiring a food-safety specialist may not be feasible for small farms
- Lower extent of “baseline” compliance

(Why is it relatively easy for large farms?)

- Learning the rule only once
- Duplicating processes and paperwork across multiple locations, crops
2. Effects of FSMA by size of farm

- Large farms with produce sales over $3,450,000 (which account for 58.6 percent of U.S. farm produce sales) will incur recurring costs of compliance of about 0.3 percent of the value of produce sales.

- Large farms with produce sales between $500k and $700k will incur recurring costs of compliance of about 4.2 percent of the value of produce sales; small ($250k to $500k) and very small farms ($25k to $250k) will incur recurring costs of 6.0 percent and 6.8 percent, respectively.

- Very small farms that qualify for a partial exemption will incur recurring costs of around 2.4 percent of the value of produce sales, compared with 6.8 percent for very small non-exempt farms.
3. Implications of Produce Safety Rule by State

- States where produce is produced by relatively few, relatively small farms will have high costs of compliance with the Produce Safety Rule, including Alaska (3.82%), South Dakota (3.73%), and Iowa (3.35%).

- Conversely, states where fresh-produce production is dominated by large farms, such as Arizona (0.61%), Florida (1.31%), California (1.32%), and Washington (1.38%), have relatively low costs of compliance.

- Exemptions may prove especially valuable in states, such as Nebraska and North Dakota, where more produce is grown for sale in local markets by small growers, rather than on a large scale for national markets.

- New York (2.88%) similar to NH, CT, MA, RI, VT
County-level differences in FSMA implementation costs

### 4–6. Effects of FSMA on costs and prices — Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Farm cost</th>
<th>Farm price increase (as share of revenue)</th>
<th>Net farm cost</th>
<th>Consumer price increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichokes</td>
<td>0.36%</td>
<td>0.13%</td>
<td>0.23%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Broccoli</td>
<td>0.44%</td>
<td>0.21%</td>
<td>0.23%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Cabbage</td>
<td>1.59%</td>
<td>0.83%</td>
<td>0.76%</td>
<td>0.20%</td>
</tr>
<tr>
<td>Carrots</td>
<td>0.97%</td>
<td>0.54%</td>
<td>0.43%</td>
<td>0.10%</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>0.43%</td>
<td>0.20%</td>
<td>0.23%</td>
<td>0.06%</td>
</tr>
<tr>
<td>Celery</td>
<td>0.42%</td>
<td>0.20%</td>
<td>0.22%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>2.12%</td>
<td>1.17%</td>
<td>0.95%</td>
<td>0.16%</td>
</tr>
<tr>
<td>Lettuce (Head)</td>
<td>0.33%</td>
<td>0.16%</td>
<td>0.17%</td>
<td>0.03%</td>
</tr>
<tr>
<td>Lettuce (Leaf)</td>
<td>0.39%</td>
<td>0.23%</td>
<td>0.16%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Lettuce (Romaine)</td>
<td>0.31%</td>
<td>0.18%</td>
<td>0.13%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Onions (Dry Bulb)</td>
<td>1.72%</td>
<td>0.93%</td>
<td>0.79%</td>
<td>0.49%</td>
</tr>
<tr>
<td>Peppers (Bell)</td>
<td>1.29%</td>
<td>0.65%</td>
<td>0.64%</td>
<td>0.15%</td>
</tr>
<tr>
<td>Peppers (Chili)</td>
<td>2.63%</td>
<td>0.20%</td>
<td>2.43%</td>
<td>0.20%</td>
</tr>
<tr>
<td>Snap Beans</td>
<td>2.99%</td>
<td>0.24%</td>
<td>2.75%</td>
<td>0.24%</td>
</tr>
<tr>
<td>Spinach</td>
<td>0.84%</td>
<td>0.06%</td>
<td>0.78%</td>
<td>0.06%</td>
</tr>
<tr>
<td>Squash</td>
<td>2.50%</td>
<td>0.29%</td>
<td>2.21%</td>
<td>0.29%</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>1.07%</td>
<td>0.13%</td>
<td>0.96%</td>
<td>0.13%</td>
</tr>
</tbody>
</table>
4–6. Effects of FSMA on costs and prices — Fruits

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Farm cost (as share of revenue)</th>
<th>Farm price increase (as share of revenue)</th>
<th>Net farm cost (as share of revenue)</th>
<th>Consumer price increase (as share of revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>2.18%</td>
<td>1.22%</td>
<td>0.96%</td>
<td>0.30%</td>
</tr>
<tr>
<td>Apricots</td>
<td>2.02%</td>
<td>1.17%</td>
<td>0.85%</td>
<td>0.38%</td>
</tr>
<tr>
<td>Avocados</td>
<td>3.53%</td>
<td>1.82%</td>
<td>1.71%</td>
<td>1.29%</td>
</tr>
<tr>
<td>Bananas</td>
<td>3.47%</td>
<td>2.27%</td>
<td>1.20%</td>
<td>0.75%</td>
</tr>
<tr>
<td>Cantaloupes</td>
<td>1.42%</td>
<td>1.05%</td>
<td>0.37%</td>
<td>0.22%</td>
</tr>
<tr>
<td>Cherries, sweet</td>
<td>2.70%</td>
<td>1.66%</td>
<td>1.04%</td>
<td>0.49%</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>1.72%</td>
<td>1.18%</td>
<td>0.54%</td>
<td>0.21%</td>
</tr>
<tr>
<td>Grapes</td>
<td>2.06%</td>
<td>1.24%</td>
<td>0.82%</td>
<td>0.45%</td>
</tr>
<tr>
<td>Honeydew</td>
<td>0.70%</td>
<td>0.59%</td>
<td>0.11%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Mangos</td>
<td>3.57%</td>
<td>2.42%</td>
<td>1.15%</td>
<td>0.80%</td>
</tr>
<tr>
<td>Nectarines</td>
<td>1.23%</td>
<td>1.07%</td>
<td>0.16%</td>
<td>0.21%</td>
</tr>
<tr>
<td>Oranges (Navel)</td>
<td>2.16%</td>
<td>1.48%</td>
<td>0.68%</td>
<td>0.24%</td>
</tr>
<tr>
<td>Peaches</td>
<td>2.30%</td>
<td>1.55%</td>
<td>0.75%</td>
<td>0.50%</td>
</tr>
<tr>
<td>Pears</td>
<td>2.97%</td>
<td>2.07%</td>
<td>0.92%</td>
<td>0.46%</td>
</tr>
<tr>
<td>Plums</td>
<td>2.30%</td>
<td>1.49%</td>
<td>0.81%</td>
<td>0.43%</td>
</tr>
<tr>
<td>Strawberries</td>
<td>1.31%</td>
<td>0.88%</td>
<td>0.43%</td>
<td>0.33%</td>
</tr>
<tr>
<td>Tangerines</td>
<td>1.34%</td>
<td>1.24%</td>
<td>0.10%</td>
<td>0.17%</td>
</tr>
<tr>
<td>Watermelons</td>
<td>2.65%</td>
<td>1.53%</td>
<td>1.12%</td>
<td>0.89%</td>
</tr>
</tbody>
</table>
7. Effects on trade: Fresh tomato case study

<table>
<thead>
<tr>
<th>Producer location</th>
<th>Simulated change in revenue (percent)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario A</td>
<td>Scenario B</td>
</tr>
<tr>
<td>United States</td>
<td>15.5</td>
<td>5.21</td>
</tr>
<tr>
<td>Mexico</td>
<td>-4.62</td>
<td>-1.67</td>
</tr>
<tr>
<td>Canada</td>
<td>-22.6</td>
<td>-3.44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulated change in market share (percentage points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario A</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>United States</td>
</tr>
<tr>
<td>Mexico</td>
</tr>
<tr>
<td>Canada</td>
</tr>
</tbody>
</table>
8. Effects on farms by GAPs adoption status: Fresh tomato case study

<table>
<thead>
<tr>
<th>Producer category</th>
<th>Mean change in revenue (percent)</th>
<th>Mean change in market share (percentage points)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario A</td>
<td>Scenario B</td>
</tr>
<tr>
<td>GAPs adopters</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24.4</td>
<td>8.19</td>
</tr>
<tr>
<td>GAPs non-adopters</td>
<td>-40.3</td>
<td>-30.2</td>
</tr>
</tbody>
</table>
How should small farms respond to FSMA?

- In order to qualify for exemptions, will farms adjust legal structure or marketing practices?
  - Split a farm in two?
  - Integrate a distribution arm?
  - Change distribution channels to favor local retailers, eliminate marketers/wholesalers?
  - Change mix of crops grown?
Private incentives for producers and marketers to improve food safety, but an externality does exist because of imperfect information.

FSMA is redundant for many regulated farms and firms.

Increased burden for foreign producers relative to domestic; for importers relative to domestic shippers and wholesalers.

Biggest gainers from FSMA:

- Larger farms
- Farms with “qualified exemptions”
- Marketers of food produced domestically
- Consumers?
References


