To be or not to be... Organic?

Industrial Organization Colloquium
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April 25th, 2018

Organic food in the US: a few facts...

- The US Department of Agriculture (USDA)'s label: "Certified to have grown on soil that had no prohibited substances applied for three years prior to harvest", including pesticides, fertilizers and GMOs.

- In many regards, an attractive market:
- Sold with a price premium compared to conventional food.
- A market that has grown by 8 to 10% annually since 2000.
- Now 5% of total food sales, more than $47 billion dollars in 2016.

...And a few questions

Is organic food in the US a relatively risky market?

- While it appears that farmers also get a price premium,
- They face lower and more variable yields.
- Retailers regularly complain about tight supply.
- "The organic premium puzzle": not enough return compared to risk?
- Yet farmers can buy cheap crop insurance with the USDA.
- Changing generosity of insurance for organic crops over time.

Research questions

High-level, long-term research questions:

- What is the role of risk in farmers' decision to transition to organic?
- Do crop insurance subsidies create inefficiencies in US agriculture?

Smaller, medium-term research questions:

- How are the price premium and the risk shared between upstream and downstream players?
- What share of the price premium is explained by higher risk?
- How do farmers deal with this risk? (insurance, less risk-aversion, higher return, different preferences...)

Today: how do farmers react to changes in the organic coverage of federal insurance?

Data collected so far

- Retail prices and quantities by supermarket and by week from Nielsen
- Wholesale prices by terminal market and by day from the USDA

- Areas grown/harvested by county/crop by year
- Areas grown/harvested by county/crop/organic, every five years
- Cropland use by 30mx30m squares and by year (no organic status)
- Weather by 4kmx4km squares and by day from PRISM

- Details about insurance plans available every year in every county
- "Summary of business" of insurance plans, by county/crop/organic, insurance plan and by year (what I am using today)

Crop insurance basics

- Farmers in the US can buy crop insurance, under the regulation of the Risk Management Agency (RMA).
- Farmers choose how much of the expected yield and price to insure.
- If crop yield falls below expected yield, the farmer is paid indemnities:

  $$\text{indemnity} = (\text{level} \times \text{expected yield - yield}) \times \text{share} \times \text{expected price}$$

- Premiums are computed based on the guarantee:

  $$\text{guarantee} = \text{maximum indemnity (zero yield)}$$
  $$\text{premium} = \text{guarantee} \times \text{premium rate}$$

- Subsidies reduce the premiums paid by up to 60%.

Literature overview

Adverse selection in crop insurance:

- Just, Calvin and Quiggin (1999) use farm-level data on corn and soybeans to show adverse selection and that it is driven by subsidies.

Moral hazard in crop insurance:

- O'Donoghue and Key (2009) use county-level data to show that after a reform that increased subsidies, farmers decreased diversification.
- Annan and Schlenker (2015) show that in counties with higher subsidies, corn and soybean yields are more sensitive to extreme heat.
- Huang and Moore (2017) show that during a reform that decreased deductibles, planting decisions were less tailored to weather.

Organic crop insurance - The start

- The RMA started providing policies for organic crops in 2001.
- Offered the same policies with a 5% surcharge on the premium.

- Same expected yields as non-organic crops:
- For most crops, organic yields are lower than non-organic yields.
- So organic farmers received indemnity payments more often than they should have.

Too simple to be good

- "By law, RMA must operate the Federal crop insurance program in an actuarially sound manner."
- Loss ratio = indemnities / premiums from the insurer's perspective.
- "The law requires an expected program-wide loss ratio ≤ 1.0."

Year	Organic soybeans	Non-organic soybeans
2011	1.35	.62
2012	1.95	.83
2013	1.85	.52
2014	1.86	.67
2015	1.28	.41
2016	1.03	.14

Organic crop insurance - Reform

- In 2013, the USDA's Office of the Inspector General audited the RMA regarding organic crop insurance and the losses generated.
- Requested to drop the 5% surcharge...
- And provide policies that reflected the organic crop yields.
- All organic policies changed in 2014.

- Consequence: the expected yield and revenue guarantee faced by organic farmers decreased...
- If the organic yield was truly lower than the non-organic yield.
- Not the case for all crops!
- Allows for comparisons across crops in a difference-in-differences.

Example (taken from the RMA)

Iowa organic corn grower:

	Expected yield	Guarantee	Premium
Up to 2013	130	$675	$55
Starting in 2014	102	$530	$41
Reform % change	-22%	-22%	-25%

Michigan organic blueberries grower:

	Expected yield	Guarantee	Premium
Up to 2013	7,081	$1,657	$147
Starting in 2014	7,081	$1,657	$140
Reform % change	0%	0%	-5%

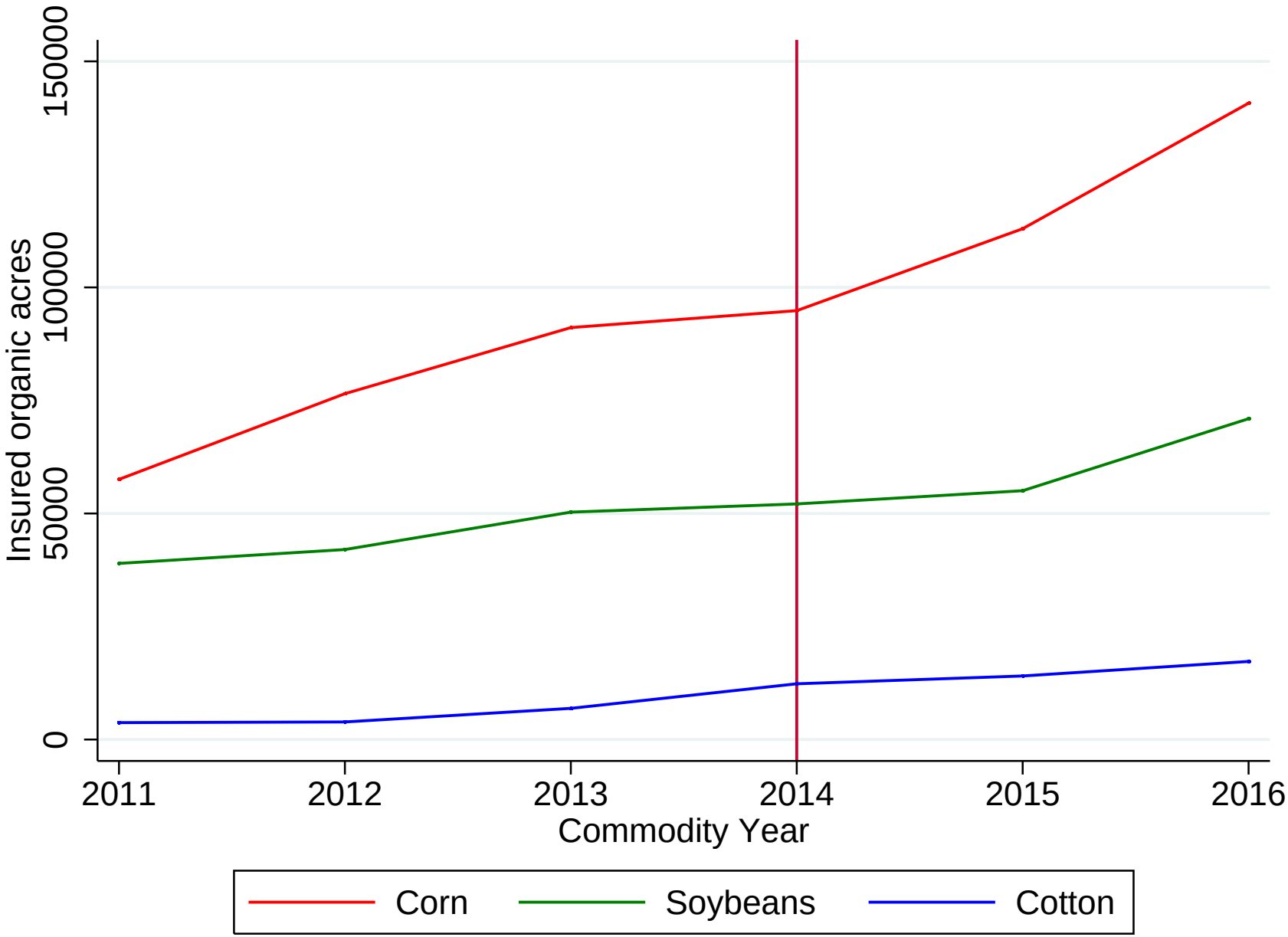
Implementing the Difference-in-Differences

- Need crops that have different organic-to-conventional yield ratios.

Crop	Cotton	Corn	Soybeans
Ratio	100%	75%	67 %

  The reform should not change anything for cotton (control crop).
- Need crops that did not experience other policy changes during the timeframe considered.
  Cotton, corn and soybeans all experienced a major change in 2011, but not after that.
- Need crops that are comparable beyond these parameters.
  Three major US crops grown in roughly the same regions, storable 'worldwide' commodities.
- Need crops that had parallel trends before the reform.

Checking for parallel trends



Beyond the Difference-in-Differences

- Card (1995)'s difference-in-differences: using the yield ratio as treatment intensity, instead of a treatment dummy.
- Advantage: since treatment is indeed not a dummy, seems relevant.
- Drawback: data is coming from a one-shot average computed by the OIG... Should work on that.

- Triple difference: using non-organic crops as another level of control.
- Advantage: more control!
- Drawback: trends are parallel before the reform.

Preliminary results

Comparing soybeans (treatment) and cotton (control), using the dummy and the treatment intensity.
Standard deviation of organic acres of soybeans per county: 284.

	Organic acres planted	
	DD	Card's DD
Reform*Post	-225.1***	-136.0***
	(78.1)	(96.6)
Crop specific time trends	Yes	No
Crop/type specific time trends	No	Yes
Constant	Yes	Yes
Observations	2,355	2,355
R-squared	0.080	0.080

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

- Preliminary result on the impact of generosity of insurance policy on evolution of organic acres insured...
- Next step: merge other datasets on land use and production (using 2017 AgCensus results).
- Long-term next step: write a dynamic model explaining farmers' organic decision.
- Primitives of interest: risk aversion, preferences for organic crop, price elasticity, etc.