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The role of US organic certifiers in organic hotspot formation

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Objectives

The purpose of this paper is to investigate the **formation of hotspots of organic operations** (geographically close areas that have positively correlated high numbers of organic operations), paying particular attention to the role of the **organic certifying agent**. We analyze **the association of county-level factors related to policy, economics, demographics and organic certifiers with the probability that a county is in a hotspot or coldspot** (geographically close areas that have positively correlated low numbers of organic operations) of organic operations.

Methodology

Step 1: Identify hotspots and coldspots of organic operations:

Local Moran's I (Anselin, 1995)

$$I_i = (x_i - \bar{X})\sum_j w_{ij}(x_j - \bar{X})$$

A permutation method is used to test the null hypothesis of spatial autocorrelation and identify whether a county belongs to a hotspot or coldspot

Step 2: Identify county-level factors associated with the presence of hotspots and coldspots of organic operations:

Logit (Cameron and Trivedi 2005):

When F is the cdf for ε_i ,

$$\Pr[y_i = 1] = F[x, \beta].$$

Where y_i takes on a value of 1 if the county belongs to a hotspot (coldspot), identified in Step 1. The x matrix represents county-level variables associated with the presence of hotspots and coldspots. When ε_i follows a logistic distribution, the model is a logit.

What are the characteristics of Organic Certifiers?

List of organic certifiers with more than 100 certified operations

Certifying agent	Provides outreach	Government	Number of operations certified
California Certified Organic Farmers Certification Services	Yes	No	2146
Quality Assurance International	No	No	1317
Midwest Organic Services Association, Inc.	Yes	No	1284
Oregon Tilth	Yes	No	1227
Washington State Department of Agriculture	No	Yes	1165
Organic Crop Improvement Association International	Yes	No	1031
Ohio Ecological Food and Farm Administration	Yes	No	700
Northeast Organic Farming Association of New York	Yes	No	662
Global Organic Alliance	No	No	631
Vermont Organic Farmers, LLC	Yes	No	551
Pennsylvania Certified Organic	Yes	No	532
Quality Certification Services	Yes	No	484
Guaranteed Organic Certification Agency	No	No	426
Indiana Certified Organic	No	No	408
Organic Certifiers	No	No	395
Maine Organic Farmers and Gardeners Certification Services, LLC	No	No	385
Texas Department of Agriculture	No	Yes	346
Iowa Department of Agriculture and Land Stewardship	No	Yes	326
Idaho State Department of Agriculture	No	Yes	298
OneCert	No	No	241
Kentucky	No	Yes	237
Baystate Organic Certifiers	No	No	215
Colorado Department of Agriculture	No	Yes	196
Hawaii Organic Farmers Association	Yes	No	155
New Mexico Organic Commodity Commission	No	No	143
Nature's International Certification Services	No	No	141
Stellar Certification Services	No	No	140
NH Department of Agriculture, Division of Regulatory Services	No	Yes	139
Montana Department of Agriculture	No	Yes	120
Global Culture	No	No	115
Maryland Department of Agriculture	No	Yes	106

The Data:

Data on location of organic operations and the names of their certifiers come from the National Organic Program's list of certified and exempt organic operations. Information on the services provided by certifiers come from the certifiers' websites. Data on other county level characteristics come from publicly available sources, such as the U.S. Census and USDA's Census of Agriculture.

Results: Where are hotspots and coldspots of organic operations located in the United States?

All organic operations

Organic production operations (crops and livestock)

Organic operations with livestock as the primary scope

Organic operations with crops as the primary scope

Organic operations with handling as the primary scope

*Notes: Grey = not significant; red = hotspot; blue = cold-spot; purple = low-high; pink = high-low

Results: What county-level factors, especially those relate to the certifier, are associated with the presence of hotspots and coldspots?

Level for certifiers (x%)	30%		50%		70%	
	Logit	Marginal effects	Logit	Marginal effects	Logit	Marginal effects
Hotspots all organic						
cert_priv_outreach_xpct_09	2.0506876***	0.10997533***	2.4484397***	0.12803699***	1.6538889***	0.08995825***
cert_govt_xpct_09	0.57637459***	0.03091011***	1.2527395***	0.06550988***	0.61077437***	0.03322121**
avg_farm_income_0	0.0000168***	9.011×10^{-7} ***	0.00001835***	9.594×10^{-7} ***	0.0000204***	1.110×10^{-6} ***
indus_entropy_indx_00	0.06909786	0.00370562	0.13602558	0.00711323	0.2126942	0.01156885
distance_to_interstate_07	-0.01630735**	-0.00087454**	-0.01221967*	-0.00067858*	-0.01247575*	-0.00067858*
pop_density_07	-0.00061764**	-0.00003312**	-0.00046259*	-0.00002419*	-0.00029177	-0.00001587
natural_amenities_scale	0.07901324**	0.00423736**	0.08483505**	0.0044363**	0.07825644**	0.00425652**
land_values_07	0.00005815**	3.118×10^{-6} ***	0.00005902***	3.086×10^{-6} ***	0.00004158*	2.262×10^{-7} *
property_tax_per_cap_02	-0.00019619	-0.00001052	-0.0001431	-7.48 $\times 10^{-6}$	-0.00017712	-9.63 $\times 10^{-6}$
politics_green_00	0.43408016***	0.02327907***	0.39416464***	0.02061217***	0.40255062***	0.02189552***
urban_influence_code_03_cons	-0.08590914**	-0.00460718**	-0.08515574**	-0.00445307**	-0.09995603***	-0.0054368***
	-4.9395405***		-5.2409713***		-4.6645635***	
Hotspots organic production						
cert_priv_outreach_xpct_09	2.0910975***	0.11127704***	2.5567506***	0.13241269***	1.795269***	0.09625132***
cert_govt_xpct_09	0.42921287*	0.02284042*	1.2511224***	0.06479494***	0.64608177**	0.03463894**
avg_farm_income_07	0.0000122**	6.494×10^{-7} **	0.00001336**	6.917×10^{-7} **	0.00001595***	8.551×10^{-7} ***
indus_entropy_indx_00	0.15406506	0.00819852	0.21586338	0.01117944	0.28386556	0.01521913
distance_to_interstate_07	-0.02304809***	-0.0012265***	-0.0190983***	-0.00098909***	-0.01907071***	-0.00102245***
pop_density_07	-0.00089284***	-0.00004751***	-0.00075387**	-0.00003904**	-0.00053943*	-0.00002892*
natural_amenities_scale	0.07824539**	0.0041638**	0.08072009**	0.00418045**	0.074589**	0.003999**
land_values_07	0.00006124**	3.259×10^{-6} **	0.00006327**	3.277×10^{-6} **	0.00004529*	2.428×10^{-6} *
property_tax_per_cap_02	-0.00022622	-0.00001204	-0.00016778	-8.69 $\times 10^{-6}$	-0.00021374	-1.15 $\times 10^{-5}$
politics_green_00	0.47499887***	0.0252769***	0.43593914***	0.02257705***	0.44158415***	0.02367503***
urban_influence_code_03_cons	-0.0468722	-0.00249429	-0.06459721	-0.00230966	-0.0607423*	-0.00325663*
	-5.264064***		-5.6297886***		-5.0252791***	
Hotspots organic handling						
cert_priv_outreach_xpct_09	1.5995048***	0.06253253***	1.6484843***	0.06439556***	1.2461322***	0.049955507***
cert_govt_xpct_09	0.62164821**	0.02430329**	0.88211955***	0.03445868***	0.52192658*	0.02075551*
avg_farm_income_07	0.0000166***	6.489×10^{-7} ***	0.00001779***	6.930×10^{-7} ***	0.00001977***	7.864×10^{-7} ***
indus_entropy_indx_00	-0.57380691**	-0.02243294**	-0.49904455**	-0.01949443**	-0.42356637*	-0.01684401*
distance_to_interstate_07	-0.01795963**	-0.00070213**	-0.01499933*	-0.00058593*	-0.01583061*	-0.00062954*
pop_density_07	0.00010962	4.29×10^{-6}	0.00020745	8.10×10^{-6}	0.00032045	1.27×10^{-5}
natural_amenities_scale	0.14805029***	0.00578802***	0.15146439***	0.00591673***	0.15927494***	0.0063339***
land_values_07	0.00010143***	3.965×10^{-6} ***	0.00010513***	4.107×10^{-6} ***	0.00009283***	3.692×10^{-6} ***
property_tax_per_cap_02	-0.00024062	-9.41 $\times 10^{-6}$	-0.00020711	-8.09 $\times 10^{-6}$	-0.00022462	-8.93 $\times 10^{-6}$
politics_green_00	0.36714606***	0.01435355***	0.33329496***	0.01301967***	0.34058072***	0.01354391***
urban_influence_code_03_cons	-0.16696988***	-0.00652768***	-0.1674223***	-0.0065401***	-0.17533963***	-0.00697275***
	-3.1841352***		-3.2569409***		-3.079473***	

Conclusions

- A high presence of private organic certifying agents who are associated with **outreach opportunities** and a high presence that are **state or local-government agents** are consistently **positively associated with the presence of hotspots, and negatively associated with the presence of coldspots**.
- Results hold no matter whether the hotspots are defined as all organic operations or as some subset of production or handling operations.
- Results hold no matter whether the threshold for an outreach presence (or a government-certifier presence) is 30, 50 or 70% of all operations in a county.
- Supplemental analyses suggest that these associations may be stronger in the Midwest and West than in the Northeast

What factors are associated with the presence of hotspots of organic operations (the variables that make up the x matrix in our logit model)?

Factors affecting organic	Description
cert_govt_30pct_09 (*cert_govt_50pct_09 and cert_govt_70pct_09 refer to 50% and 70% cutoffs, respectively)	takes a value of 1 if 30% or more of the organic operations in the county are certified by a government agency
cert_outreach_30pct_09 (*cert_outreach_50pct_09 and cert_outreach_70pct_09 refer to 50% and 70% cutoffs, respectively)	takes a value of 1 if 30% or more of the organic operations in the county are certified by a private agency (non-governmental) which provides outreach (e.g., conferences, workshops, education, networking)
avg_farm_income_07	receipts of income and farm related totals measured in dollars per operation, 2007
indus_entropy_indx_00	industry entropy index, which measures economic diversity in 2000: High IE means higher diversity
urban_influence_code_03	urban influence code in 2003: Lower UIC means higher level of urban influence
pop_density_07	population density in 2007
natural_amenities_scale	natural amenities scale
land_values_07	value of land and buildings per acre, 2007
property_tax_per_cap_02	property tax per capita in 2002
politics_green_00	number of people who voted for Nader or the green party in 2000
distance_to_interstate_07	distance of the county from an interstate highway measured in kilometers
Hotspots and Coldspots	
hh_09	takes a value of 1 if the county is an organic hotspot, and 0 otherwise
hh_prod_09	1 if the county is an organic production hotspot
hh_hand_09	1 if the county is an organic handling hotspot
hh_crop_09	1 if the county is an organic crop hotspot
hh_live_09	1 if the county is an organic livestock hotspot
ll	1 if the county is an organic coldspot

Rationale	Variables	Expected Effect on number of organic operations	Source for Rationale
Certifiers	cert_priv_outreach_xpct_09 (* x=30, 50, 70)	positive: private certifiers who provide outreach may indicate the level of communication between organic operations	Hypothesis
	cert_govt_xpct_09 (* x=30, 50, 70)	positive: the diversity of activities that government certifiers participate in may be another indicator of communication; however, a high government presence in certification may also imply the need for it	
Policy	property_tax_per_cap_02	ambiguous: state level fiscal policies have been found to negatively affect the formation of clusters; however, higher taxes may also imply higher amenities	Goetz (1997), Glaeser (1996)
Work-force heterogeneity	indus_entropy_indx_00	ambiguous: this indicates economic diversification and clustering is driven by workforce heterogeneity and diversity of a region; however, organic has been found to need more specialized labor	Davis and Schullter (2005), Duranton and Puga (2003), Delgado et al. (2012)
Resources/Supply	land_values_07	positive: This may indicate presence of resources	Kamath et al. (2012), Brown et al. (2012)
	pop_density_07	ambiguous: This variable may capture labor supply, which would imply a positive effect given the fact that organic operations tend to be more labor intensive; however, farms, specifically may fare better if they are removed from population centers.	
	natural_amenities_scale	positive: a higher natural amenities scale may imply availability of better resources	
Demand conditions	avg_farm_income_07	positive: may indicate high demand for agricultural goods	Kamath et al. (2012)-Schmidtner et al., (2012), Brown et al. (2012)
	urban_influence_code_03/ distance_to_interstate_07/ pop_density_07/ indus_entropy_indx_00	ambiguous: being closer to a highway or being in an urban area may provide market access, which encourages the development of farms; however, farms may also fare better if they are protected from sprawling development	
	politics_green_00	positive: liberal areas are generally associated with more receptiveness of organic	
Opportunity Cost	land_values_07/ natural_amenities_scale	negative: high land values and amenities may also indicate that the opportunity cost of using them for farming is high	Brown et al. (2012)- Mishra and Goodwin (1997)