A few case studies from US Agricultural Policy

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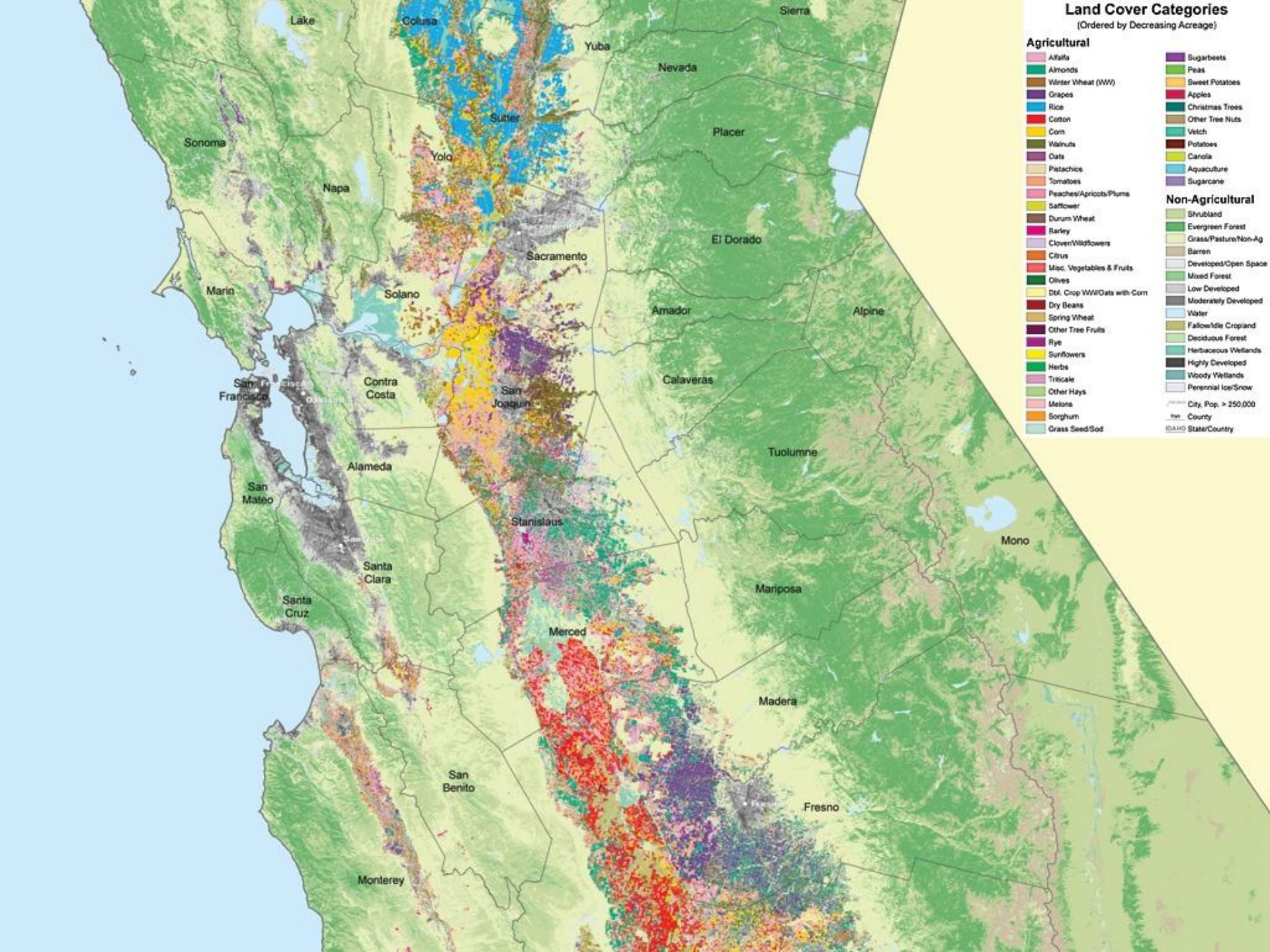
Outline

- Brief Overview of California agriculture
- Two specific case studies:
  - 1. A Federal Marketing Order for Pistachios
  - 2. The Dairy Sector in the Australian-US Free Trade Agreement
- Discussion

Readings

- Pistachios: **Brunke, H.**, J. M. Alston, R. S. Gray, and D. A. Sumner. "*Industry-Mandated Testing to Improve Food Safety: the New US Marketing Order for Pistachios*." German Journal of Agricultural Economics. Special Issue on Food Quality, Incomplete Consumer Information and the Role of Markets and the State, (53)8, 2004. Available at: http://aic.ucdavis.edu/research1/GermanPistachiosOnlineDraft10-25-04.pdf

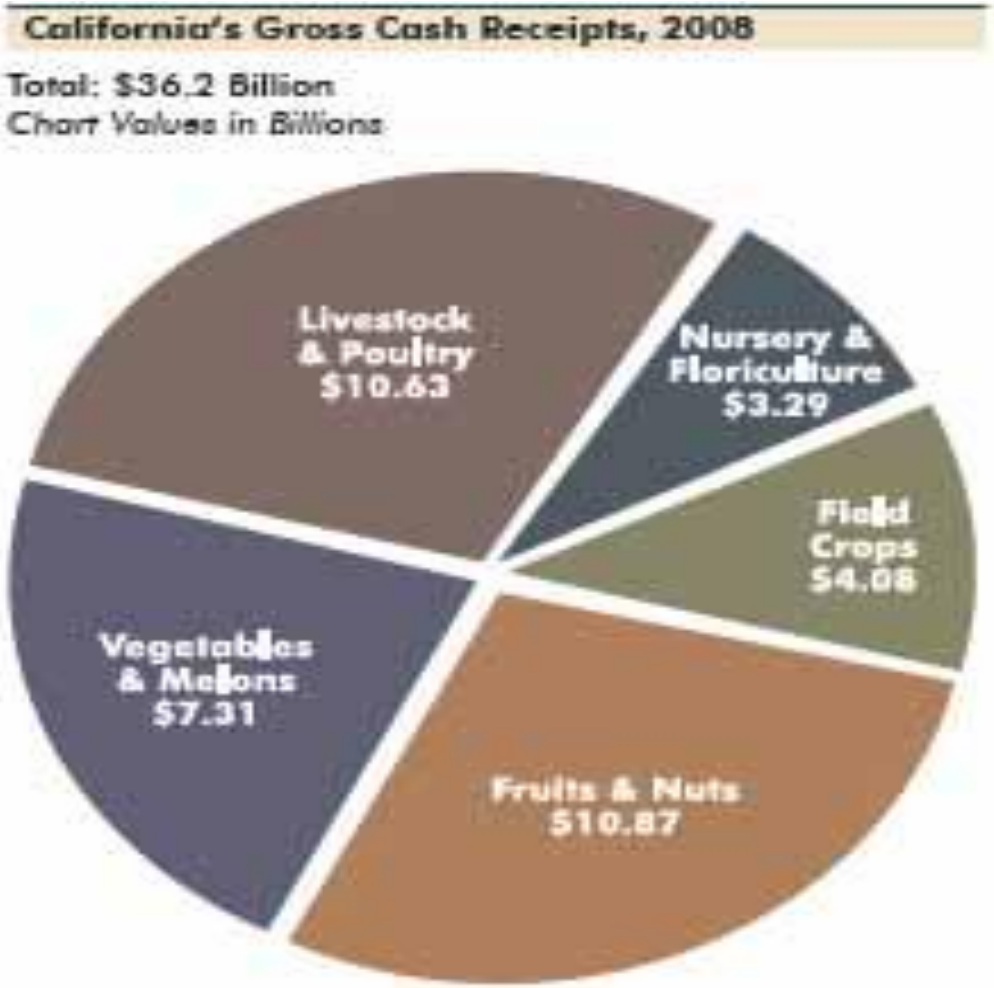
- AUSFTA (dairy): Alston J.M., J.V. Balagtas, **H. Brunke,** and D.A. Sumner. "*Supply and Demand for Commodity Components: Implications of Free Trade versus the AUSFTA for the U.S. Dairy Industry.*" Australian Journal of Agricultural Economics, V. 50 (2), p 131-152, June 2006


Land Cover Categories
(Ordered by Decreasing Acreage)
Agricultural
Alfalfa
Almonds
Winter Wheat (WW)
Grapes
Rice
Cotton
Corn
Walnuts
Oats
Pistachios
Tomatoes
Peaches/Apricots/Plums
Safflower
Durum Wheat
Barley
Clover/Wildflowers
Citrus
Misc. Vegetables & Fruits
Olives
Dbl. Crop WW/Oats with Corn
Dry Beans
Spring Wheat
Other Tree Fruits
Rye
Sunflowers
Herbs
Triticale
Other Hays
Melons
Sorghum
Grass Seed/Sod
Sugarbeets
Peas
Sweet Potatoes
Apples
Christmas Trees
Other Tree Nuts
Vetch
Potatoes
Canola
Aquaculture
Sugarcane
Non-Agricultural
Shrubland
Evergreen Forest
Grass/Pasture/Non-Ag
Barren
Developed/Open Space
Mixed Forest
Low Developed
Moderately Developed
Water
Fallow/Idle Cropland
Deciduous Forest
Herbaceous Wetlands
Highly Developed
Woody Wetlands
Perennial Ice/Snow
City, Pop. > 250,000
County
IDAHO State/Country
Lake
Colusa
Sierra
Yuba
Nevada
Sutter
Placer
Sonoma
Yolo
Napa
El Dorado
Sacramento
Marin
Solano
Amador
Alpine
San Francisco
Contra Costa
San Joaquin
Calaveras
Tuolumne
Alameda
San Mateo
Stanislaus
Mono
Santa Clara
Mariposa
Santa Cruz
Merced
Madera
San Benito
Fresno
Monterey

Grown only in California (>99%)

- Almonds, Walnuts, Pistachios
- Dates, Figs
- Grapes, Raisins
- Peaches, Prunes
- Sweet Rice, Artichokes
- Pomegranates

Value of Aggregated Ag Commodities, 2008



California Top 15 ag commodities, 2008

Rank/Commodity	Value (Millions)
1. Milk and Cream	$6,924,121
2. Grapes, All	2,937,838
3. Almonds (shelled)	2,343,200
4. Nursery Products	2,273,500
5. Cattle and Calves	1,822,856
6. Hay, Alfalfa and Other	1,797,032
7. Lettuce, All	1,580,831
8. Berries, All Strawberries	1,578,175
9. Tomatoes, All	1,317,321
10. Rice	1,183,325
11. Flowers, Foilage	1,015,394
12. Chickens, All	787,679
13. Broccoli	663,319
14. Oranges, All	608,682
15. Pistachios	569,900

Pistachio Outline

- **Objectives**
- **Pistachio production in the world**
- **Marketing Orders in the United States**
- **Mycotoxins: A threat to food safety**
- **Industry Collective Goods and Food Safety**
- **Model, Simulation, Results**

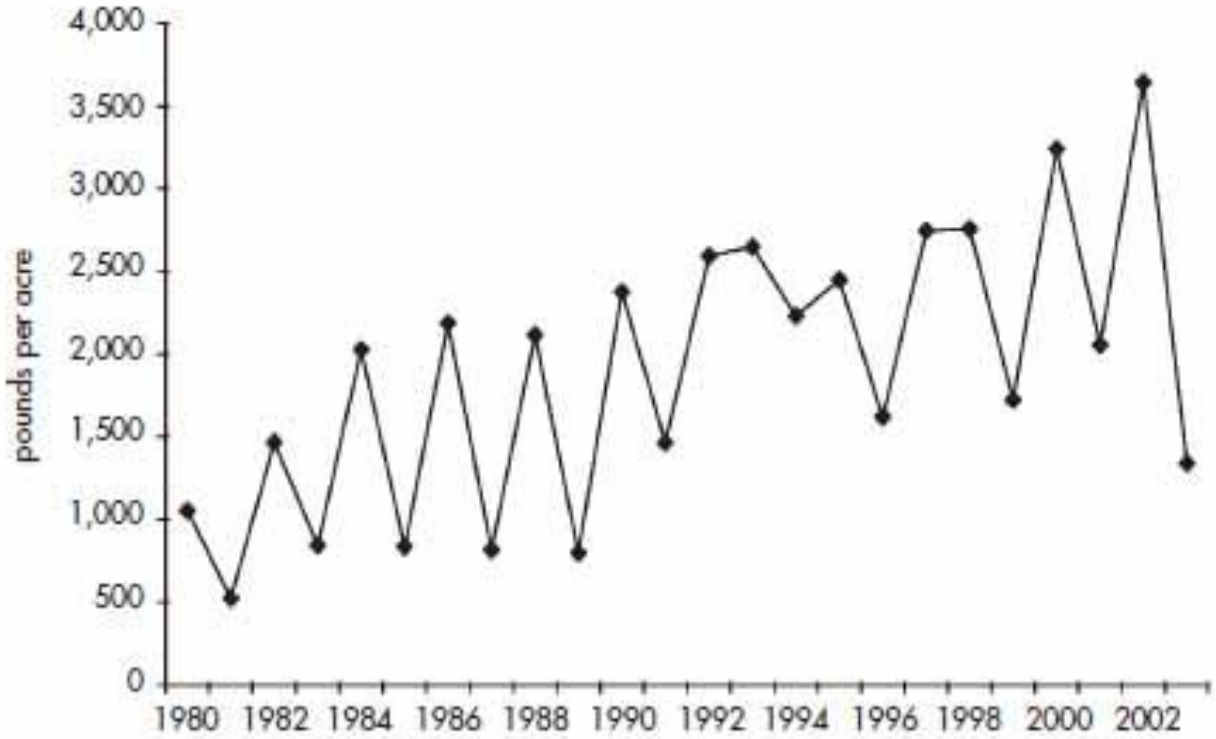
Objectives of the research

- Examine the rationale behind marketing orders for food safety assurance
- Identify benefits and costs of an order to producers, consumers and the nation
  - Identify specific sources of benefits and costs for producers and consumers of pistachios
- Illustrate with case study of federal marketing order for CA pistachios
  - Develop a model to simulate pistachio markets with and without the new federal marketing order

US and World Pistachio Production

Source: United States Department of Agriculture

Alternate Bearing Cycle



Source: Appendix Table A2

Industry Background

- CA produces 99% of U.S. Pistachios
- U.S. accounts for 20-25% of world supply.
- California industry is young (~35 years)
- California production has grown more than 200-fold between 1976 and 2010 to
  - 240,000 metric tons from 55,000 ha
  - valued at about $600 million or
  - $9000 per hectare

Marketing Orders

- State and Federal Marketing Orders are legal instruments
- Collective action to solve marketing problems
- All marketing orders are initiated by producers
- Apply to defined geographic area
- Approved by referendum (2/3 majority)

Marketing Orders, cont.

- Financed through assessment ($0.04/pound)
- Generally used to fund authorized activities (R+D, promotion, quantity and/or quality control, …)
- Federal orders generally can cover more than one state and aim at quality and quantity control, while state MOs usually aim more a promoting and research.

Federal Marketing Order for California Pistachios

Sets standards for quality through

- maximum aflatoxin levels,
- maximum limits for defects,
- minimum size requirements

Also requires mandatory inspection and certification.

Differences between pistachio MO and commodity promotion program

- Promotion programs aim to enhance demand every year (and benefit can be compared to annual check-off)
- Pistachio program experiences annual benefit from higher demand through certification, but another part of the benefit stems from reducing the odds and severity of a negative shock that does not happen every year

Aflatoxins in Pistachios

- Aflatoxin is a poison in naturally occurring mold
- Causes liver damage (aflatoxicosis); cancer?
- EU ban on Iranian pistachios in 1997 for three months; demand impact much longer
- Since 1997, numerous cases of high aflatoxin levels around the world, but none in pistachios in the United States

Economic Rationale for Standards

- Collective goods in the industry
  - Public good role in standardized grades in that they reduce transaction costs
  - Also public good in quality regulation when quality is hidden and markets can be spoiled
  - Also, because one consumer's experience with the quality of one supplier will directly affect that consumer's future demand for pistachios from that supplier and other suppliers as well

Economic Rational, cont.

- Regulations over visual standards are less easily justifiable as public good. However, there is because small and damaged nuts are more likely to be affected by aflatoxins, and thus nuts are no removed.
- Food safety as well as collective good element
  - Maximum aflatoxin level prevents food scare
  - Prevent negative publicity that may affect other food industries as well

Why Collective Action?

- Voluntary action by individuals provide less safety than is optimal
- Individual action will not work unless the whole industry matches the action
- Individual farms have incentive to keep cost low, which is classic free rider problem

Pistachio market is special because

- first, there is little brand identification and a bad experience or only hears negative news and thus not a specific supplier would be affected by the industry as a whole.
- second, pistachio consumption is often infrequent and irregular; thus a food safety event involving pistachios may lead to consumers simply not buying any pistachios anymore.

Summary of Policy Issues so far

- Public health
  - Aflatoxin is a potentially deadly poison
  - Government sets standards of maximum tolerable levels
- A food-safety event affecting demand could arise because of
  - actual evidence of death or illness
  - heightened concern because of publicity about high levels of aflatoxins in other products or in other countries
- Industry collective good can reduce the odds of a food safety event

The Model: Objectives

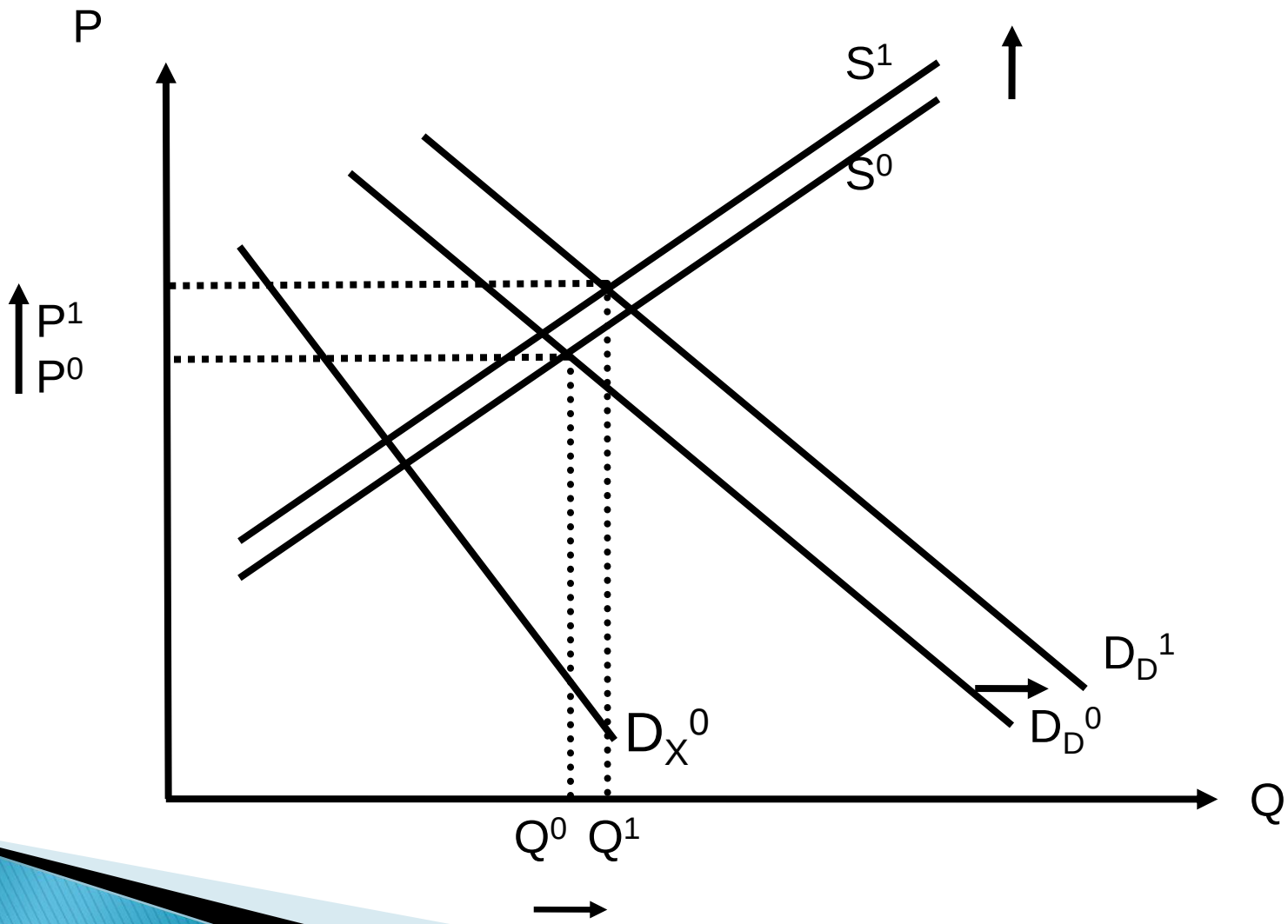
Objective:

- Simulate production, prices and allocation among markets for Cali pistachios 50 years ahead
- Stochastic element because yields vary over time and also aflatoxin events occur at random
- Through 250 draws of future time paths of yields we estimate impact of MO on various measures (both on average or expected value and the range of outcomes
- Assess the cost and benefits of the introduction of the MO on producers and consumers

The Model: Specifics

- Linear equations representing domestic and export demands and storage demand are specified using estimates of elasticities and data on market share quantity and prices.
- Model is solved by equating total demand with the exogenous quantity and solving for price; this is done with and w/o the MO in place for all 250 draws and all 50 years and those results can then be used to calculate costs and benifits

Illustration of Supply and Demand Shifts



Supply response

- Plantings depend on expected present value of revenue per acre

$$PL_t = a_0 + a_1 E_t \quad PV_t$$

- Bearing acreage equals on last year's acreage minus removal plus new plantings (7 years ago)

$$B_t = (1 - r_t) B_{t-1} + PL_{t-7}$$

- Yield grows (*y*) and faces proportional shocks (*u*)

$$Y_t = (1 + y)^t Y_0 \quad 1 + u_t$$

Demand Equations

Modeled are:
-domestic demand (DD), export demand (DE) and storage demand (DS),
all of which are linear with parallel shifts

$$DD_t = (d_0 - d_1 P_t)(1 + d)^t$$
$$DE_t = (e_0 - e_1 P_t)(1 + e)^t.$$
$$DS_t = (s_0 - s_1 P_t)(1 + s)^t$$

Supply Shift Depends on Testing Costs

- The cost of testing is borne initially by processors, like a per unit tax
- Cost is different among processors
- Measured carefully and precisely using detailed sources
- The weighted average cost is $0.0035/lb

Demand Shifts

- Higher standard means lower probability of a food safety event
  - This is represented as lower odds of a negative demand shift
- Inspection and certification results in improved consumer confidence
  - This is represented as increased demand in every year (increased willingness to pay = 1 cent per pound ~ 1%)

Demand Effect of Aflatoxin Event

- 30% decrease in domestic demand
- some decrease in export demand
- shock decays by 30% per year
- probability of an event:
  - Without marketing order 4%
  - With marketing order 2%

How a shock would look like

Year	Percent Change in Domestic Demand	Percent Change in Export Demand	Percent Change in Price
2024	0.00	0.00	0.00
2025	−10.96	7.92	−6.99
2026	−6.71	7.66	−6.35
2027	−4.47	5.69	−4.76
2028	−3.06	3.99	−3.42
2029	−2.13	2.76	−2.43
2030	−1.48	1.91	−1.72
2031	−1.03	1.32	−1.23
2032	−0.72	0.91	−0.87
2033	−0.50	0.63	−0.62
2034	−0.35	0.44	−0.44

Shock in 2025

Back to normal in 2035

Results: Benefit-Cost Ratios

- Measures of benefits include
  - Consumer Surplus (CS)
  - Producer Surplus (PS)
  - National Surplus (NS = PS + CS)
- Annual benefits are discounted back and expressed in present value terms.
- Benefit-cost ratios:
  - present value of producer net benefits divided by
  - present value of the producer incidence of the costs of compliance

Results: Base-Case Results

- Increases in
  - bearing acreage, 1.4% (1,866 acres)
  - production, 1.7% (12.6 million lbs)
  - domestic consumption, 2.9% (11.5 million lbs)
- Surplus changes (PV)
  - NS = $234 million
  - PS = $ 69 million
  - CS = $165 million
  - Foreign Surplus decreases $25 million
- Total cost of compliance = $37 million

Range of Results across Scenarios

- Increases in
  - bearing acreage, 1,279 – 2,716 acres
  - production, 8.63 – 18.31 million lbs
  - domestic consumption, 8.15 – 16.9 million lbs
- Surplus changes (PV)
  - NS = $159 - $350 million
  - PS = $ 50 - $104 million
  - CS = $110 - $165 million
  - Foreign Surplus decreases $19 – $36.5 million
- Total cost of compliance = $35 – $38 million

Benefit-Cost Ratios

- Benefit Cost Ratios for Base Case Parameters
  - 13.5 for domestic producers
  - 6.9 for the United States
  - 6.7 for the world.
- Sensitivity analysis of “high- and low-impact” scenarios => benefit-cost ratios are generally greater than 5:1 and often greater than 10:1
- Compelling evidence that producer benefits are greater than producer costs of the marketing order regulations

Conclusion

- Collective action can serve as useful tool to guarantee a safer food product
- The analysis of the pistachio marketing has shown that it is expected to generate net benefits for both U.S. consumers and U.S. producers
- Future Steps: In three years, we will conduct ex-post study to see if the results obtained here hold up

A thought!!

- Pistachio industry structure may provide a different explanation of what is going on here.
- What if one producers/handler controls 50 percent of production?
- What would be his incentives to pass this marketing order?