Additionality in Conservation Programs

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Our research is very similar to Mezzatesta et al. Our method is similar and our results are most consistent with theirs

Our data is somewhat different and that has driven some differences in our modeling and in our results:

(1) We look at a somewhat different set of practices, although there is some overlap in the practices

(2) our data is field-level only—we do not know the extent of adoption on the rest of the farm. So adoption is a binary variable rather than proportion. No decomposition previous adoption status—don't have that info.

(3) We do have some details on production and conservation practices that Mezzatesta et al. do not. We use these to look a little bit more deeply into NM practices that underlie NM plans.

(4) Our data covers 28 states rather than a subset of counties in a single state. So, we are dealing with a much more heterogeneous dataset.

So, today, I want to talk briefly about our data and our method because both do vary a bit from Mezzatesta et al.   Then I'll talk about our results, how they are similar to and different from Mezzatesta et al., and talk about several issues that came in course of our work.

Practice Adoption Data from ARMS Surveys

Practices

Field-edge filter strips
Field borders
Riparian buffers
Grassed waterways
	• Phase 2 = Field-level data
	  – Crop-specific surveys
	  – Data from 2009 (wheat), 2010 (corn), and 2011 (barley, sorghum)

Terraces
Grade stabilization structures
Water and sediment basins
Conservation tillage
	• Questions:
	  – Is practice in use?
	  – When was it adopted/install?
	  – Was a payment received?
	  – Which program?
	    ▪ EQIP, CSP, CRP, and other

Comprehensive NM
Manure management
	• Phase 3 = Farm-level follow-on survey
	  – General information on farm and farmer
	  – Nothing about farm-level adoption

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To look at the question of additionality, we added some questions to the Agricultural Resources Management Survey (ARMS). We asked producers about their use of a set of widely used practices that are also frequently support by financial assistance from USDA and other sources

Phase 2 is a field-level and crop-survey that is designed for the collection of production practice and cost information. Our data is from surveys for 2009 (wheat), 2010 (corn), and 2011 (barley and sorghum). Fortunately, these practices are not specific to any given crop.

Our data is also focused entirely on single fields—we don't know how broadly these practices are or are not adopted on the farms where we survey a field. So we cannot decompose our based on previous adoption/non-adoption.

The Phase 2 questionnaire is followed by a farm-level (Phase 3) questionnaire that provides a lot of information on the overall farm and the farmer(s) involved in the operation (but not conservation practice adoption).

Observations with CSP payments excluded

- Some CSP payments for stewardship, not adoption
  - Payments based on existing practices
  - Producers required to address soil and water quality concerns to be eligible for CSP
- Majority of CSP payments for "enhancements" rather than adoption
  - Hundreds of possible enhancements
  - Examples: Add practice to existing nutrient management plan
    Widen filter strips or riparian buffers
  - These "enhancements" may be additional, but are not full adoption of the practices we asked about in ARMS

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Farms receiving CSP payments were excluded

Some payments for stewardship, rather than adoption

Enhancement payments typically fund changes in conservation practices implementation rather than full scale adoption as contemplated by the ARMS questions. Some examples include:
Widen a filter strip or riparian buffer
Knife in manure rather than spread it on the surface
Add plant tissue test

No CSP—The Conservation Security Program (2004-2008) and Conservation Stewardship Program (2009-present) represent a significant departure from EQIP and other working land conservation programs.

Some portion of funds are used to "reward" farmers to good stewardship (the exact percentage has varied over the years). These payments are not really intended to prompt adoption of practices (although they may play a role in practice maintenance).

Also, much of the money (at least in the early version of CSP) was spent on "enhancements" which are changes to practice that are already in place. For example, it may include widening a buffer or adding another practice to a nutrient management plan. So, the actions carried out on the ground were almost ways related to the practices survey but almost always involved less effort than full adoption. This was reflected in CSP payment rates, which we often lower than EQIP for similar practices.

Practice Adoption Data from ARMS Surveys

Practices	Practice Group	Surveys
Field-edge filter strips Field borders Riparian buffers Grassed waterways	Buffer practices	Wheat, 2009 Corn, 2010
Terraces Grade stabilization structures Water and sediment basins	Soil Conservation	Wheat, 2009 Corn, 2010
Conservation tillage	Conservation tillage	Corn, 2010 Barley, Sorghum, 2011
Comprehensive NM Manure management	Nutrient management	Wheat, 2009; Corn, 2010 Barley, Sorghum, 2011

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The number of surveys used for each practice group did vary a bit because the exact questions varied a bit across years.
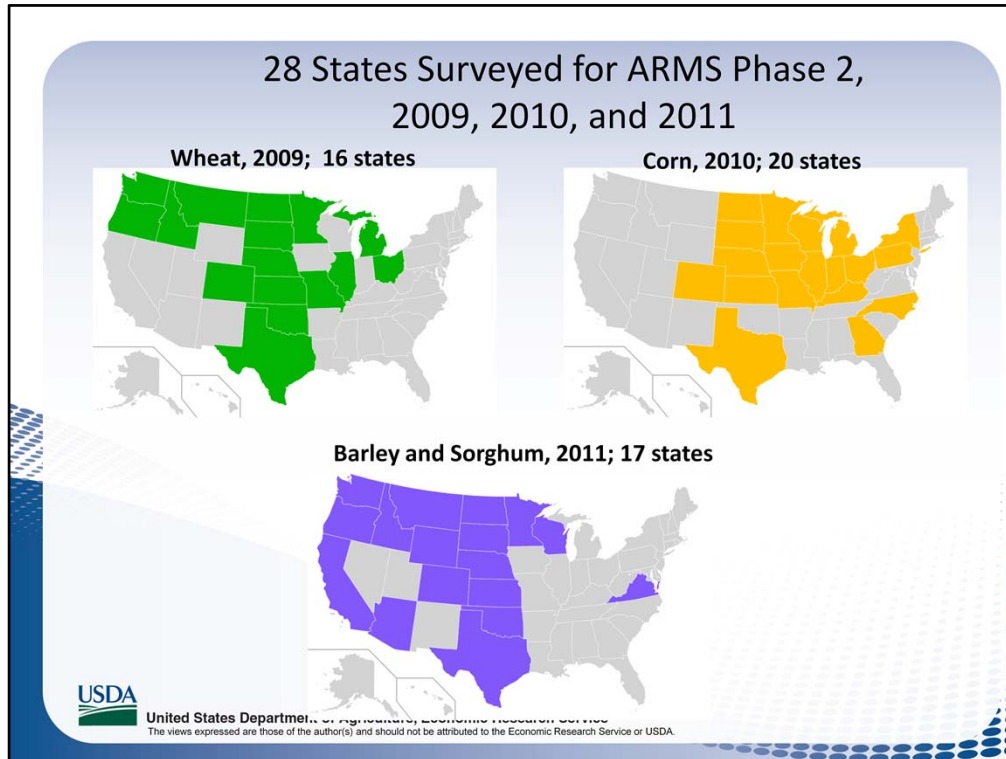
This just gives you a bit of information on geographic coverage. In total, for the three surveys, our data covers 28 states. Some states are in all three surveys….
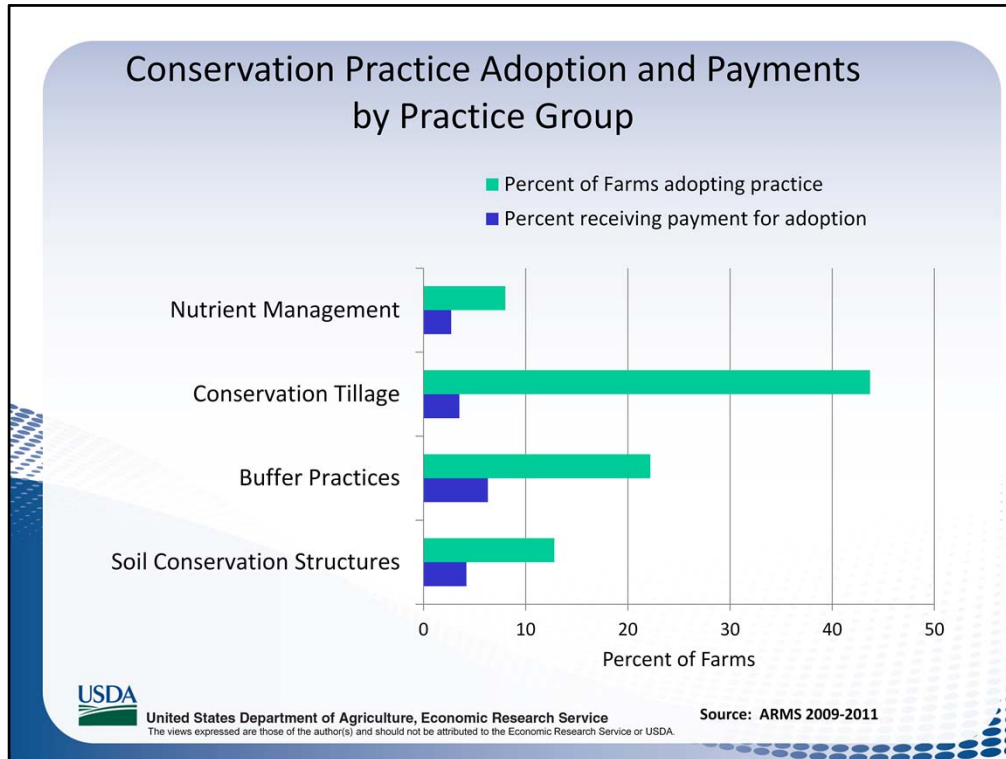
This charts show rates of practice adoption and payment from the wheat, corn, barley, and sorghum surveys for 2009-2011.   The green bars represent the overall number of farms that adopted at least one practice in each group, estimated from the ARMS data. The dark bars are the percent of farms that received a payment in conjunction with adoption.

This graphic clearly illustrates the concern about additionality. Many farmers have adopted conservation practices without the benefit of a conservation payment. That may be because practices are profitable, or they protect a producers' investment in land, or because of some state or local regulation. Whatever the reason, it is possible that some producers are being paid to adopt practices that they would have adopted in any case.

What we need to understand…

Measuring Additionality in Practice Adoption

$$ATT = E[Y_{i1} - Y_{i0} | D_i = 1]$$

- D_i = 1 for farms receiving payments
- Y_{i1} = outcome on farm i with payment
  = 1
- Y_{i0} = (unobserved) outcome without payment
  = 1 if practice would have been adopted w/o payment
  = 0 if not

- ATT is proportion of supported practices that are "additional"
- Estimate ATT using Propensity Score Matching

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A common statistic used to evaluate the effect of a "treatment" provided by a government program is the average effect of treatment on the treated (ATT). In the conservation program context, the ATT is the expected effect of a payment (treatment) on an environmental or related outcome for producers who received payments for the adoption of a conservation practice.

Estimate ATT separately for each practice group…

Di=1 indicates that farm i has received a payment for a practice in the practice group

When practice adoption is the measure, of course, the first term in the expectation on the RHS is always equal to one; Y_{i1}=1. That is, farms that receive payments adopt the specified practice.

The second term (Y_{i0}) could be 0 (signifying that the farm would not have adopted the practice without the payment,

or it could be 1 if the farm would have adopted in any case. So, taking the difference, farm i contributes either 0 or 1 to the overall ATT.

So, when we take the expectation, the ATT is the proportion of funded practices that are additional.

Additionality In Adoption of Selected Conservation Practices

Practice	Payment Farms	Non-Payment Farms		ATT for practice adoption
		Matched	Un-matched	
		Proportion Adopting Practice		
Soil Conservation Structures	1	0.21	0.09	0.78 **
Buffer Practices	1	0.22	0.15	0.78 **
Conservation Tillage	1	0.46	0.42	0.54 **
Nutrient Management	1	0.18	0.05	0.83 **

**=significantly different from zero with p<0.01

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Explain table

Proportion of payment farms adopting =1

Non-payment farms have two measures:
- one is proportion of "matched" farms adoption practice (weighted according to distance in terms of propensity score);
- another the average across all farms in the dataset

Additionality is high for structures…expensive to install, long-term payoff.
- Results are similar to Mezzatesta et al. in the sense that also seem to find that more expensive practices, with less no-farm payout appear are more likely to be additional.
    - Buffers--89%
    - Hay field (no crops) – 93%
    - Cover crops—89%

CT is relatively low… But not as low as estimated by Mezzatesta et al. (20%)
- To some extent, this may reflect regional differences – 55% adopt in Ohio vs. 42% in our data, overall.

NM: Here ARMS questions about the existence of a written plan—so we show that farmers who receive payments are more likely to have written plans. A second question is what difference are the plans making?

To look a bit at NM implementation we look at several nutrient management practices that are likely to be included in nutrient management plans:
We use the same measure—the Average Effect of Treatment on the Treated (ATT)—but we redefine Y1 abd Y0:

- N application rate
  - Y1 vs Y0…
  - Rates normalized as percentage deviations from crop average
- Fall N application in corn
- After planting N application

Additionality for Selected Nutrient Management Practices for Corn Fields

Practice	Unit	Payment Farms	Non-Payment Farms		ATT for N application rate/timing
			Matched	Un-matched	
Nitrogen Application Rate	Lbs. per acre	94.6	115.6	115.6	21.6
Fall Nitrogen Application	% N Applied in Fall	1.2	12.9	14.4	-11.6 *
Post-Plant Nitrogen Application	% N Applied After Planting	38.1	24.8	23.4	13.3

*=significant with p<0.05

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We do not find differences between payment farms and matched non-payment farms in terms of N application rates or post-plant application rates.

Matched farms apply 12.9 percent of N in the fall before planting corn while payment farms apply only 1.2 percent in fall.

Don't actually know what is in NM plans, but fall N before corn is virtually never allowed; other results may be driven by what is actually in plans….

Conclusions and Observations

- Find high additionality for structural practices
  - Farmers hesitant to make significant invest without support
  - Similar to Mezzatesta et al. results
    - Buffers--89%
    - Hay field (take land out of crops)--93%
    - Cover crops--89%

Conclusions and Observations

- Additionality results mixed for management practices
  - Relatively low for CT
    - 54 % for 28 states
    - Mezzatesta et al. -- 20% for part of Ohio
  - Written NM plans unlikely without payment
  - Fall N application is reduced sharply for farms that received NM payments

Thank you!