Similar Worldviews and Network of Communication in Conservation Practices of Producers: A Social Network Explanation

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Background

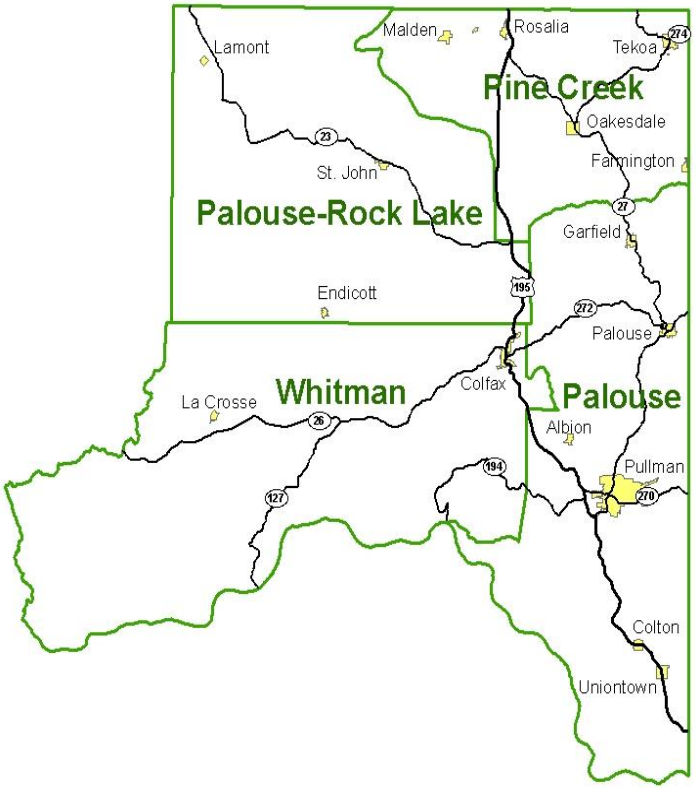
- Adoption of conservation practices likely to demand producers to seek information from information sources (experts)
- Assuming producers seek valuable information, they face a choice who to connect to.
- If so, we would expect to observe a network of links (contacts) between producers and information sources.
- The question is: What explains a producer's choice of making a tie to a particular source?

Research question

- Two categories of influence may be at work for the presence (or absence) of a tie between a producer and a source.
  - Social selection (attributes of producers and sources; homophily (similarity) of attributes)
  - Social influence or network processes
- In this study, we ask: Does similarity of WVs of producers and sources explain the network ties between the two?

Empirical Context

- Study area: Whitman County, Washington
- Dry land farming with some rangeland/pasture, wheat being the predominant crop
- Soil erosion and water quality have been ongoing issues.
- Many of the streams in the county are currently on State's 303 (d) list of impaired waters.
- The region consists of steep topography and erodible soils.
- High winter precipitation and frequent snow melt further contribute to soil erosion.



Data collection

- Producer surveys were conducted with principal farm operators in the Whitman county during January – March of 2012.
- All USDA identified 875 producers (2007) included in the survey. 258 surveys were returned (30 % response rate)
- (Email) survey was conducted on producer-named 130 information sources (individuals) during September- October of 2012. 78 surveys were returned.

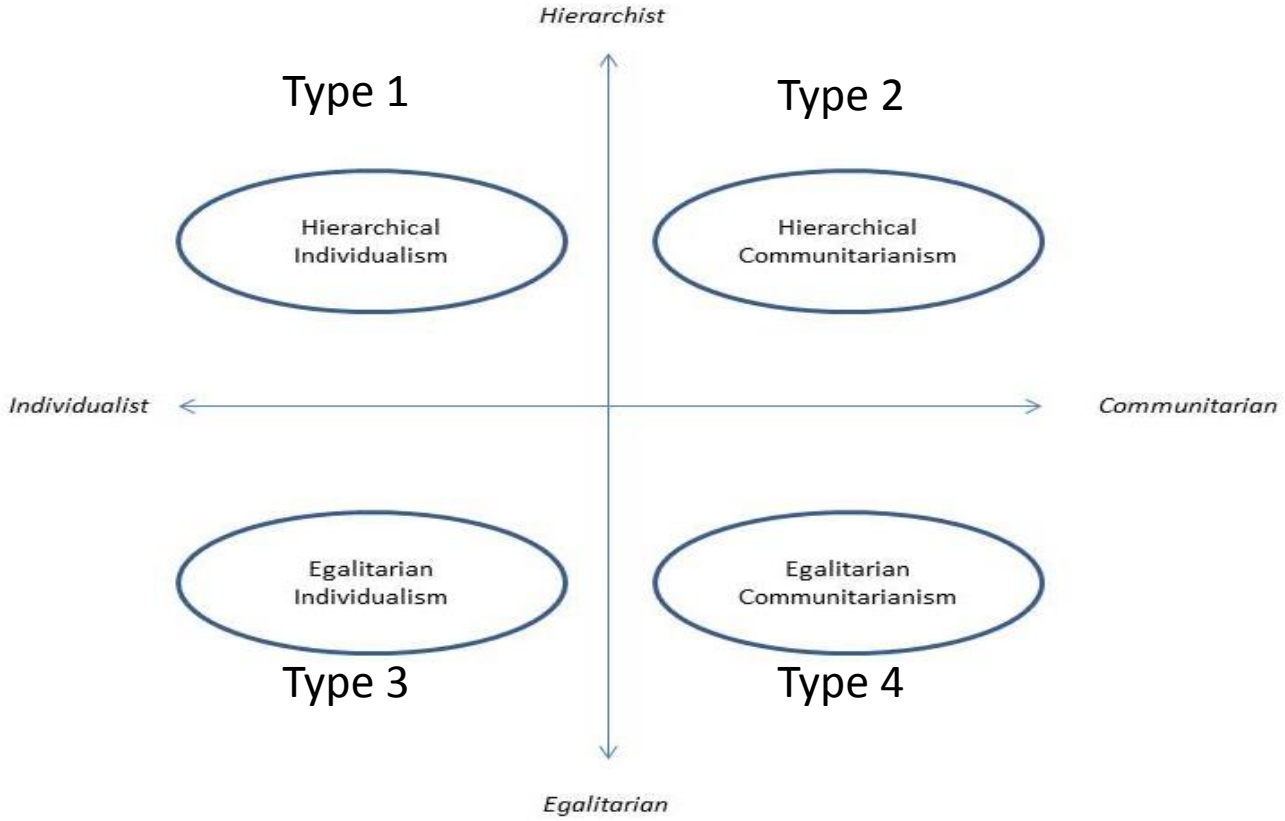
Data collection

- The survey gathered information on producers' contact with information sources as well as about socio-economic and farm characteristics of the producers.
- Cultural worldviews of producers and sources were gathered by using cultural cognition items developed and tested by Kahan (2011).
- Cultural cognition items characterize respondents' cultural worldviews along two cross-cutting dimensions: (1) hierarchy-egalitarianism, and (2) individualism-communitarianism.

Data collection

- To determine cultural worldviews, respondents indicated the level of their agreement or disagreement with each of the six items on a six-point Likert scale.
- Responses were aggregated to form continuous hierarchy-egalitarianism and individualism-communitarianism worldview scores.
- Based on the worldview scores, respondents were classified into Hierarchical Individuals (Type 1), Hierarchical communitarians (Type 2), Egalitarian Individuals (Type 3), and Egalitarian Communitarians (Type 4).

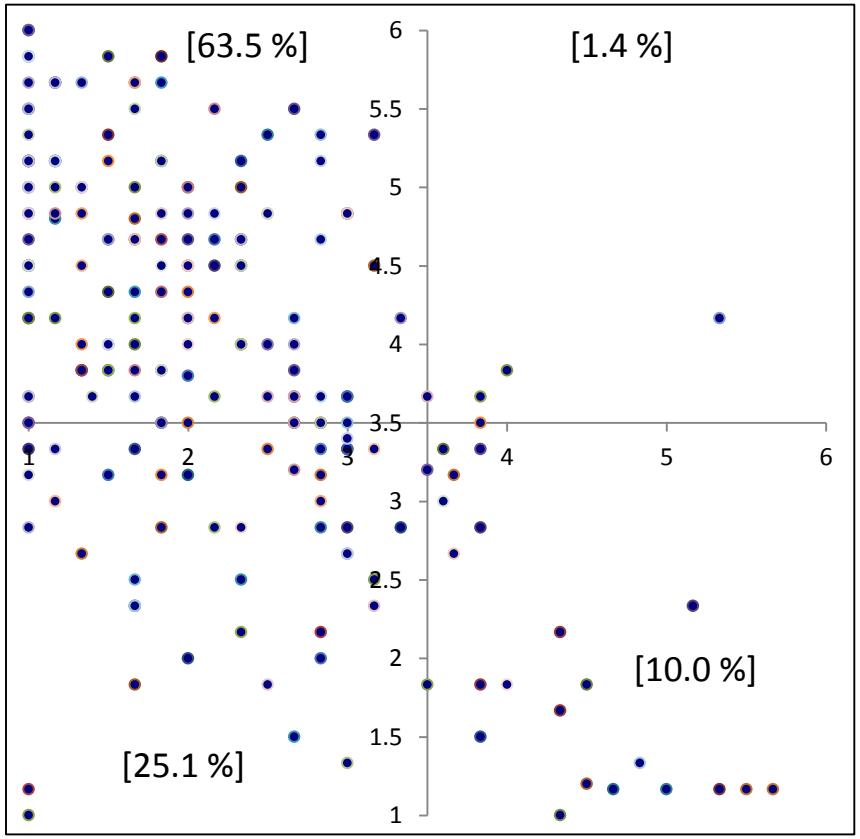
Cultural worldview type



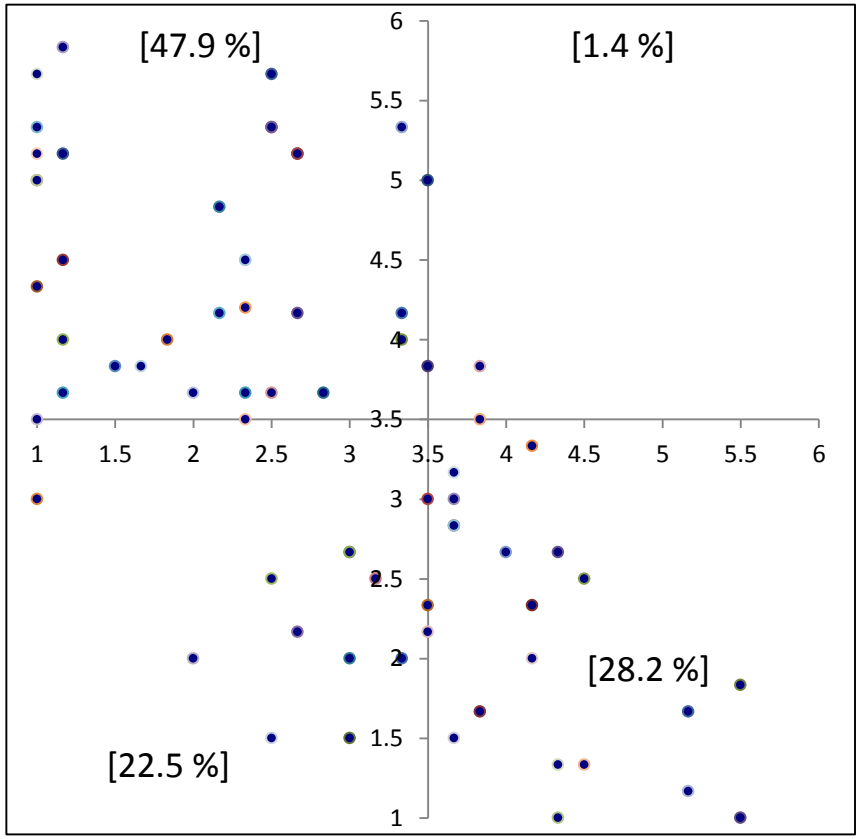
Source: Framework for classifying individuals' cultural values (Kahan, Braman, Slovic, Gastil, & Cohen, 2007).

Cultural Worldview types

Producers



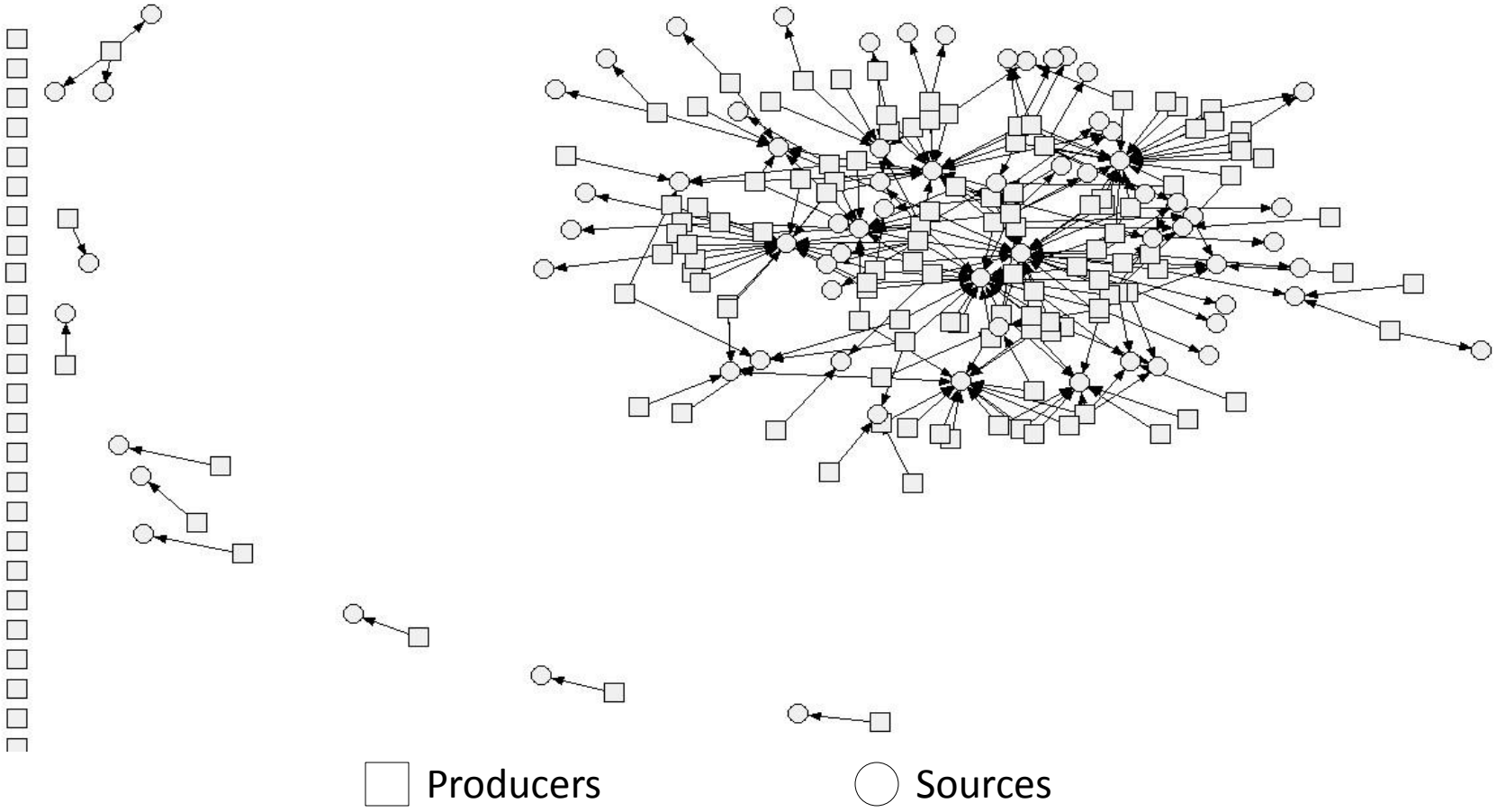
Information sources



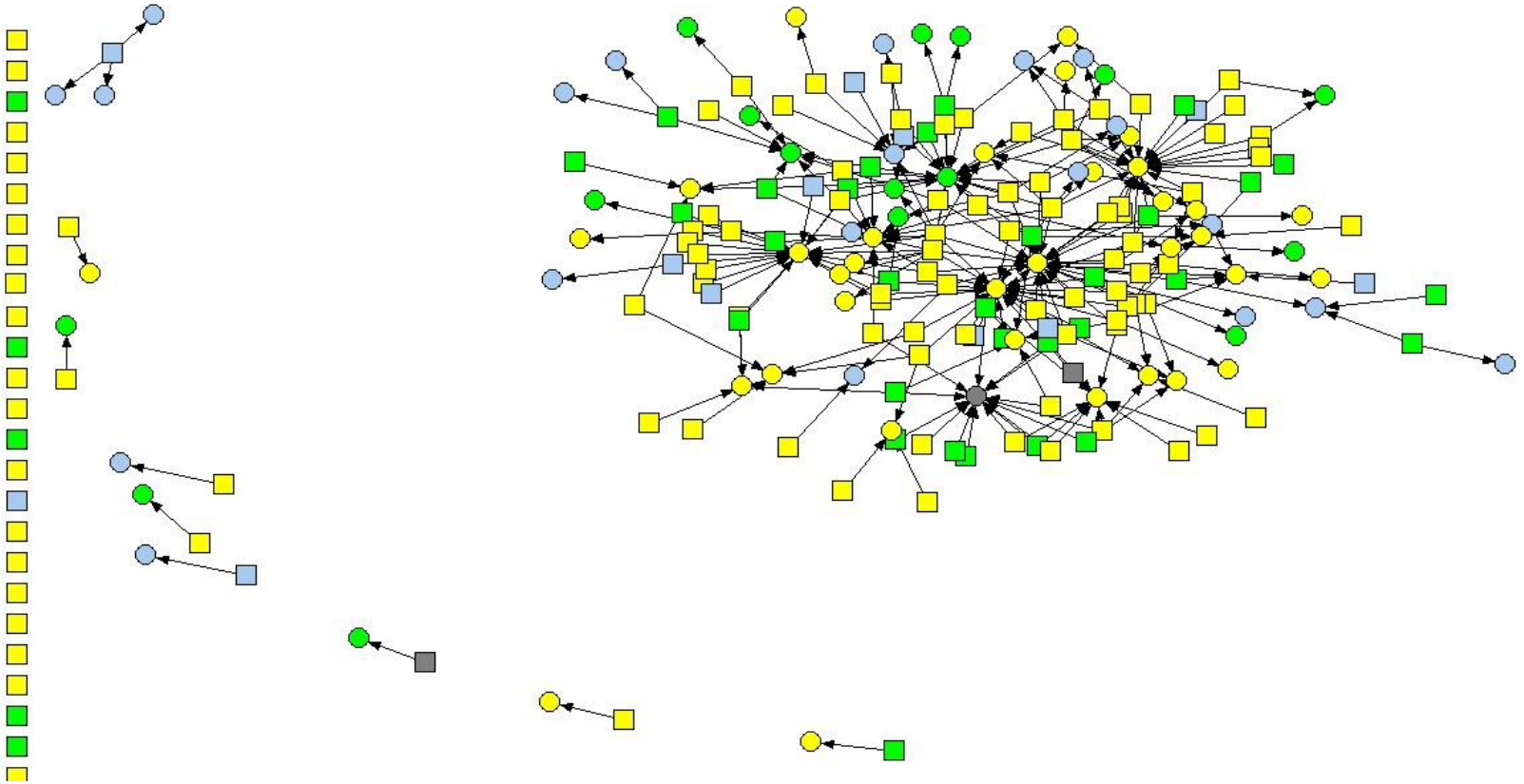
Producers' characteristics

	Type 1 Hierarchical individualists	Type 3 Egalitarian individualists	Type 4 Egalitarian communitarians
Total size of farm (average acres)	2,195	1,292	586
Acres owned (average acres)	1,049	662	392
Number of years this farm has been in producer's family (average years)	77.4	79.1	55.7
Number of years producer has been farming (average years)	33	33	23
Highest level of education (average): < 12th grade; 2- high school; 3-some college, no degree; 4- two year college; 5- 4-year college; 6- graduate degree	4.3	4.3	5.1
% of producers who are currently affiliated with or a member of an agricultural association	70.5	61.8	46.7
% of producers who are affiliated with or a member of a conservation association	4.0	5.8	29.4
Number of sources used to gain information relating to conservation practices	4.1	3.5	2.7

Contact Network Graph (193 Producers x 71 Sources)



Contact Network Graph (193 Producers x 71 Sources)



Yellow = Type 1 Gray = Type 2 Lime = Type 3 Sky blue = Type 4

Description of the Contact Network

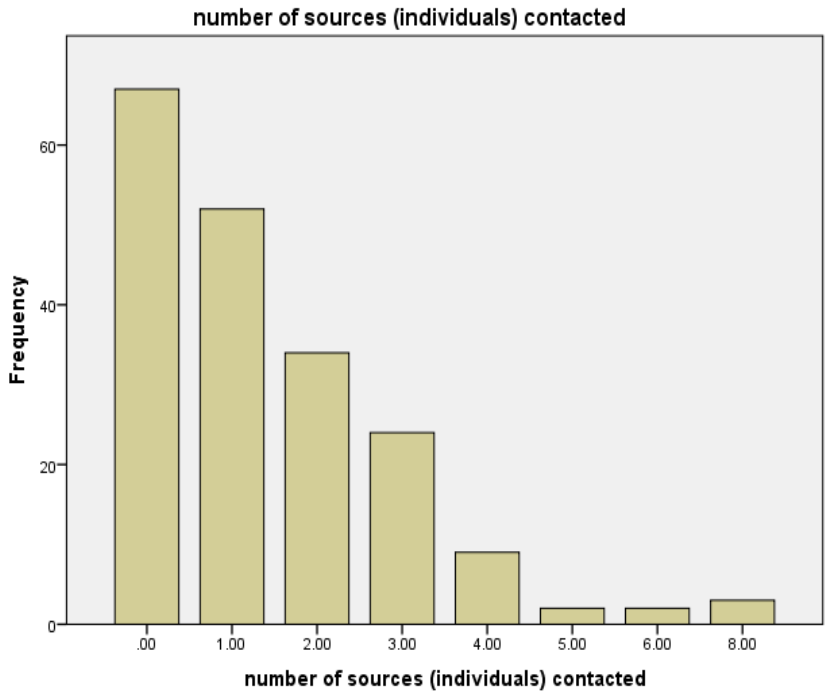
- Presence of isolate producers
- Network is fragmented (0.551)
- Density is 0.02 (2 % of total potential ties are connected)
- Average path distance is 4.19. The largest path distance is 9
- No cluster of “core” producers and sources
- Some sources appear to be more central than the producers

Density Matrix

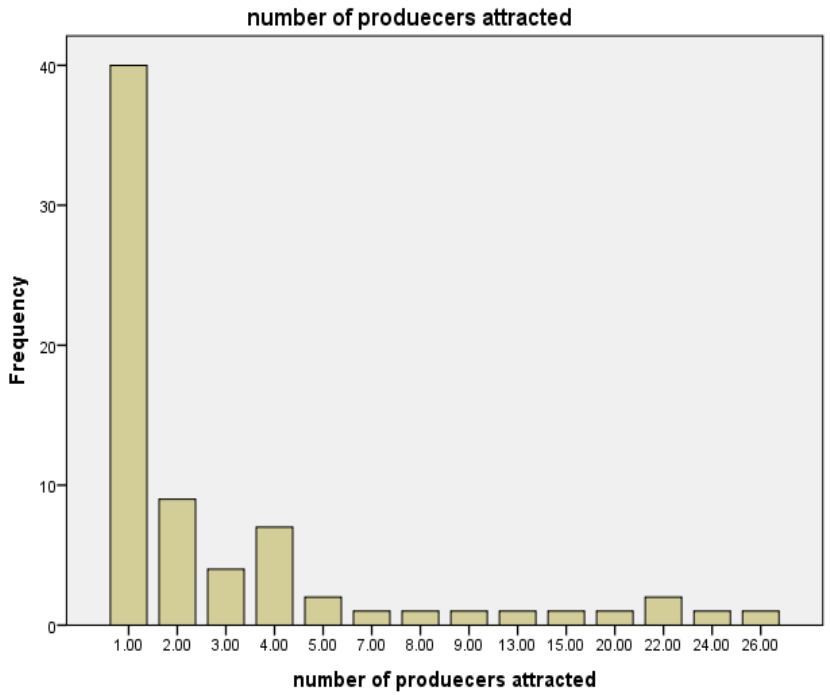
	S-core	S-peripheral
P-core	0.076	0.013
P-peripheral	0.043	0.006

Distribution of number of contacts (Degree distribution)

Producer contacting sources



Sources attracting producers



Who are the isolate producers?

worldviews

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	43	64.2	64.2	64.2
	3.00	17	25.4	25.4	89.6
	4.00	7	10.4	10.4	100.0
	Total	67	100.0	100.0	

1 = Type 1 WV 3 = Type 3 WV 4 = Type 4 WV

Who are the isolate producers?

Descriptive Statistics

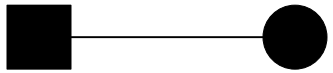
	N	Minimum	Maximum	Mean	Std. Deviation
acres	67	.00	21200.00	1376.6724	2818.21431
education	67	1.00	9.00	4.4627	1.48046
experience	67	4.00	67.00	26.3731	16.62586
impl_number	67	1.00	20.00	6.5821	4.60286
NotLive	67	.00	100.00	84.4627	30.42991
org_number	67	.00	9.00	2.2090	2.22613
Valid N (listwise)	67				

progY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	16	23.9	23.9	23.9
	1.00	51	76.1	76.1	100.0
	Total	67	100.0	100.0	

Does similarity of WV explain the contact network?

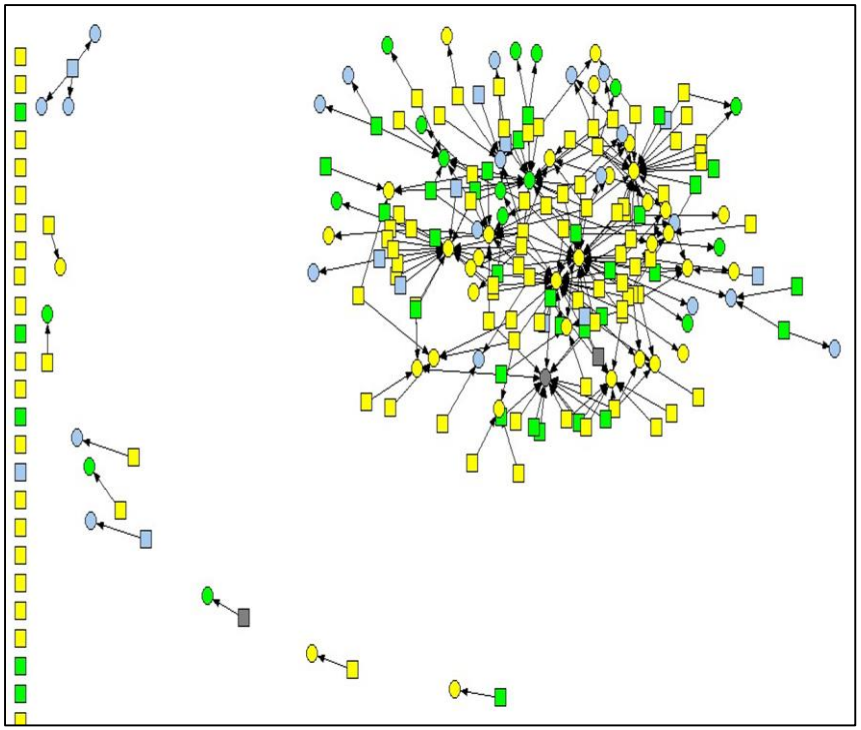
- We look for the following pattern:
- Contact between producers (P) and sources (S) when they have similar worldviews



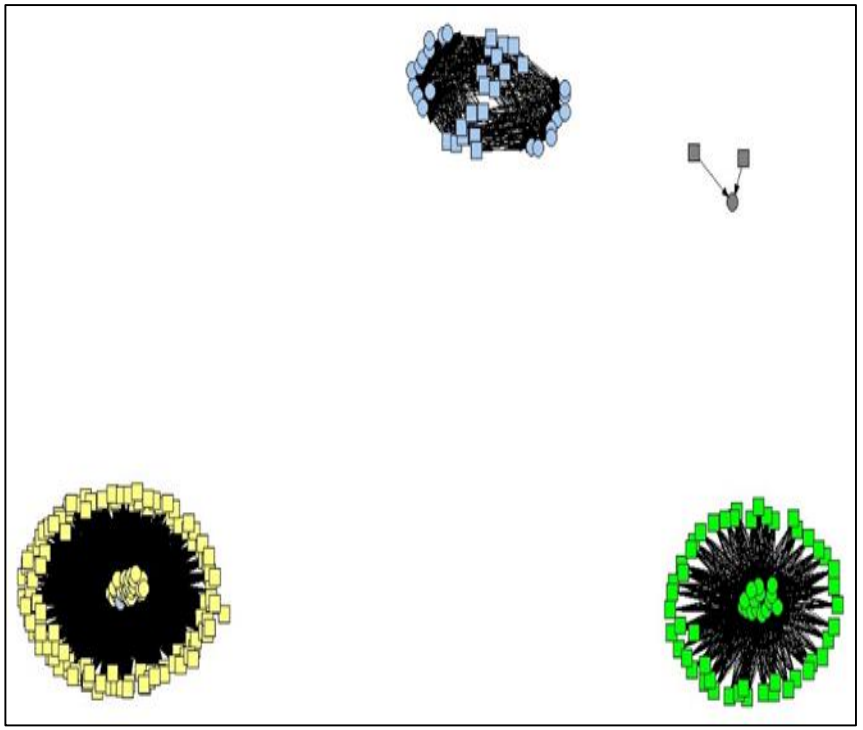
- No contact between producers (P) and sources (S) when they have dissimilar worldviews

Is there an overlap between contacts and similar worldviews?

Contact network



Worldviews similarity



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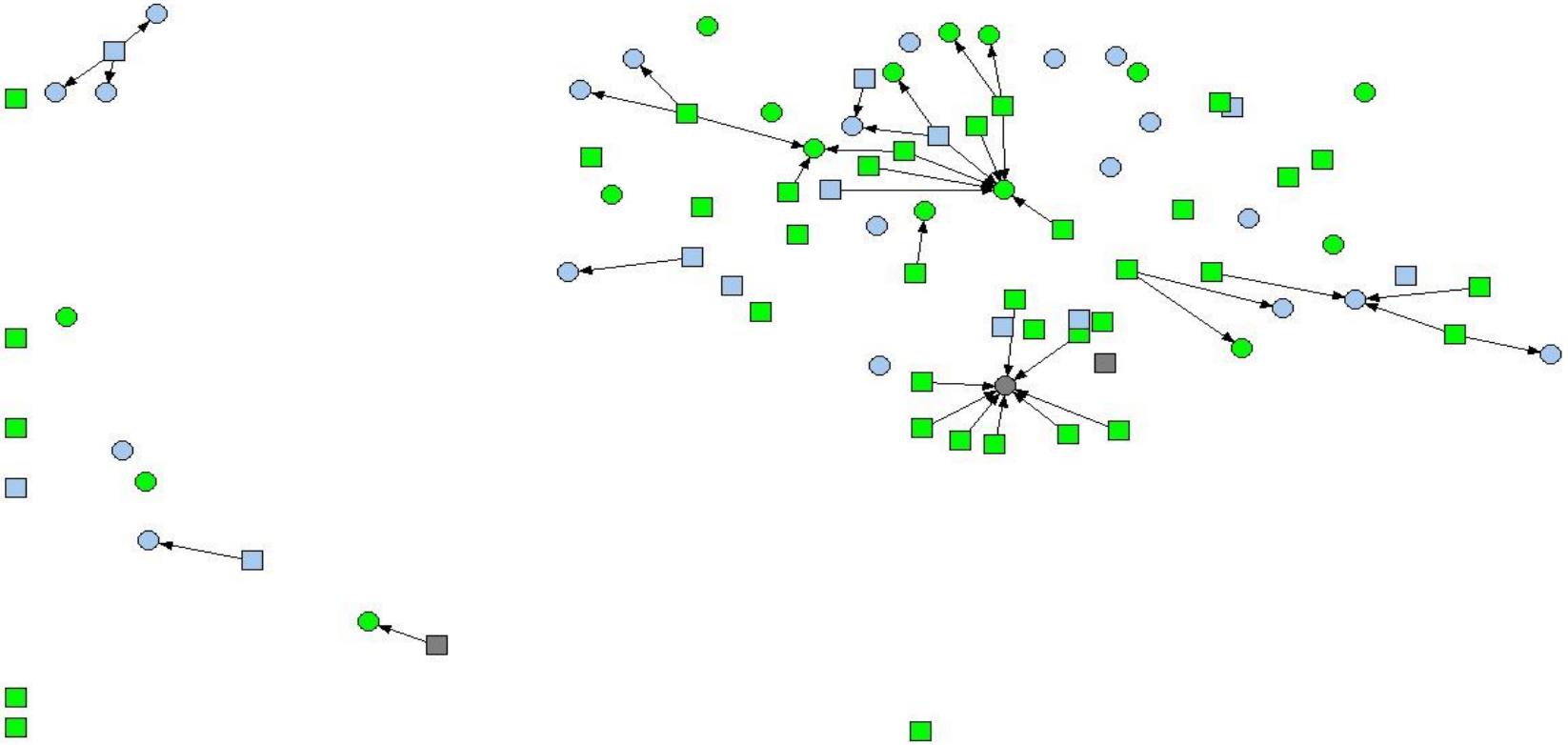
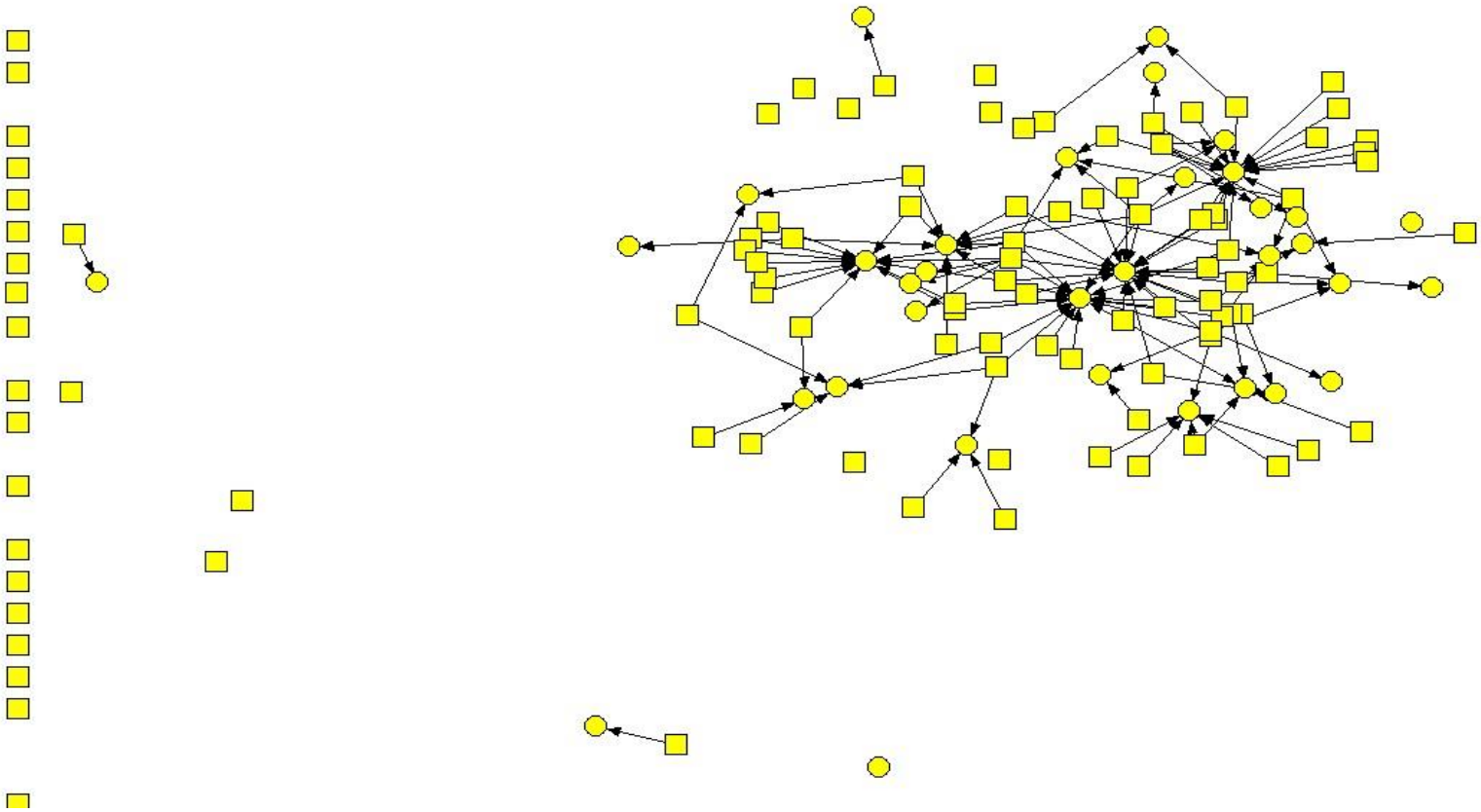


Gray = Type 2 Lime = Type 3 Sky blue = Type 4

Is there an overlap between contacts and similar worldviews?



Yellow = Type 1

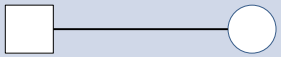
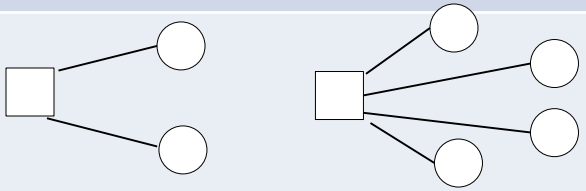
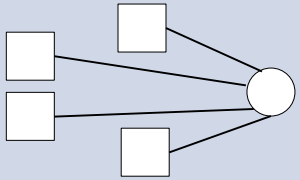
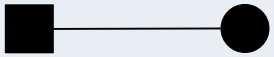
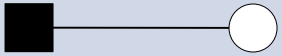
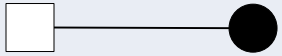
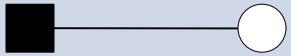
Statistical Modeling
Exponential Random Graph Model (ERGM)

- Suitable for cross-section network data.
- Simulation based estimation using Markov Chain Monte Carlo Maximum Likelihood technique.
- ERGM conducted with MPNet (Wang et. al. 2014), a program for simulation and estimation of two-mode (bipartite) networks.
- ERGM models the presence or absence of a network tie that explicitly takes into account complex dependencies among the ties in the network.

Statistical Modeling
Exponential Random Graph Model (ERGM)

- The model assumes that the network is build up of micro configuration of network ties.
- The model is deemed acceptable for interpretation if it converges (*t*-ratios for all parameters < 0.1) and has a good goodness of fit (GOF).
- In this model, network ties are considered dependent variable and network processes and actor attributes (e.g. similar worldviews) function as independent variables.
- In a loose way, ERGMs can be conceived to a logistic regression, predicting the presence or absence of a tie.

Parameters included in the model

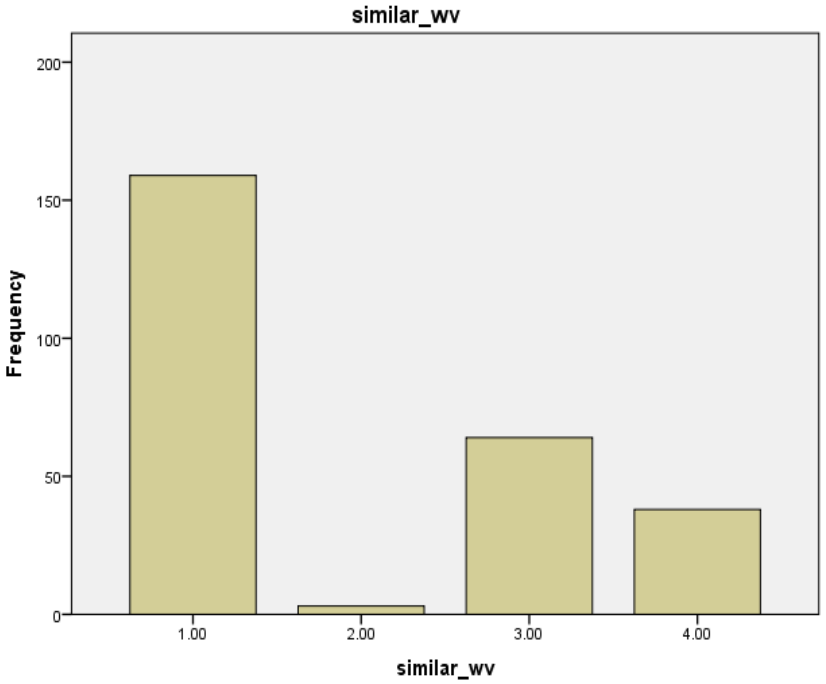
Effects	Bipartite network configuration
Producer contacting sources	
Producer centralization (producer contacting multiple sources)	
Source centralization (multiple producers contacting sources)	
Similar worldviews	
Producer with particular WV tied to sources	
Sources with particular WV tied to producers	
Producer with particular attribute tied to sources	

Producer Sources Producer w/attribute Sources w/attribute

Descriptive

similar_wv

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	159	60.2	60.2	60.2
	2.00	3	1.1	1.1	61.4
	3.00	64	24.2	24.2	85.6
	4.00	38	14.4	14.4	100.0
	Total	264	100.0	100.0	



Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
acres	193	.00	21200.00	1817.3738	2633.25638
education	193	1.00	9.00	4.4456	1.26590
experience	193	.00	67.00	26.2746	14.45295
impl_number	193	.00	23.00	7.4663	4.40291
NotLive	193	.00	100.00	91.0829	23.58459
org_number	193	.00	9.00	2.4404	2.01242
Valid N (listwise)	193				

ERGM Results

Effects	Model 1	Model 2	Model 3
	Est. (std. error)	Est. (std. error)	Est. (std. error)
Producers tied to sources (Edge)	-4.18 (0.09)*	-6 .75 (0.19)*	-5.25 (0.72)*
Similar worldviews	0.62 (0.13)*	0.46 (0.10)*	0.39 (0.16)*
Producers' degree of 2		0.11 (0.07)	0.12 (0.07)
Producers' centrality		0.36 (0.21)	0.35 (0.21)
Sources' centrality		1.26 (0.12)*	1.11 (0.15)*
Producers' WV Type 1			0.01 (0.61)
Producers' WV Type 3			0.13 (0.60)
Producers' WV Type 4			-0.07 (0.63)
Sources' WV Type 1			-1.18 (0.30)*
Sources' WV Type 3			-1.31 (0.30)*
Sources' WV Type 4			-1.47 (0.32)*

Cell entries are parameter estimates with standard errors in parentheses. All parameters converged with *t*-ratios ≤ 0.08. *Reject null hypothesis of parameter = 0, $p < 0.05$.

ERGM Results

Effects	Model 4	Effects continued	Model 4
	Est. (std. error)		Est. (std. error)
Producers tied to sources (Edge)	--6.10 (0.81)*	Producers' exp.	-0.004 (0.004)
Similar worldviews	0.38 (0.15)*	Producers' edu.	0.04 (0.05)
Producers' degree of 2	0.11 (0.07)	Producers' org.	0.05 (0.028)**
Producers' centrality	0.24 (0.22)	# of CP implemented	0.03 (0.01)*
Sources' centrality	1.12 (0.15)*	Producers' farm size	0.00 (0.00)
Producers' WV Type 1	-0.24 (0.64)	Producers' NotLive	0.002 (0.003)
Producers' WV Type 3	-0.07 (0.64)	Producers' program	0.52 (0.25)*
Producers' WV Type 4	-0.21 (0.65)		
Sources' WV Type 1	-1.16 (0.30)*		
Sources' WV Type 3	-1.29 (0.29)*		
Sources' WV Type 4	-1.45 (0.30)*		

Cell entries are parameter estimates with standard errors in parentheses. All parameters converged with t-ratios ≤ 0.02.
*Reject null hypothesis of parameter = 0, $p < 0.05$.

Conclusion

- Individual producers and information sources are more likely to connect when they share similar worldviews controlling for the tendency for preferential attachment and characteristics of the producers.
- Some information sources are more central (popular) than others.
- Producers who adopt greater number of conservation practices and who have greater degree of involvement in organizations and programs are more likely to develop contacts with information sources.

Thank You!

Questions? Comments?