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Taxation Incidence on Rented Agricultural Land

An Evaluation of Ohio's Current Agricultural Use Value Program

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The Ohio State University

NC-1177 Meetings at Minneapolis, MN
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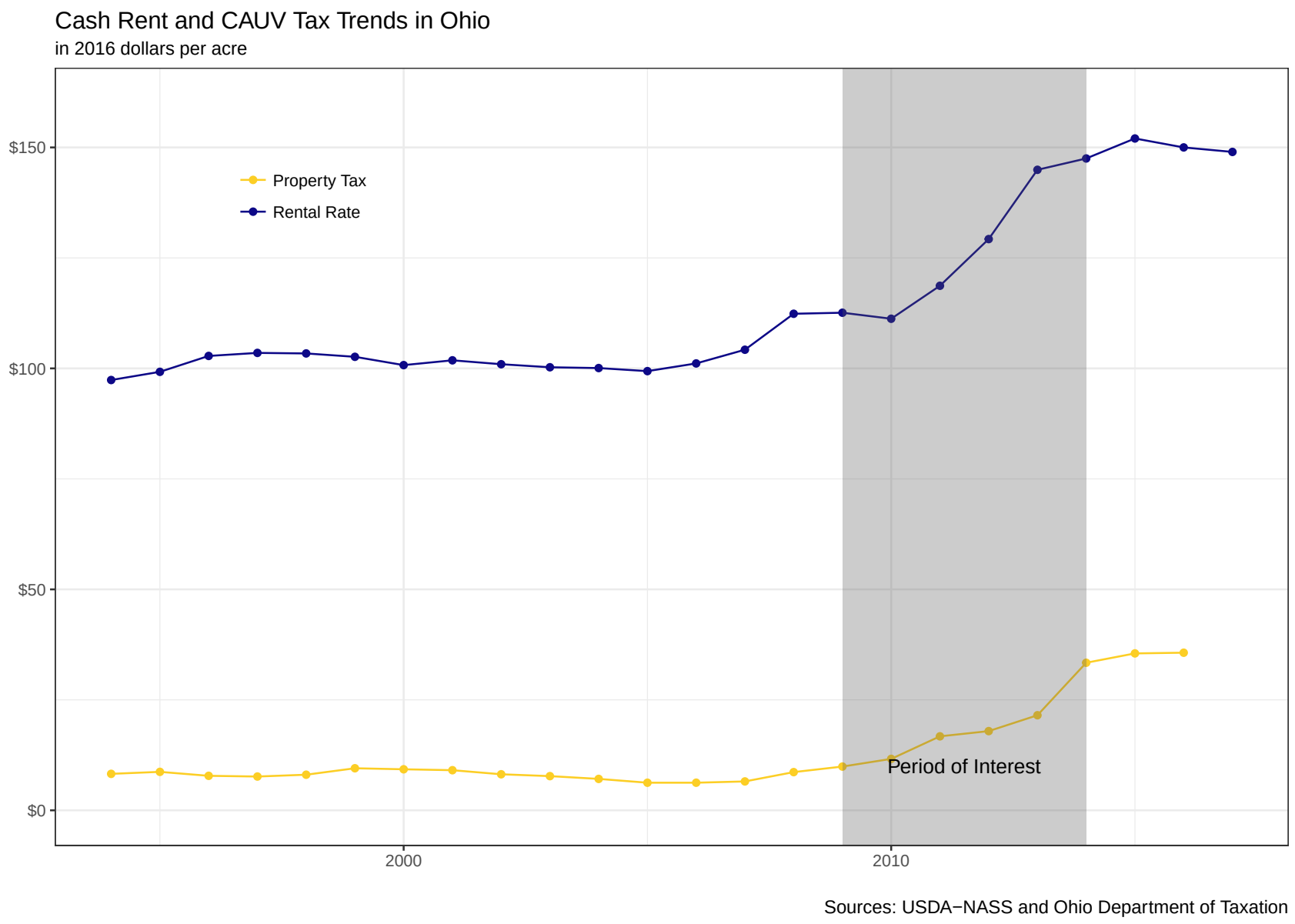
Introduction

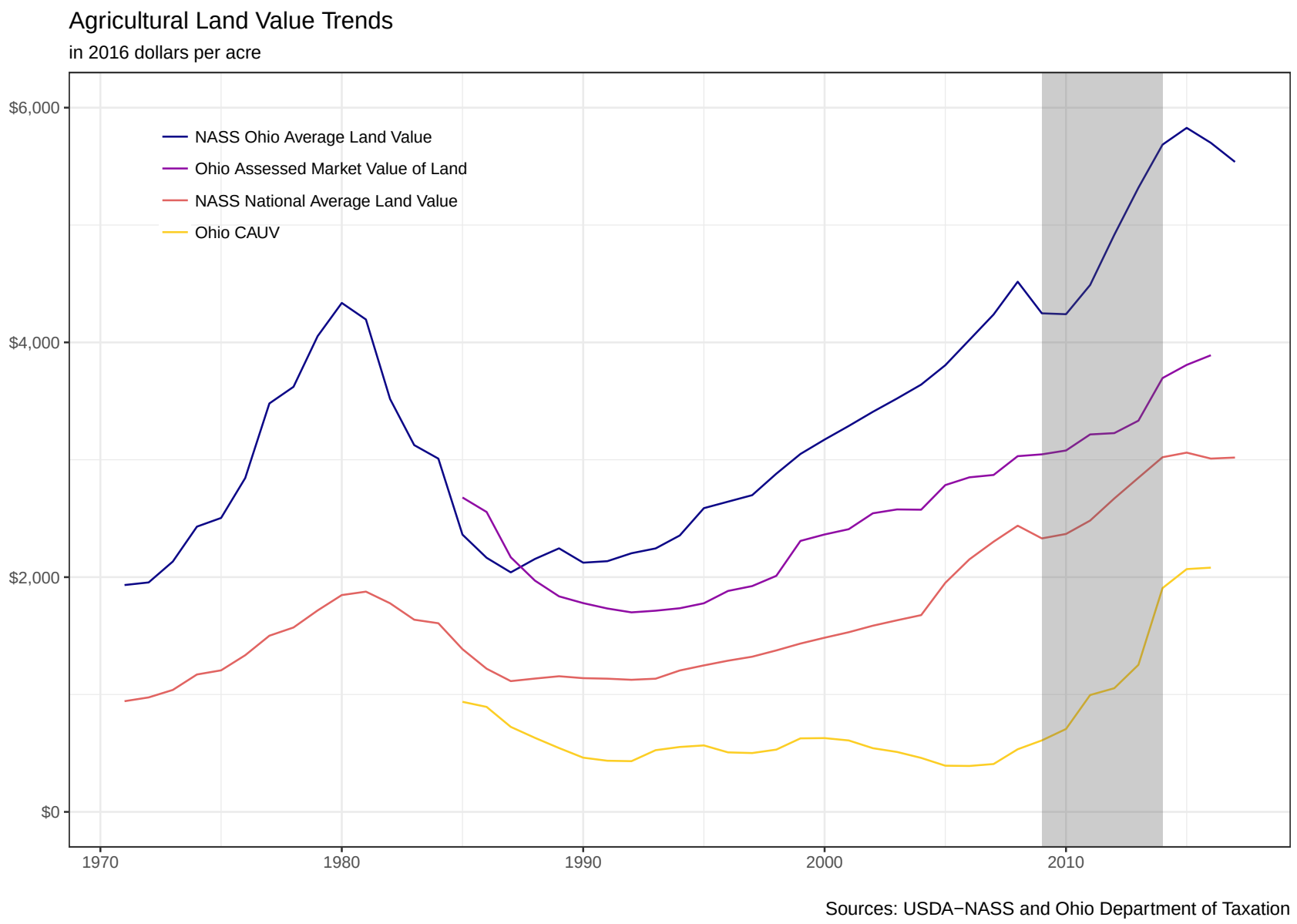
Introduction

- Almost 40 percent of all farmland in the US is rented per Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey administered by the USDA in 2014
- Renters more likely to operate smaller farms and be young and beginning farmers (Mishra, Wilson, and Williams 2009)
  - These types of farmers are more likely to experience elevated levels of financial stress
  - Renting farmland reduces debt loads for farmers which can mitigate financial stress
  - However, renters do not capitalize on farmland value increases
- Renters are concerned with rental contracts, which are influenced by soil quality, expected revenue, social capital, and costs

Research Question

- Measure incidence rate of property tax (tax burden) for renters
  - What share do renters pay?
- Exploit the Current Agricultural Use Value (CAUV) Program for Ohio
  - Commercial agricultural land is assessed based upon agricultural factors instead of typical market value for taxation purposes
  - Substantial changes in CAUV values from 2006 onward
  - Formula for CAUV does not account of expectations of future income
- Preview of main results:
  - Our findings indicate renters pay 38% to 50% of marginal dollar on agricultural property tax increases
  - Evidence that landowners are slow to adjust cash rental rates


Cash Rent and CAUV Tax Trends in Ohio
in 2016 dollars per acre
$150
$100
$50
$0
Property Tax
Rental Rate
Period of Interest
2000
2010
Sources: USDA−NASS and Ohio Department of Taxation


Agricultural Land Value Trends
in 2016 dollars per acre
$6,000
$4,000
$2,000
$0
1970
1980
1990
2000
2010
NASS Ohio Average Land Value
Ohio Assessed Market Value of Land
NASS National Average Land Value
Ohio CAUV
Sources: USDA−NASS and Ohio Department of Taxation

Related Research

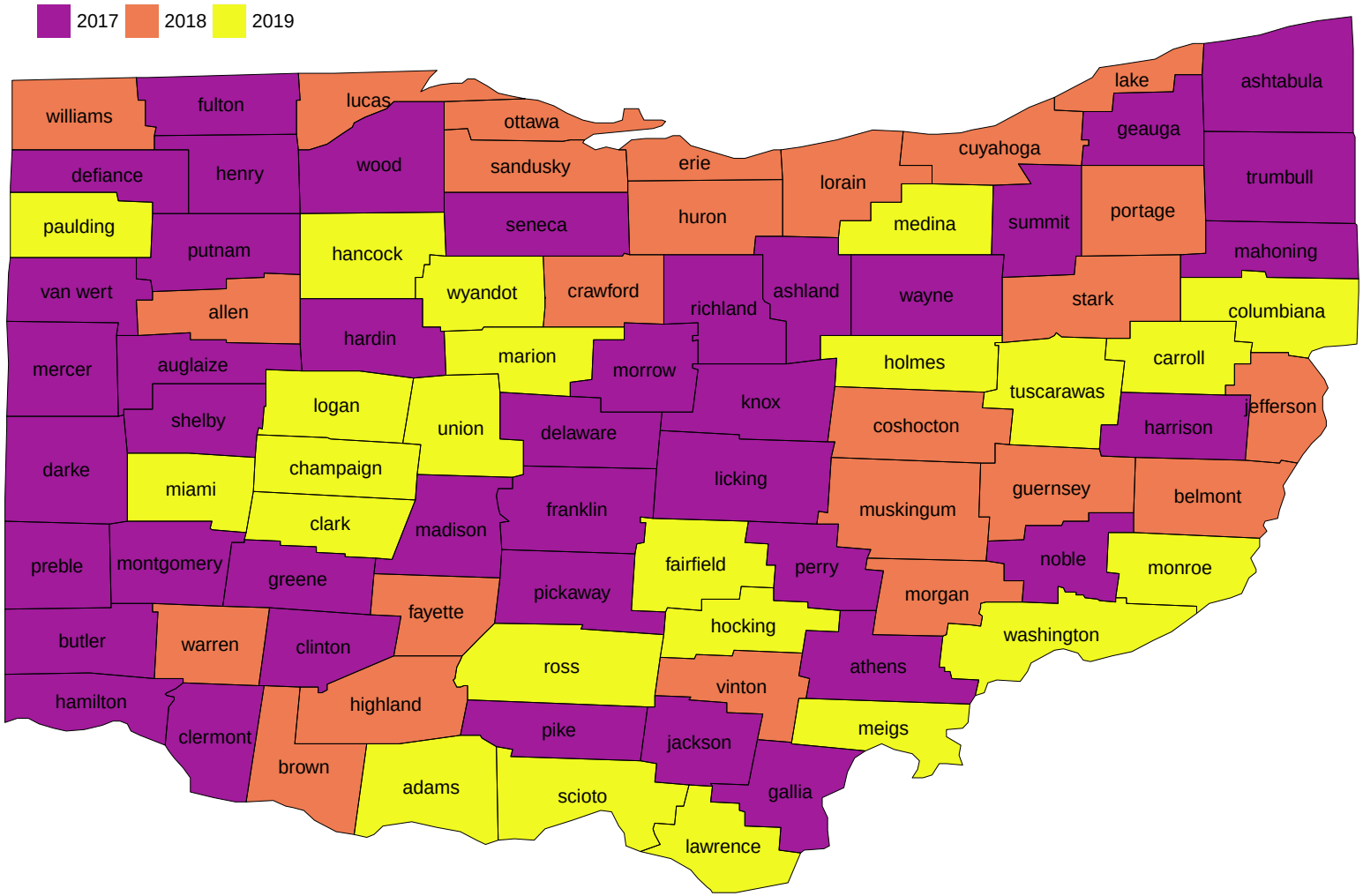
- Several research studies on incidence rates for government payments on rented land (Goodwin and Ortalo-Magné 1992; Roberts, Kirwan, and Hopkins 2003; B. E. Kirwan 2009)
  - Address policy intent behind who is targeted group for subsidies
  - Generally find a range between 40% to 60% for incidence rate on marginal dollar – ie rents increase by $0.40 to $0.60 for every additional dollar in government payments
- Aggregation issues exist, B. E. Kirwan and Roberts (2016) indicates 42-49% captured by landowners with farm-level estimates but 20-28% from field-level estimates from 2006 and 2007 ARMS data
- Effects not immediately captured, Hendricks, Janzen, and Dhuyvetter (2012) finds $0.12 in short-run and $0.37 in long-run captured by Kansas landowners in farm-level panel from 1990 to 2008

CAUV Program

CAUV History

- Began in early 1970s as a tax break for farmers to discourage urbanization of farmland – similar programs exist in majority of states and began around this time (Anderson 2012)
- CAUV calculation for each soil type in Ohio (3,500+) based on:
  - corn/soybean/wheat yields and prices; non-land costs; and capitalization rate
- Each county updates CAUV values once every three years and formula remained consistent from 2006 until 2014
- Backwards looking valuation, no futures values or expectations in CAUV values
- Largely unanticipated increase in CAUV values due mainly to high crop prices and low capitalization rate

Schedule for updating CAUV



Source: Ohio Department of Taxation

CAUV Formula

For each of the 3,500+ soil types (s), a particular year's (t) CAUV value is calculated as the soil's net income divided by the capitalization rate:

$$CAUV_{s,t} = \frac{NOI_{s,t}}{CAP_t}$$

where CAP_t is based on 60% loan and 40% equity interest rates and net operating income ($NOI_{s,t}$) is defined as:

$$NOI_{s,t} = \sum_c w_{c,t} \times (GOI_{s,c,t} - nonland_{s,c,t})$$

Formula

$$NOI_{s,t} = \sum_{c} w_{c,t} \times (GOI_{s,c,t} - nonland_{s,c,t})$$

where c denotes the crop type, which is either corn, soybeans, or wheat and represent the dominant crops in Ohio and $w_{c,t}$ is crop's share of state production. $GOI_{s,c,t}$ represents gross operating income and $nonland_{s,c,t}$ represents non-land costs.

Their gross operating incomes across crop types are defined as:

$$GOI_{s,c,t} = \frac{Yield_{c,Ohio,t}}{Yield_{c,Ohio,1984}} \times Yield_{c,s,1984} \times Price_{c,Ohio,t}$$

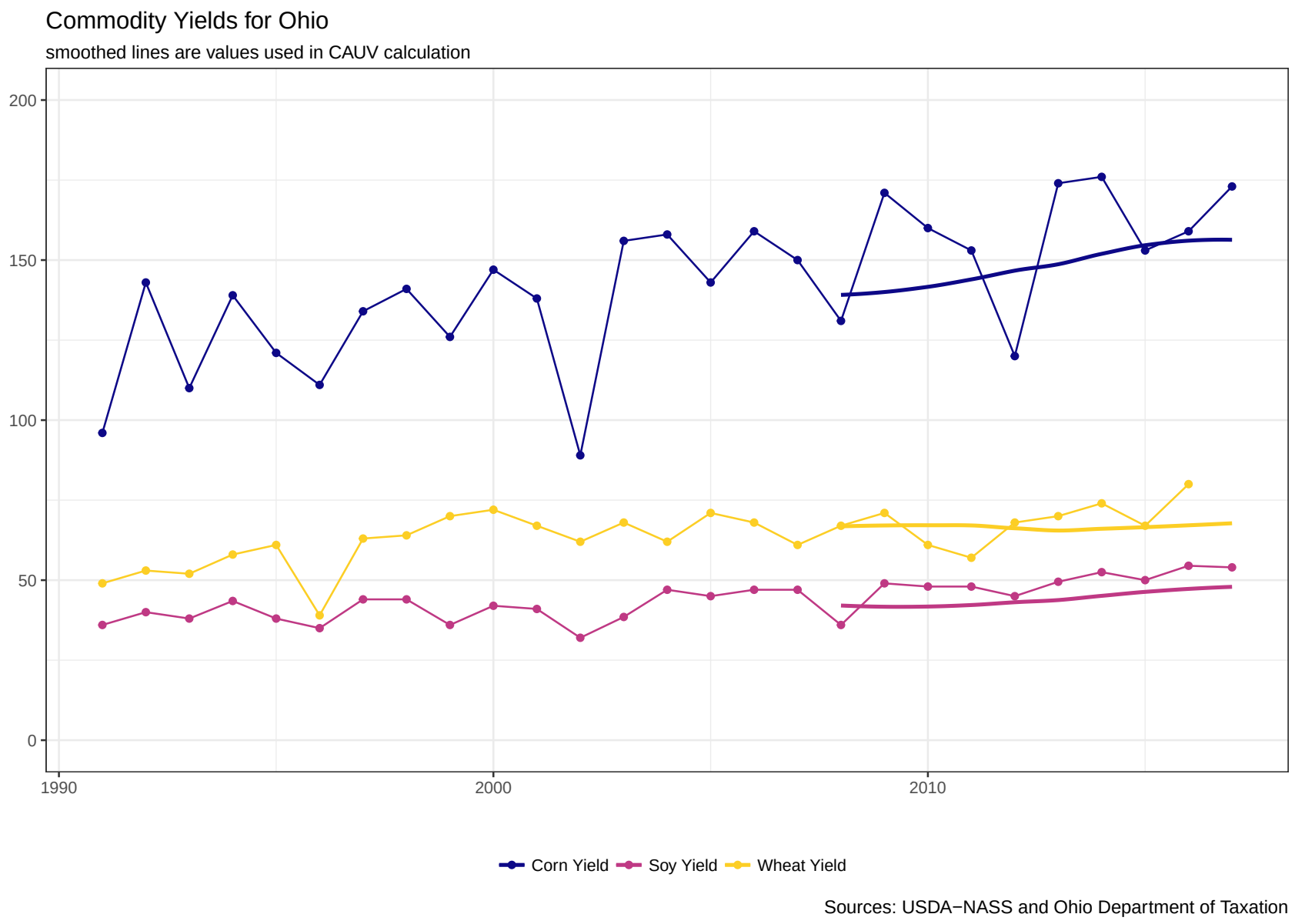
Formula

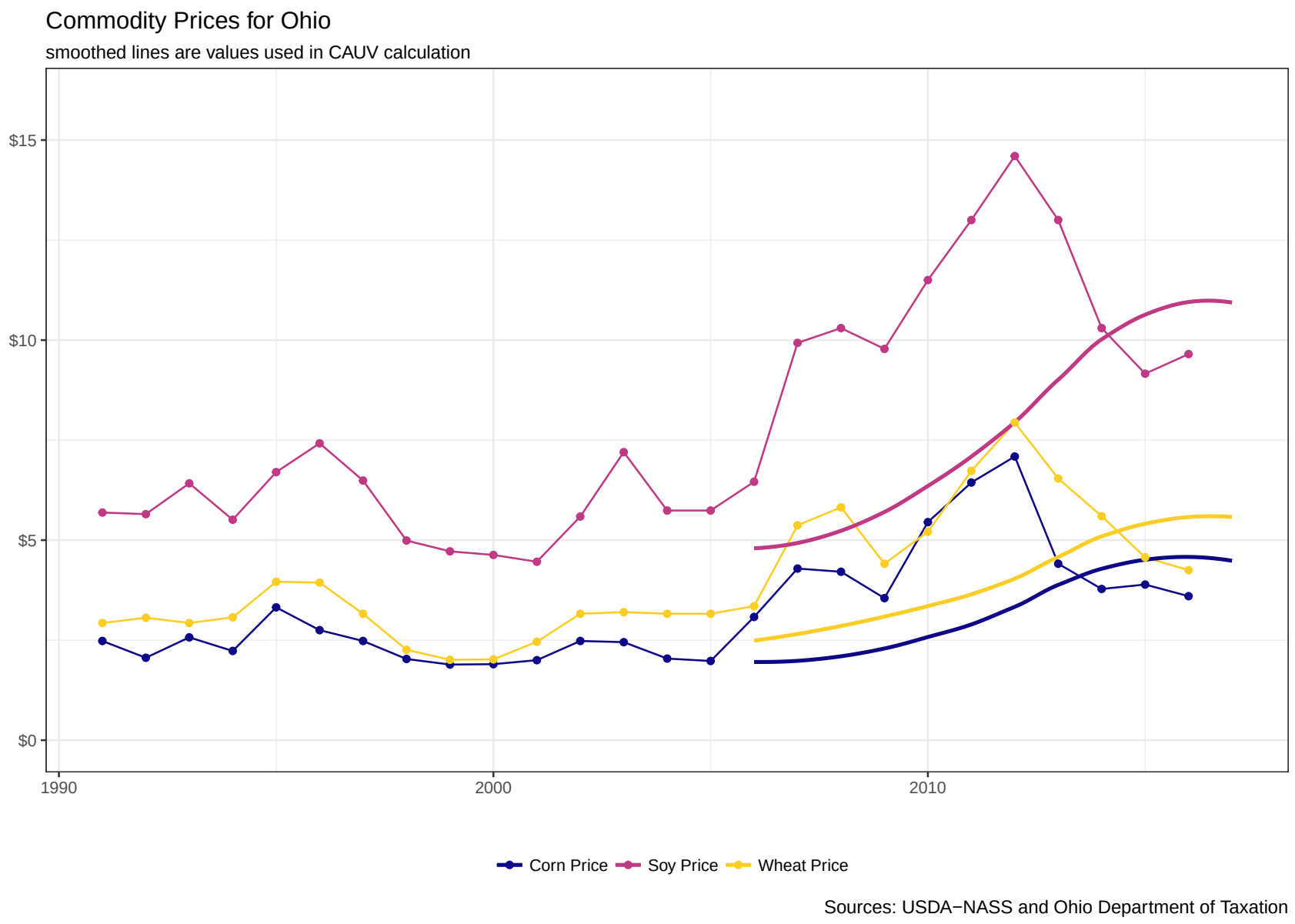
Their gross operating incomes across crop types are defined as:

$$GOI_{s,c,t} = \frac{Yield_{c,Ohio,t}}{Yield_{c,Ohio,1984}} \times Yield_{c,s,1984} \times Price_{c,Ohio,t}$$

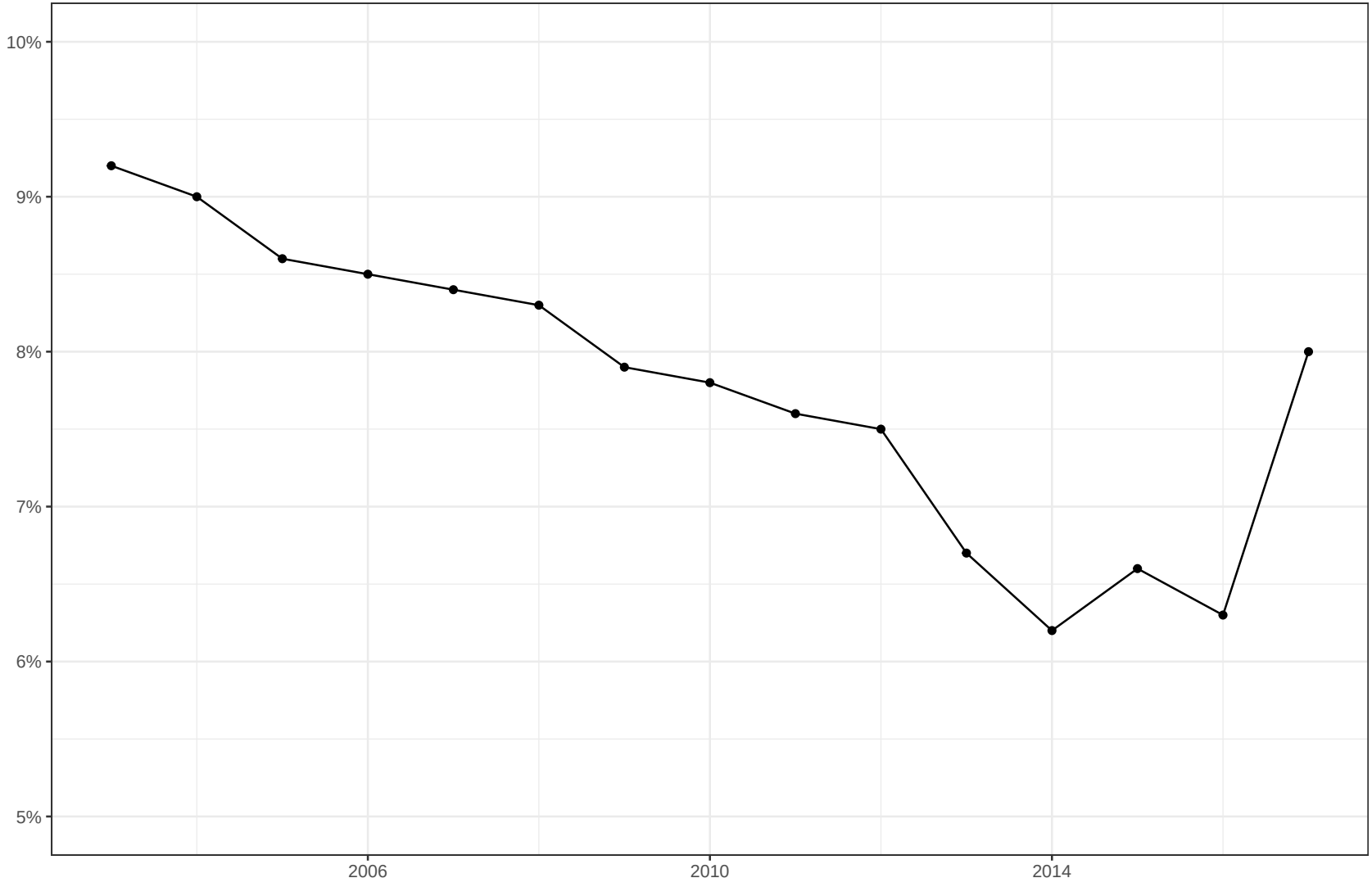
- Changes in yields are based upon state-wide level yields
- Base yields for each soil type is based upon 1984 value
- Values used across total formula are seven year Olympic averages (remove highest and lowest value)

CAUV value for each soil type and landowner pays based off of soil composition for their land.


Commodity Yields for Ohio
smoothed lines are values used in CAUV calculation
200
150
100
50
0
1990
2000
2010
Corn Yield
Soy Yield
Wheat Yield
Sources: USDA−NASS and Ohio Department of Taxation


Commodity Prices for Ohio
smoothed lines are values used in CAUV calculation
$15
$10
$5
$0
1990
2000
2010
Corn Price
Soy Price
Wheat Price
Sources: USDA−NASS and Ohio Department of Taxation

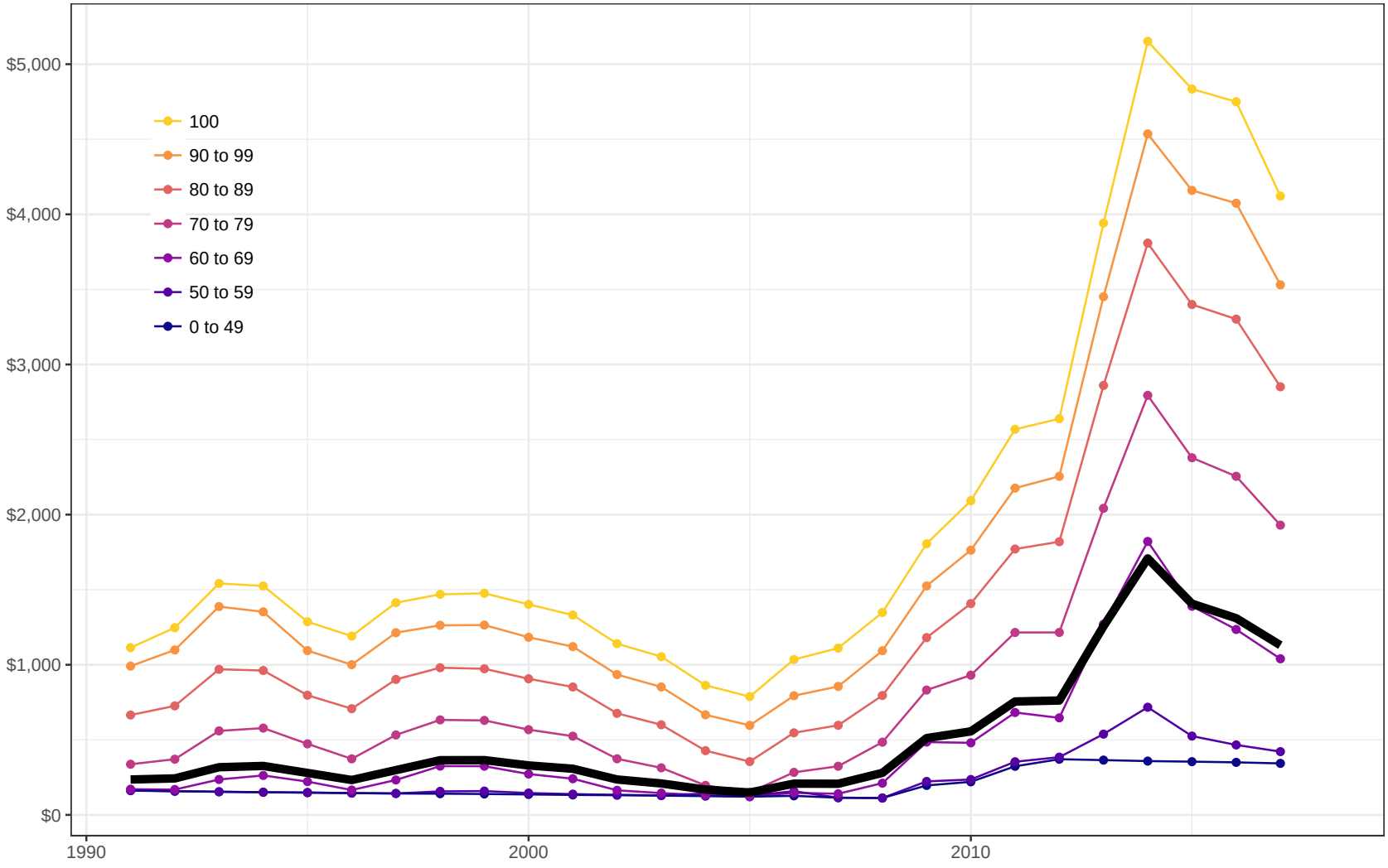
Capitalization Rate



Source: Ohio Department of Taxation

CAUV for Cropland by Productivity Index

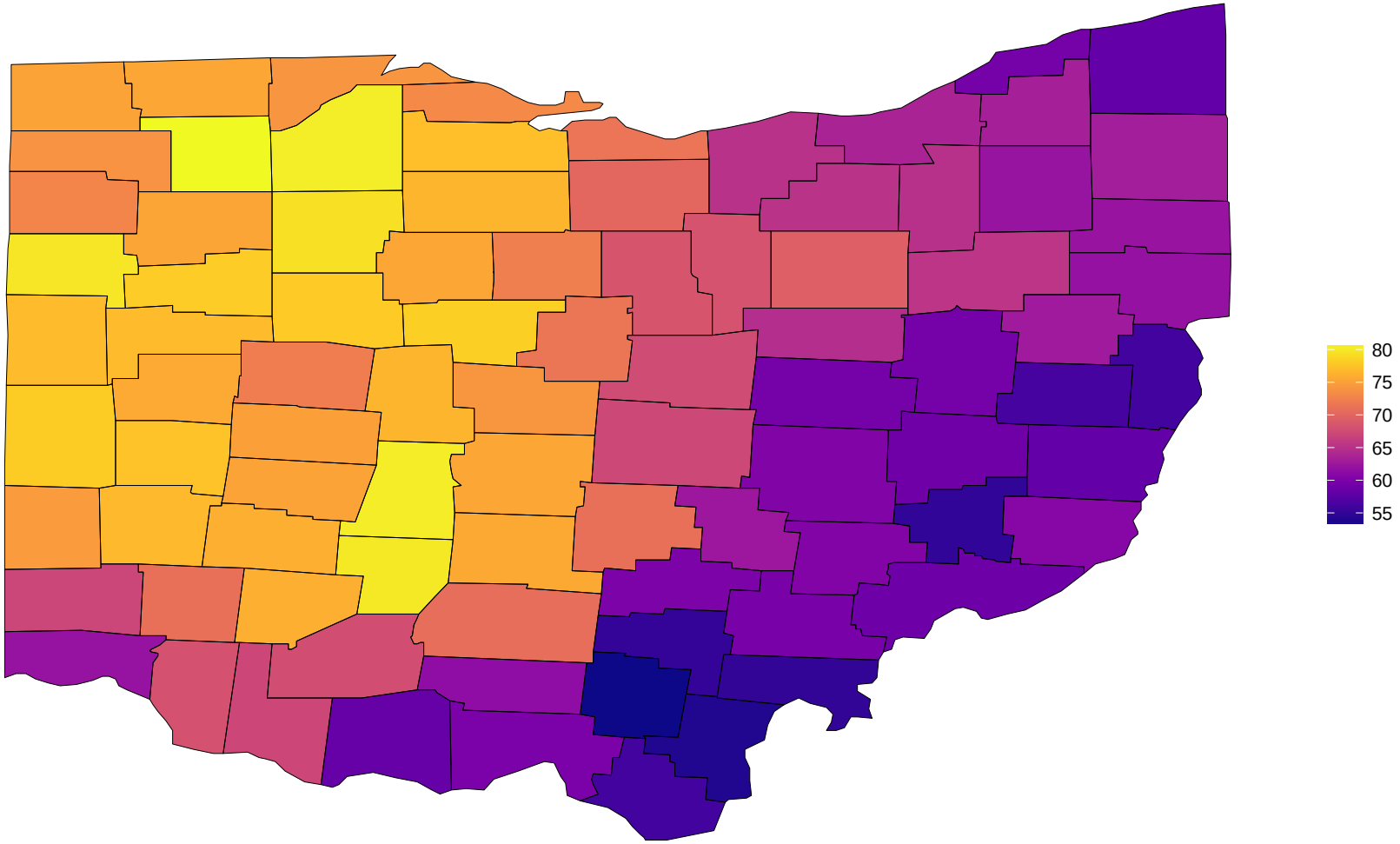
in 2016 dollars per acre, average value in black



Source: Ohio Department of Taxation

Average Soil Productivity Index

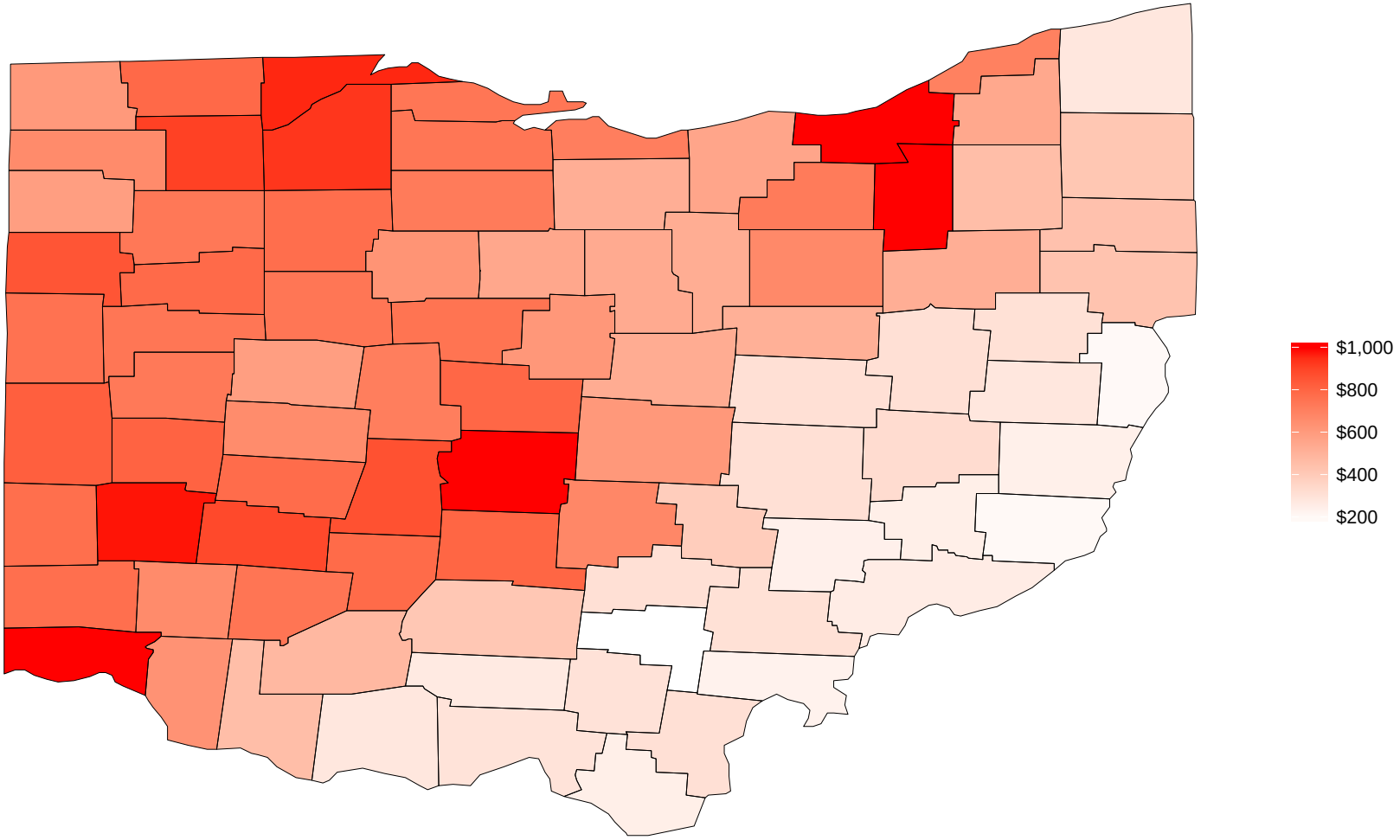
weighted by acreage



Source: USDA−NRCS

Average CAUV from 1985 to 2016

in 2016 dollars per acre



Source: Ohio Department of Taxation

Empirical Strategy

Regression Framework

- Main variable of interest is the property tax paid for farmland, which is calculated as 35% of CAUV multiplied by the net millage rate for the county
- Baseline equation of interest is:

$$Y_{i,t} = \alpha + \beta Tax_{i,t} + \gamma X_{i,t} + u_{i,t}$$

- Y_{it} is the cash rental rate, i represents a county, t represents the year (from 2009 to 2014), $Tax_{i,t}$ is average CAUV tax paid for per acre, and $X_{i,t}$ vector of inputs which affect cash rental rate
- β is incidence rate and represents the increase in rental rates due to increase in CAUV tax, ie the share of tax paid by renters

Regression Framework

$$Y_{i,t} = \alpha + \beta_0 Tax_{i,t} + \beta_1 Tax_{i,t-1} + \beta_2 Tax_{i,t-2} + \gamma X_{i,t} + u_{i,t}$$

- CAUV changes for a county once every three years with the reappraisal schedule of Ohio
- CAUV changes are not announced until after the tax year
  - Concern over appropriate lag of Tax, ie should it be $Tax_{i,t}$ or $Tax_{i,t-1}$ or $Tax_{i,t-2}$
- βs provide estimate for incidence rate over a medium-run

Regression Framework

$$Y_{i,t} = \alpha + \alpha_i + \alpha_t + \tilde{\beta}_0 Tax_{i,t} + \tilde{\beta}_1 Tax_{i,t-1} + \tilde{\beta}_2 Tax_{i,t-2} + u_{i,t}$$

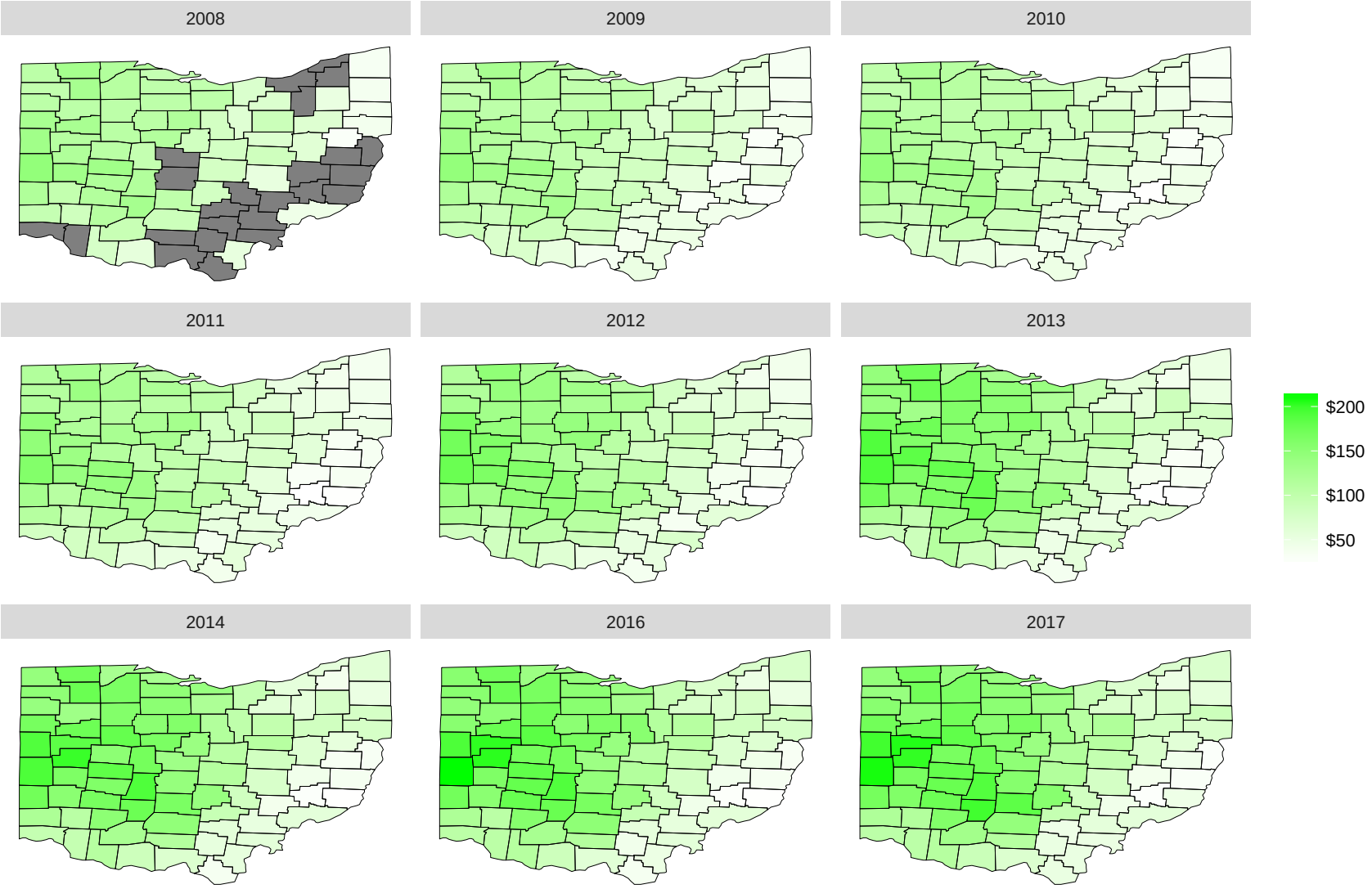
- An additional strategy is a fixed effects approach for county and time effects
  - Still a concern over appropriate lag of *Tax*
  - Assumes productivity index is absorbed in county fixed effects (as well as other time-invariant factors)
  - Assumes futures prices of commodities is absorbed in time fixed effects (as well as other county-invariant factors)
- Provides robustness check for incidence rate

Data Sources

Analysis is at the county level from 2009 to 2014 and weighted by rented acreage per 2012 Agricultural Census.

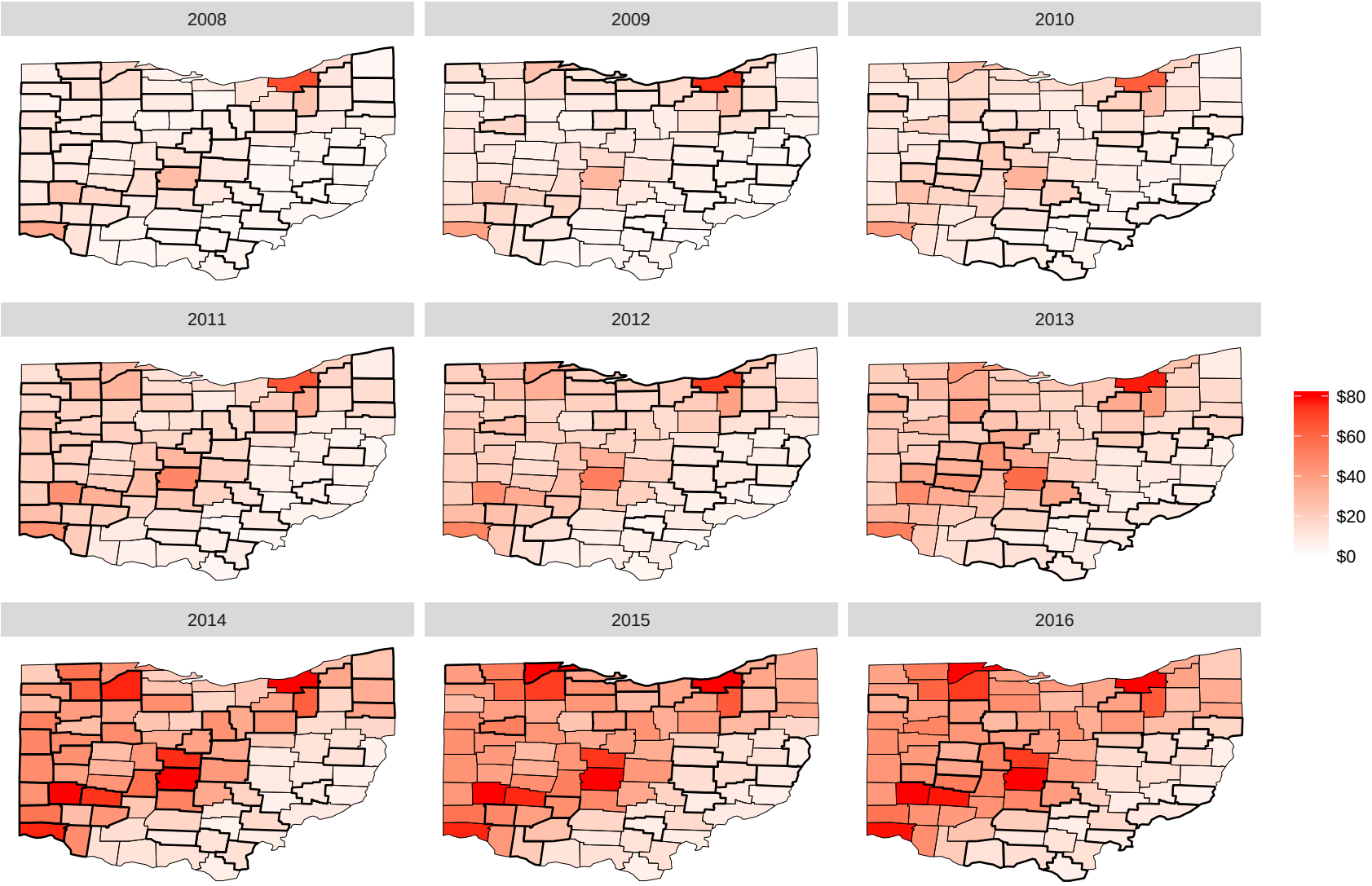
Variable	Availability	Level	Source
Cash Rent	2009-2014, 2016, 2017, and partial 2008	County	USDA-NASS
CAUV and Appraised Market Value	1985-2016	County	Ohio Department of Taxation
Soil Productivity Index	Time Invariant	County	USDA-NRCS
Corn/Soy/Wheat Futures Prices	2005-2015	National	Chicago Board of Trade

Cash Rent for Cropland



Source: USDA−NASS

Average CAUV Tax Collected (bolded counties that update)



Source: Ohio Department of Taxation

Results

Table 2: Panel Models for Tax Incidence of the Ohio CAUV Program

	Dependent variable:				
	Cash Rent				
	(1)	(2)	(3)	(4)	(5)
CAUV Tax	1.523***	1.317***	0.776***	1.424***	0.382***
	(0.147)	(0.177)	(0.125)	(0.222)	(0.125)
Appraised Market Value		0.003**	−0.001	0.003*	−0.0003
		(0.001)	(0.001)	(0.002)	(0.001)
Soil Productivity Index			4.465***		4.707***
			(0.159)		(0.160)
Corn Futures Price				6.030***	3.808***
				(2.087)	(1.293)
Soybean Futures Price				−2.396	7.389***
				(2.111)	(1.299)
Wheat Futures Price				−0.864	−11.647***
				(3.306)	(2.148)
Observations	528	528	528	528	528
Adjusted R^2	0.293	0.302	0.740	0.314	0.771
Note:	Robust standard errors, p<0.1 *; p<0.05 **; p<0.01 ***				

Table 3: Panel Models for Lagged Tax Incidence Effects

	Dependent variable:				
	Cash Rent				
	(1)	(2)	(3)	(4)	(5)
CAUV Tax	0.382***			0.287**	0.244
	(0.125)			(0.145)	(0.160)
CAUV Tax Lag 1		0.479***		0.271	0.190
		(0.166)		(0.201)	(0.229)
CAUV Tax Lag 2			0.578***		0.213
			(0.191)		(0.281)
Observations	528	528	528	528	528
Adjusted R^2	0.771	0.769	0.770	0.772	0.772
Note:	Robust standard errors, p<0.1 *; p<0.05 **; p<0.01 ***				

Table 4: Panel Fixed Effects Models for Lagged Tax Incidence Effects

	Dependent variable:				
	Cash Rent				
	(1)	(2)	(3)	(4)	(5)
CAUV Tax	0.287***			0.271***	0.155**
	(0.071)			(0.075)	(0.065)
CAUV Tax Lag 1		0.669***		0.652***	0.618***
		(0.163)		(0.158)	(0.097)
CAUV Tax Lag 2			0.858***		0.722***
			(0.142)		(0.121)
Observations	528	528	528	528	528
Adjusted R^2	0.995	0.996	0.996	0.996	0.996
Note:	Robust standard errors, p<0.1 *; p<0.05 **; p<0.01 ***				

Economic Relevance

- Short-run incidence rate of 16% to 38% on CAUV tax increases passed onto renters
  - Lagged values of CAUV tax significant and larger than current period, possibly indicating adjustment period
  - Medium-run indicates up to 50% but also unclear if the effects exist
- Significant cross-sectional variation explained through productivity index
- Results only span 6 years and are county level, farmer level implications not feasible with current analysis

Policy Implications

- Current results provide fodder for Ohio's recent changes in CAUV calculation
  - CAUV changed method of calculating capitalization rate, now based on 80% loan and 20% equity
  - Interest rates now from different sources, substantially higher rate thus lowering CAUV values
  - Phased in over 6 years, suggesting portion of increased rental rates from tax payments will take longer to dissipate
- Clarifying policy intent behind CAUV program as it relates to intended group for benefit – operators or owners? Possible change in CAUV program as it relates to rented land dependent upon answer

Future Research

- Projections of CAUV values for 2018 and beyond, bounded by upper and lower limits per Olympic average methodology
- Extend to farmer level analysis through Western Ohio Cropland Values and Cash Rents survey
- Potential to compare states with similar agricultural land use program calculations

Taxation Incidence on Rented Agricultural Land

Questions or comments?

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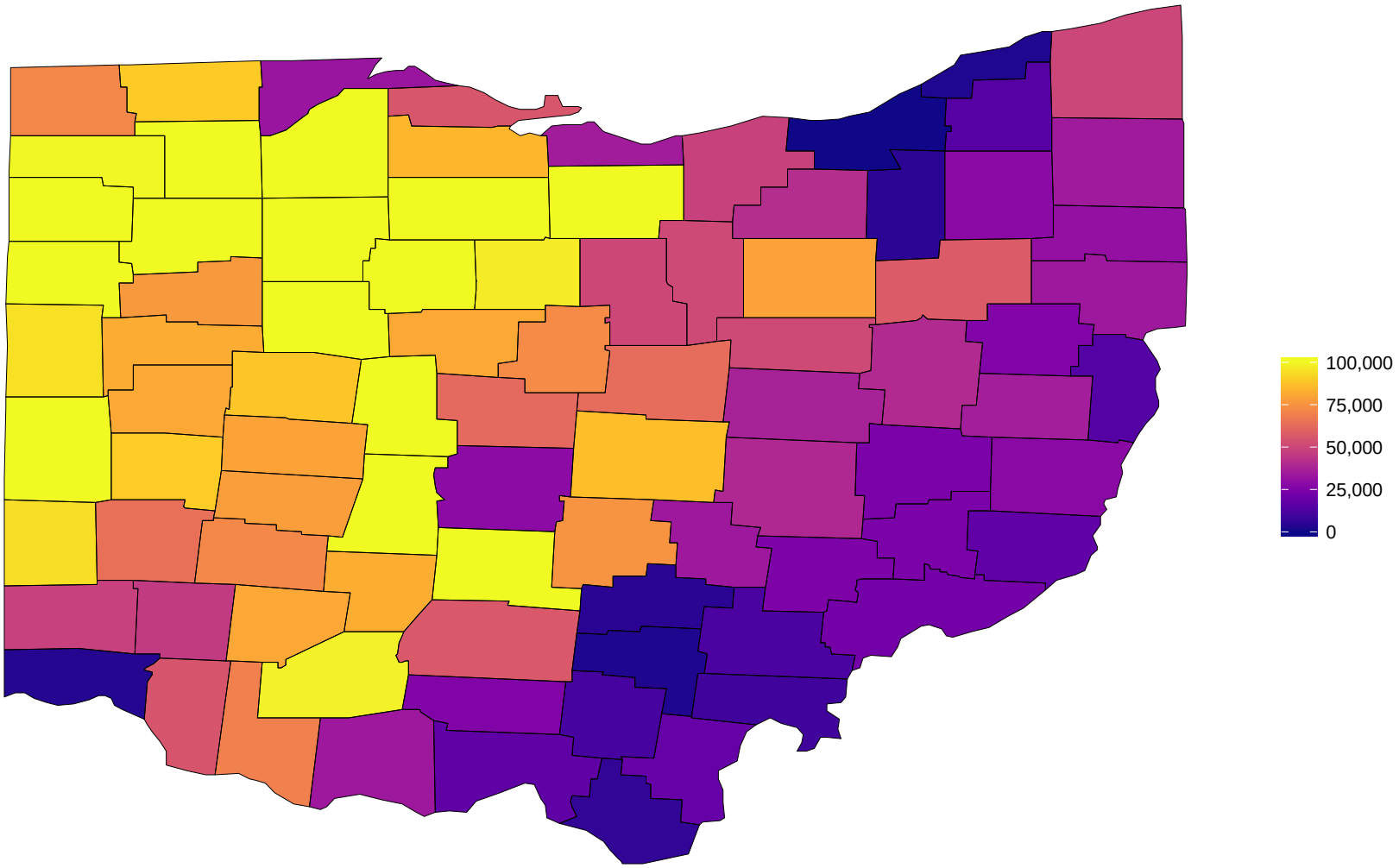
- Ani Katchova: katchova.1@osu.edu

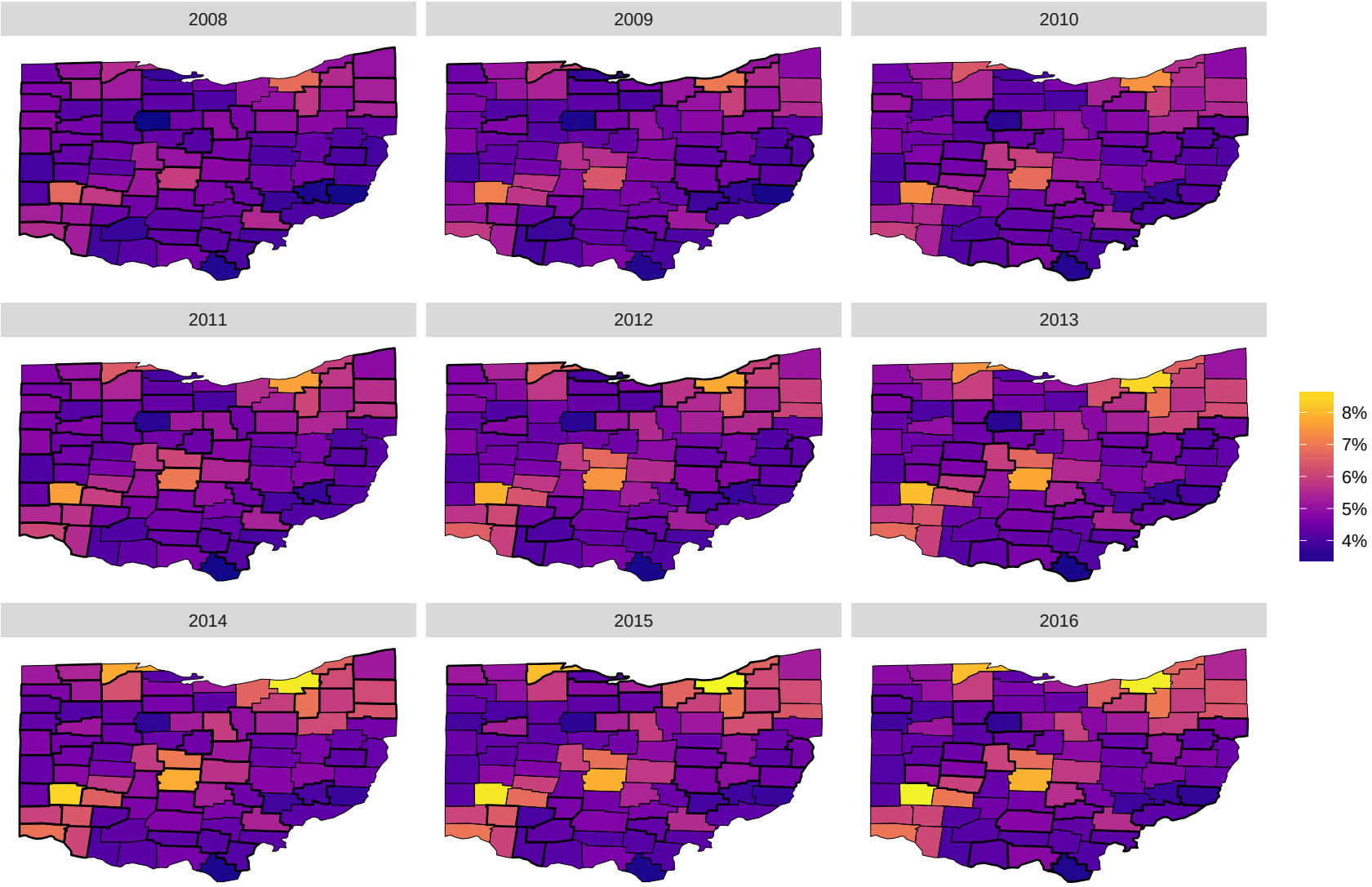
Additional Resources

Rented Acreage



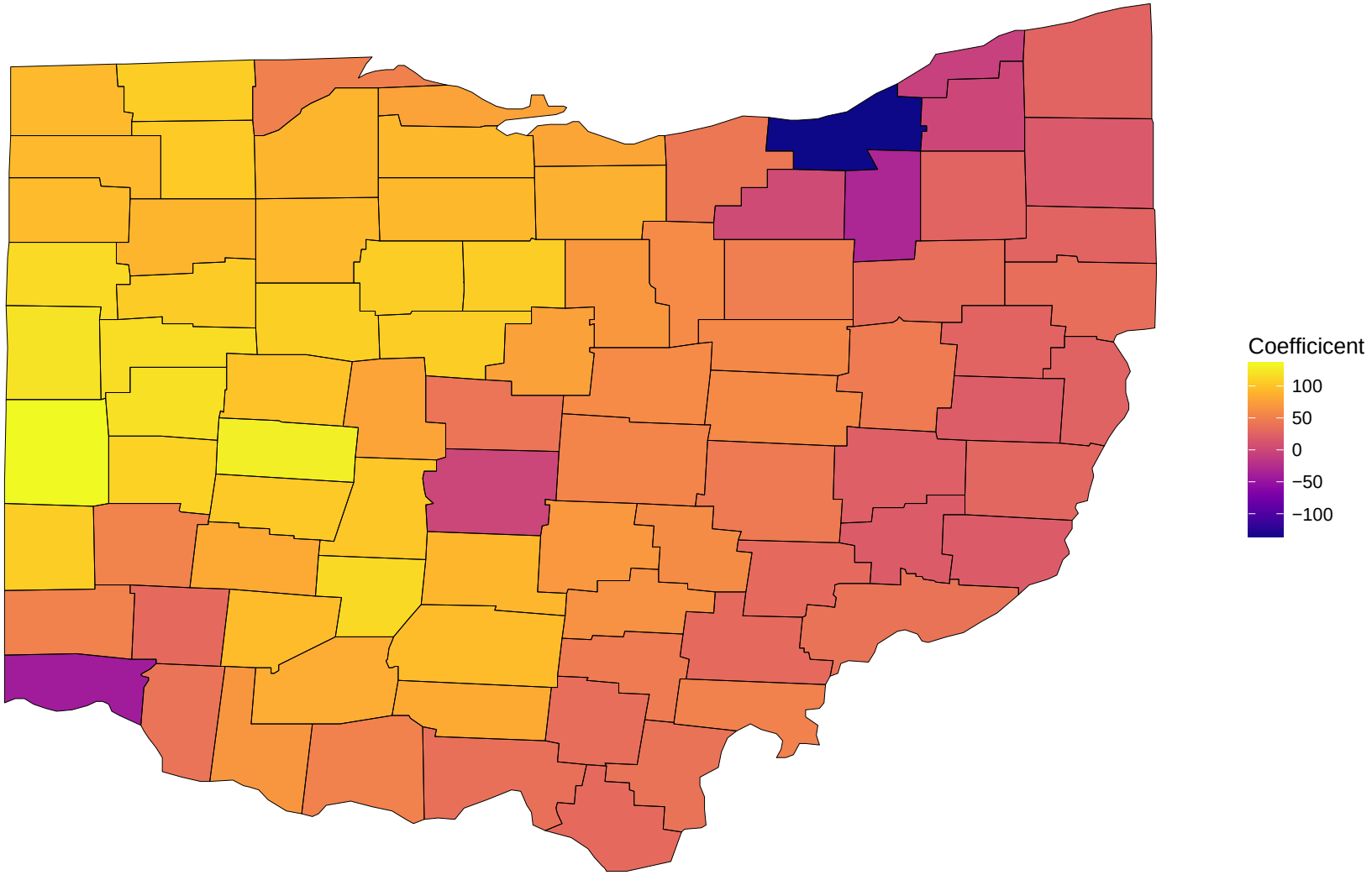
Source: 2012 Agricultural Census

Agricultural Net Millage Rate

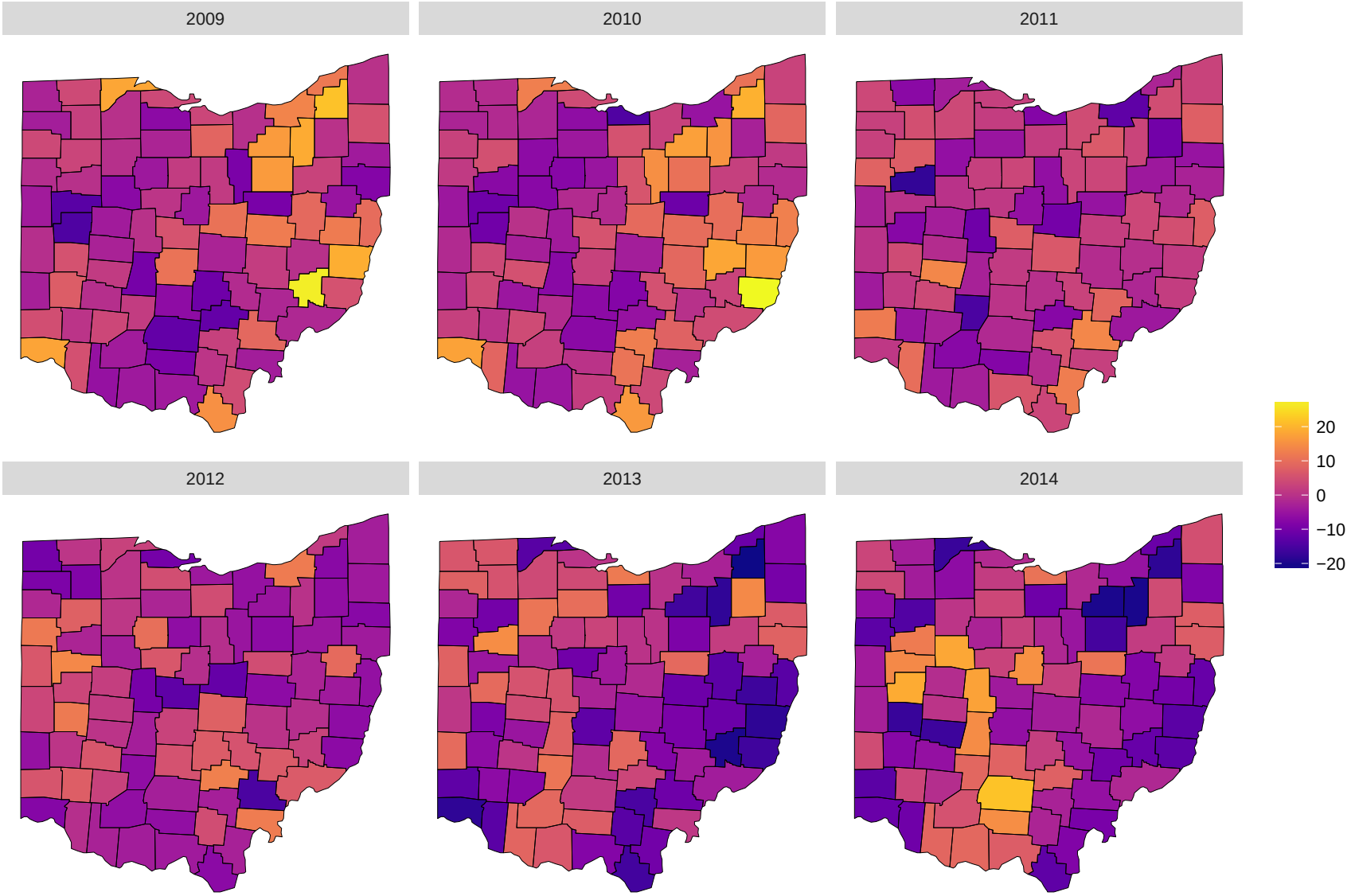


Source: Ohio Department of Taxation

County Fixed Effects Estimates



Fixed Effects Residuals



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