To be or not to be... Organic?

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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:

  indemnity = (level X expected yield - yield) X share X expected price

- Premiums are computed based on the guarantee:

  guarantee = maximum indemnity (zero yield)
  premium = guarantee X 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

Loss ratio = indemnities / premiums from the insurer's perspective.

Year	Organic soybeans	Non-organic soybeans
2011	1.35	.62
2012	1.89	.83
2013	1.80	.44
2014	1.68	.45
2015	1.23	.66
2016	1.17	.25
2017	1.09	.27

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%

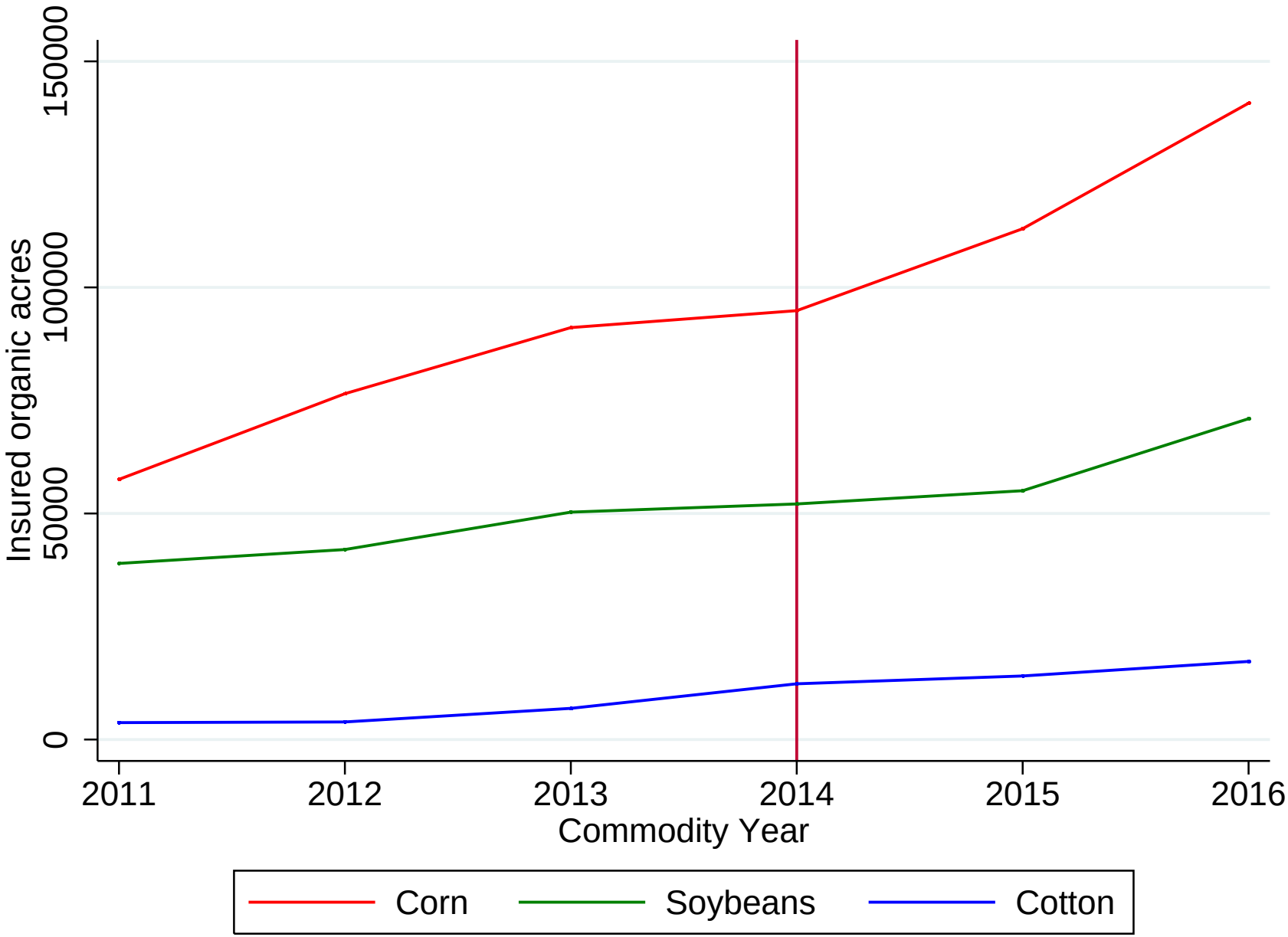
Implementing the Difference-in-Differences

- 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 not as parallel before the reform.

Preliminary results

Comparing soybeans (treatment) and cotton (control), using three different strategies. Mean acres per county soybeans 155, cotton 403.

	Organic acres planted[1]		
	DD	Card's DD	DDD
Reform*Post	-225.1***	-136.0***	-16,750***
	(78.1)	(96.6)	(2,427)
Crop specific time trends	Yes	No	No
Crop/type specific time trends	No	Yes	Yes
Constant	Yes	Yes	Yes
Observations	2,355	2,355	17,463
R-squared	0.080	0.080	0.10

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[1] In fact, insured.

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.