



# Culture, Networks, Twitter and foursquare: Testing a model of cultural conversion using social media data

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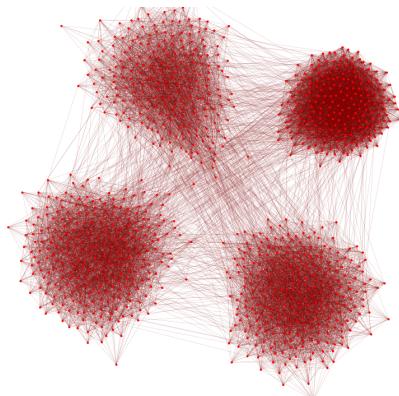
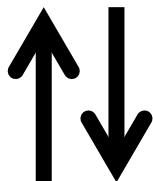
Center for Computational Analysis of  
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Carnegie Mellon

# Overview



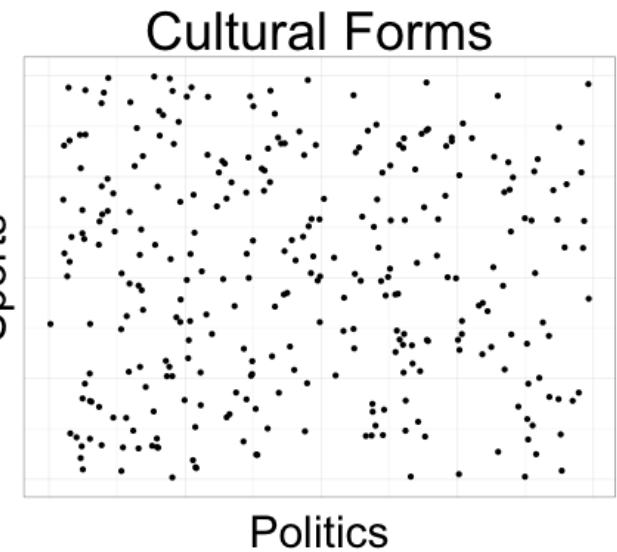
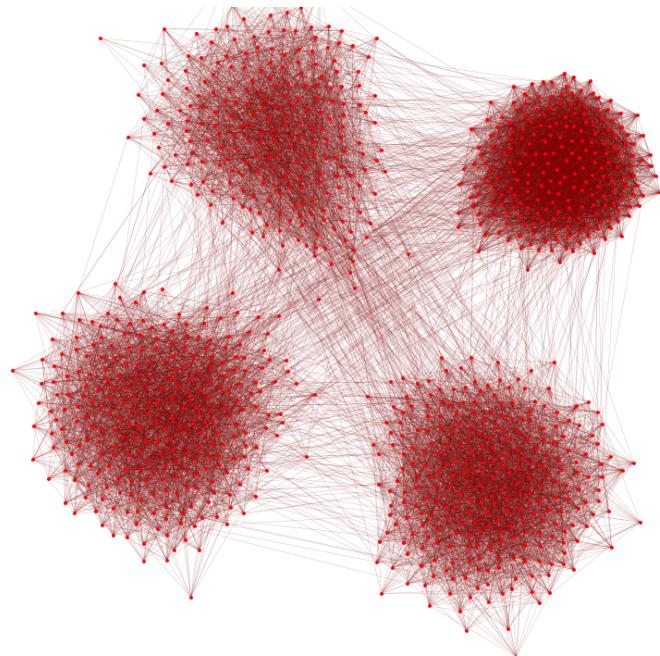
$\approx$  foursquare



$\approx$  twitter

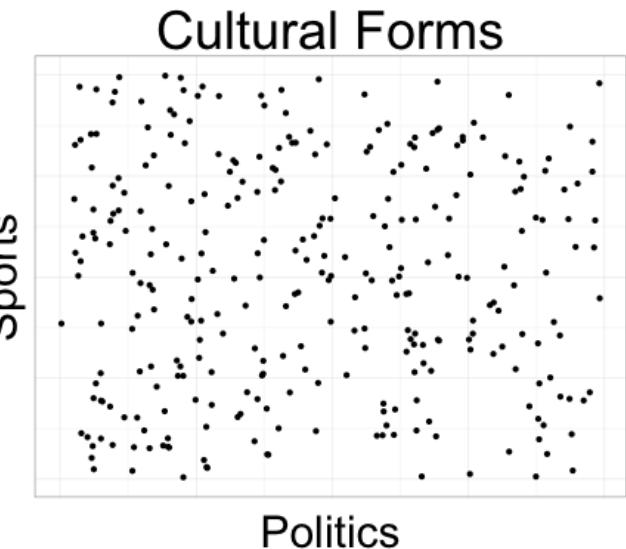
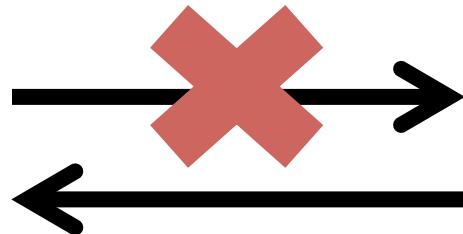
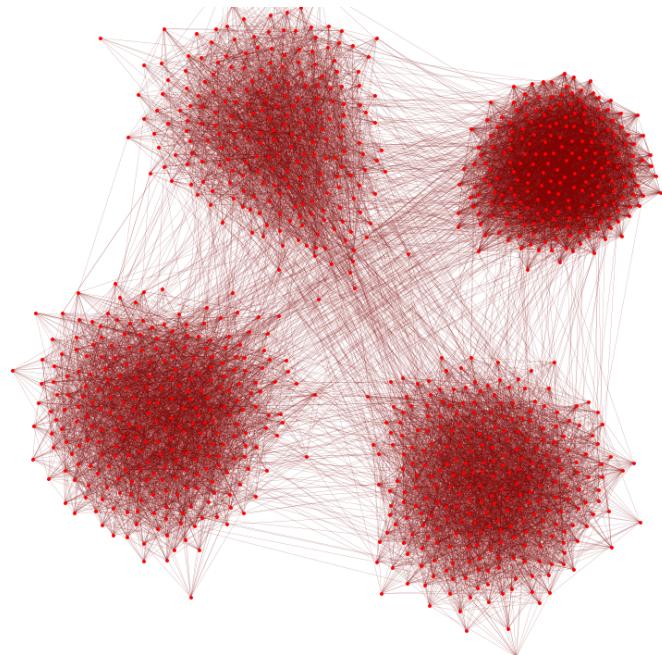
- Parts of the theory hold up very nicely
  - Other parts don't
  - Results point to a “dynamically stable” view of networks and culture
- (Patterson, 2014)

# The “network centric” view



Culture spreads through networks  
(White, 1979)

# The “culture centric” view



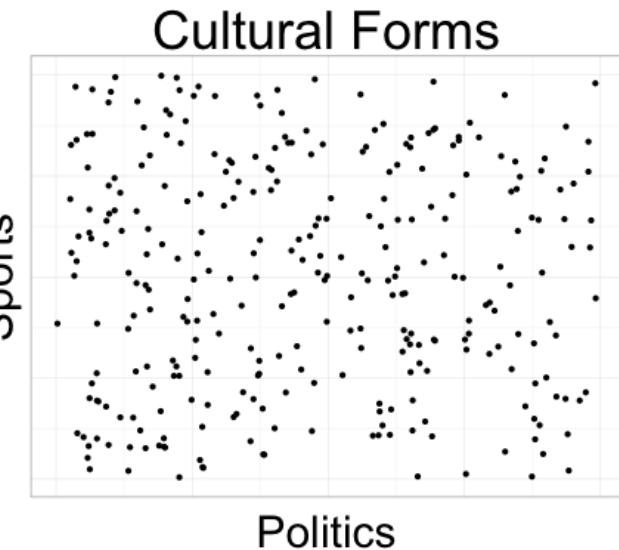
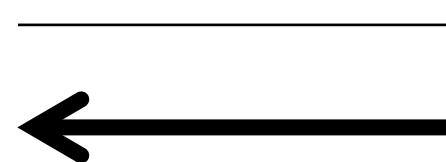
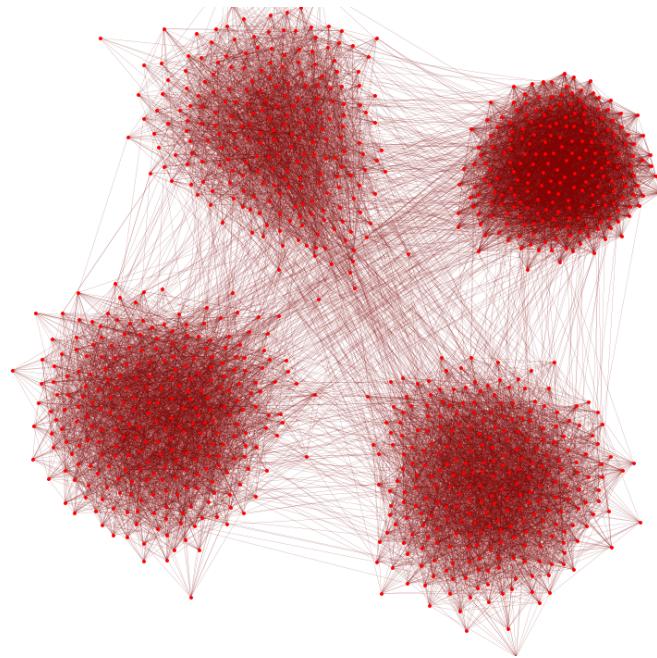
Networks form because of shared culture (Vaisey, 2010)

# The Constructuralist model



Networks and culture co-evolve  
(Carley, 1991)

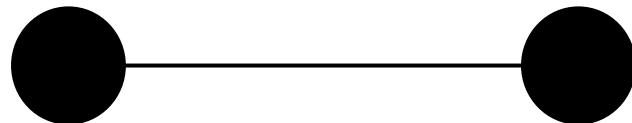
# Lizardo's Cultural Conversion Model (CCM)



We **use** culture in **particular ways** with **particular social ties** to obtain **particular social positions**

(Lizardo, 2006, 2011)

# Strong/weak culture for strong/weak ties



Weak culture for  
weak ties



Strong culture for  
strong ties



# Hypotheses from Lizardo's CCM

**H1:** More total cultural preferences,  
more total ties (2006)

**H2:** More weak cultural preferences,  
more weak ties (2006)

**H3:** More strong cultural preferences,  
more strong ties (2006)

**H4:** More strong (weak) cultural  
preferences, more (less) closed one's  
network is (2011)

# I mimic Lizardo's data using social media

## GSS data

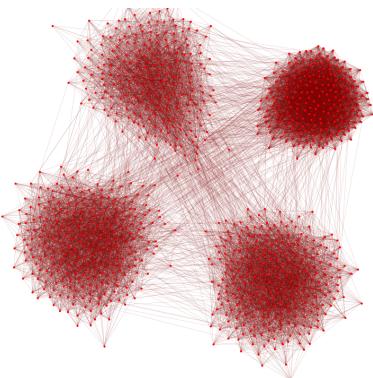
2006

Where have you been?  
(e.g. movies, opera)



2011

What websites have you  
visited?  
(e.g. sport, science)



2006

Strong/weak tie  
generator

2011  
Connections between  
Strong ties

## SM data



foursquare



twitter

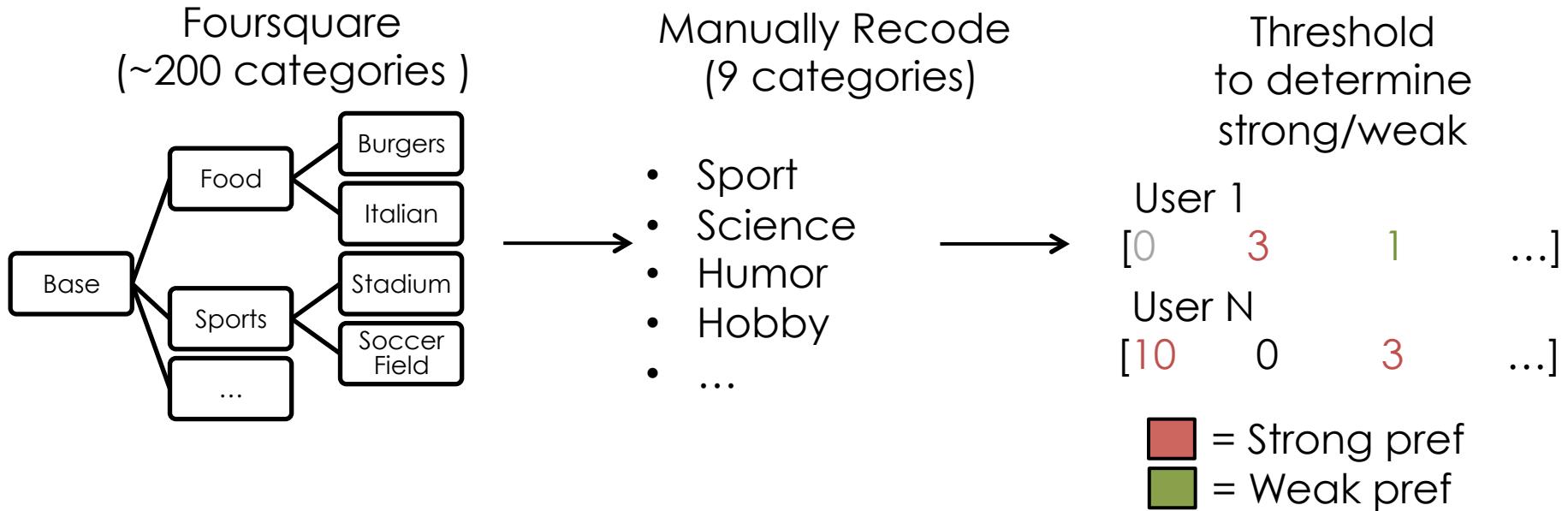
@jmon\_food

@MikeBerkun @louisstromberg

Following

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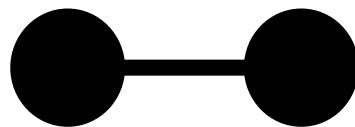
# Specifics on the foursquare data



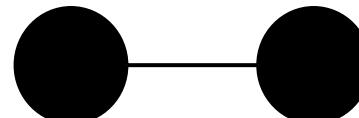
- ~12M check-ins from 120K users from 2010-2012
- Manually labeled foursquare categories to Lizardo's website categories ( $\kappa = .64$ )
- Strong/weak preferences decided via simple threshold

# Specifics on Twitter network data

Form links based  
on mentions, follows



Threshold for  
strong, weak

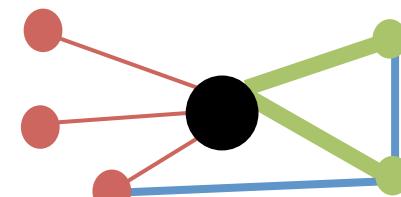


$\min(\text{ment}) = 1$



$\min(\text{ment}) > 1$

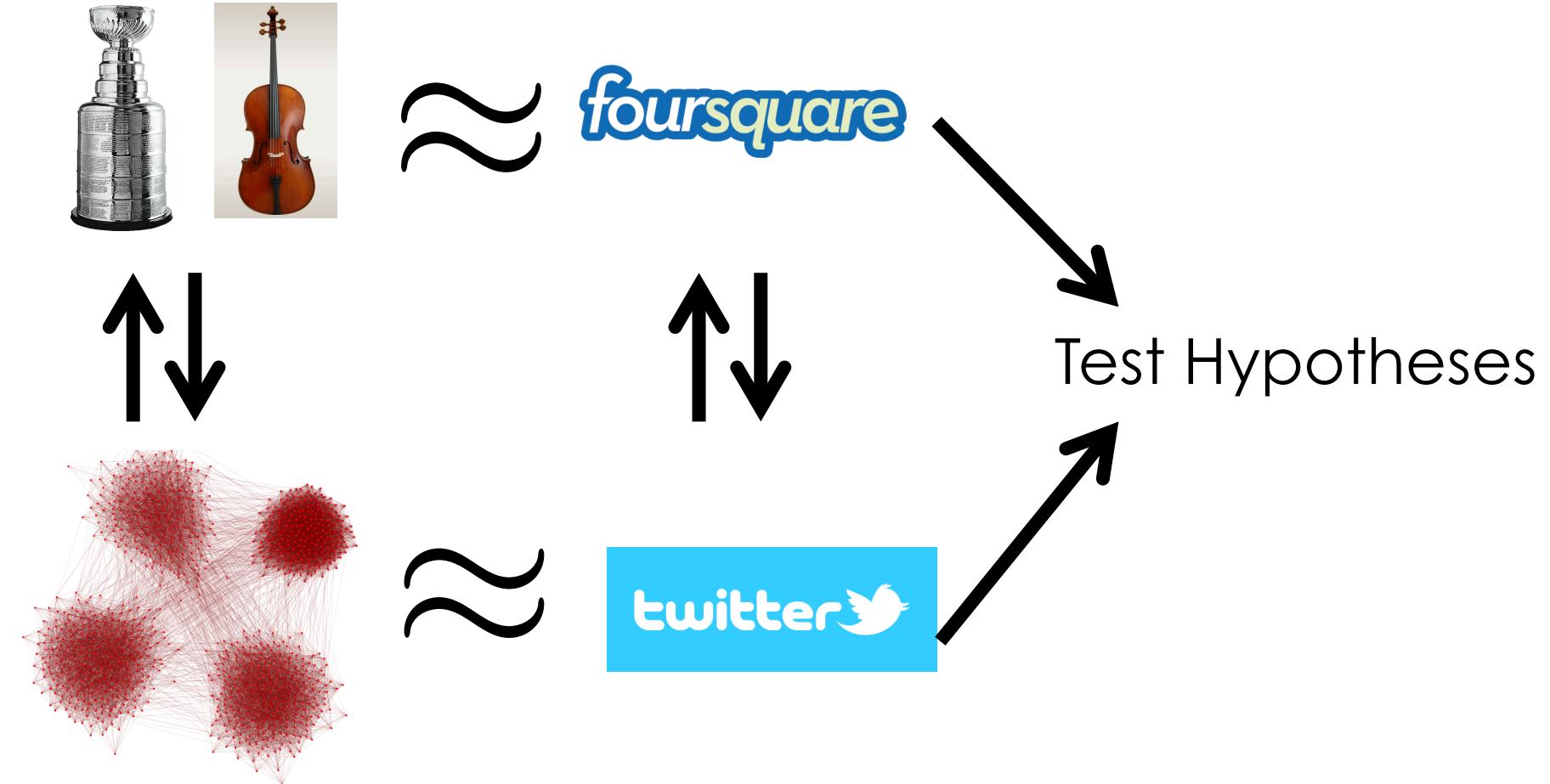
Compute ties,  
closure



**User 1:**  
2 strong ties  
3 weak ties  
2 alter ties

- **N=1817** (various controls)
- Collected full timeline of ego and everyone ego mentioned
- Constructed ego network from 2014 data
- Links are mutual mention, follow

# Recap



# Hypotheses and dependent variables

**H1/H2/H3:** More total/weak/strong cultural preference, more total/weak/strong ties

Dependent Variable:

# *total/weak/strong ties*

**H4:** More strong (weak) cultural preferences, more (less) closed one's network is

Dependent Variable:

# *ties between alters*

# Independent Variables

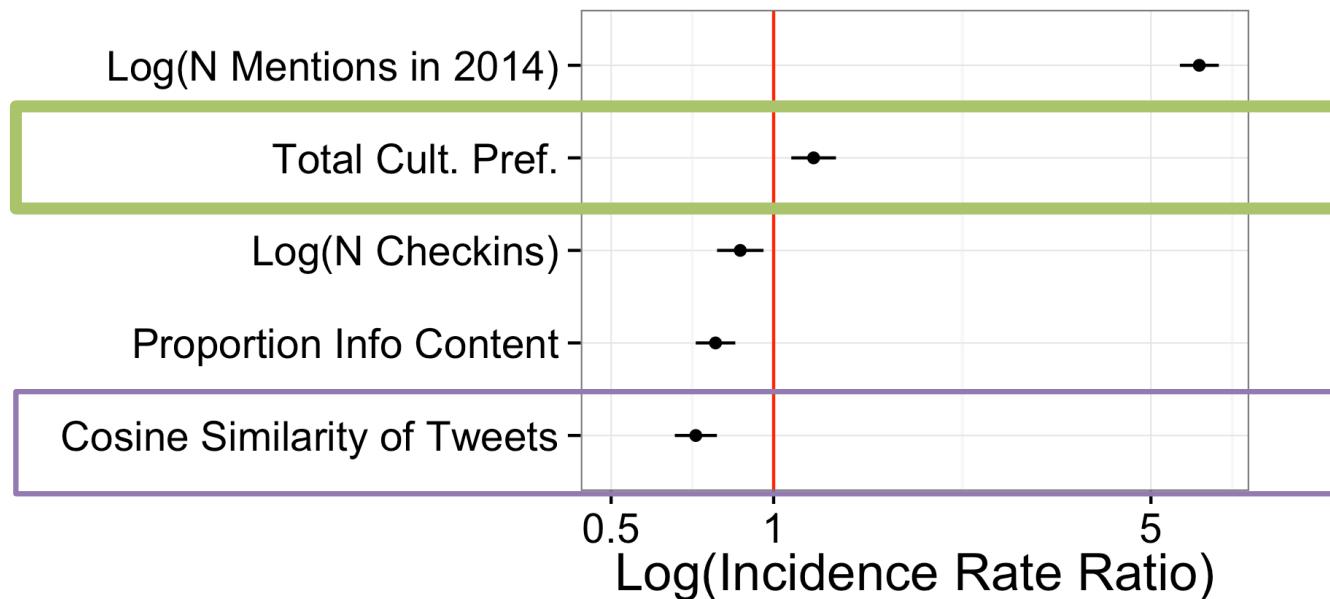
- Culture variables
  - # strong preferences (**H3,H4**)
  - # weak preferences (**H2,H4**)
  - # total preferences (**H1**)
- Control variables
  - Log(# checkins)
  - Log(# mentions) (2014)
  - Log(# tweets) (2014)
- Linguistic variables
  - Info content (Hutto et al., 2013)
  - Avg. number of hashtags (Hutto et al., 2013)
  - Avg. pairwise cosine sim. (unigrams) (Wang and Kraut, 2012)
- Offset term for **H4**
  - Log(# possible connections)

# Regression Model

- Used Negative Binomial Regression
  - GLM for overdispersed count data
  - Canonical (logit) link
- Model selection by hand
  - Models shown are parsimonious ( $\alpha = .01$ )
  - Fit visually assessed at each selection
- Variables centered, scaled by 2 s.d.
- Results show *Incidence Risk Ratio (IRR)*
  - **IRR=1:** no effect
  - **IRR=.5:** 2 s.d. increase in IV is 50% decrease in DV

# Results for H1 (total ties)

The more total cultural preferences one has, the more total social ties one has

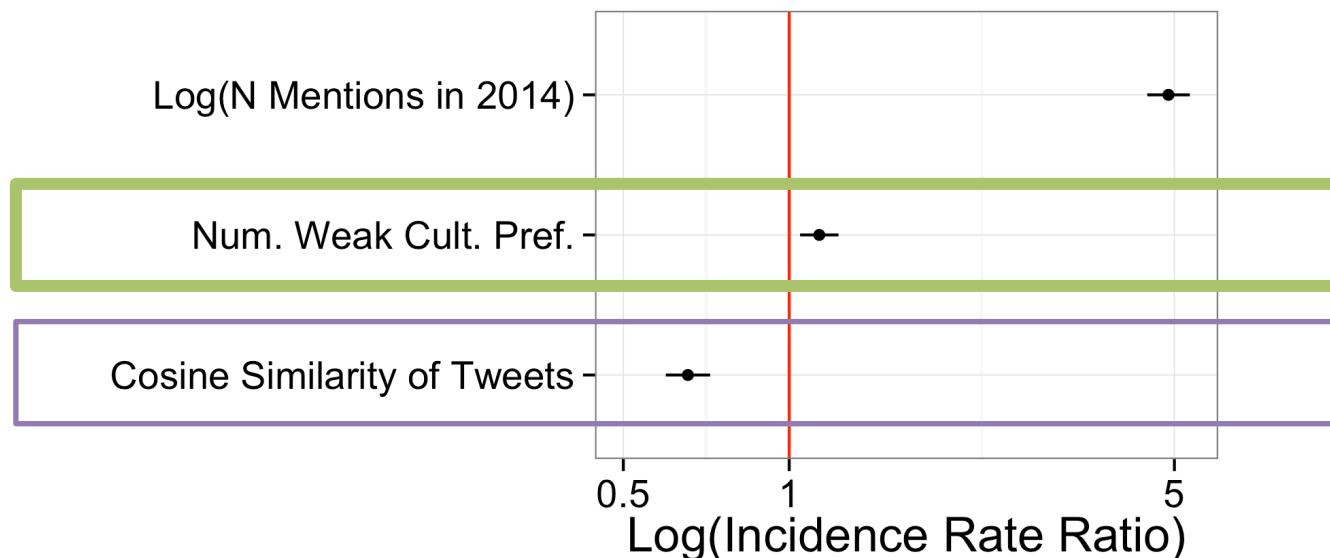


Data shows support for H1

18.6% increase

## Results for H2 (weak ties)

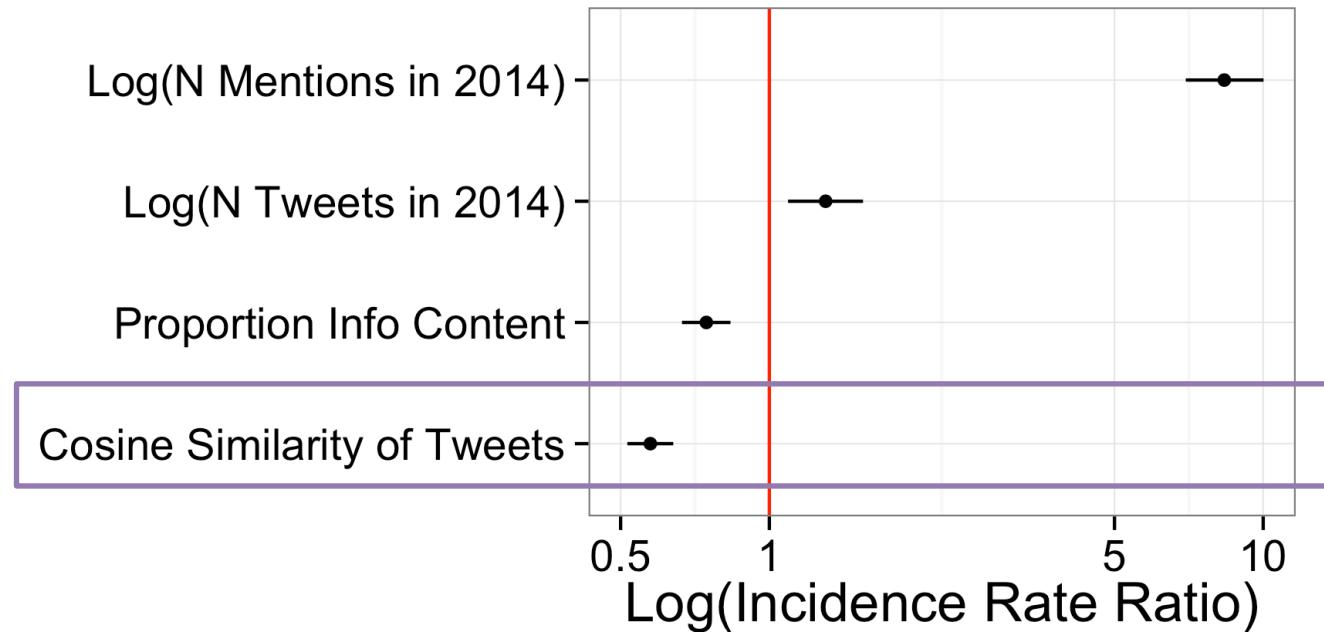
The more weak cultural preferences one has, the more weak social ties one has



Data shows support for H2  
14% increase

# Results for H3 (strong ties)

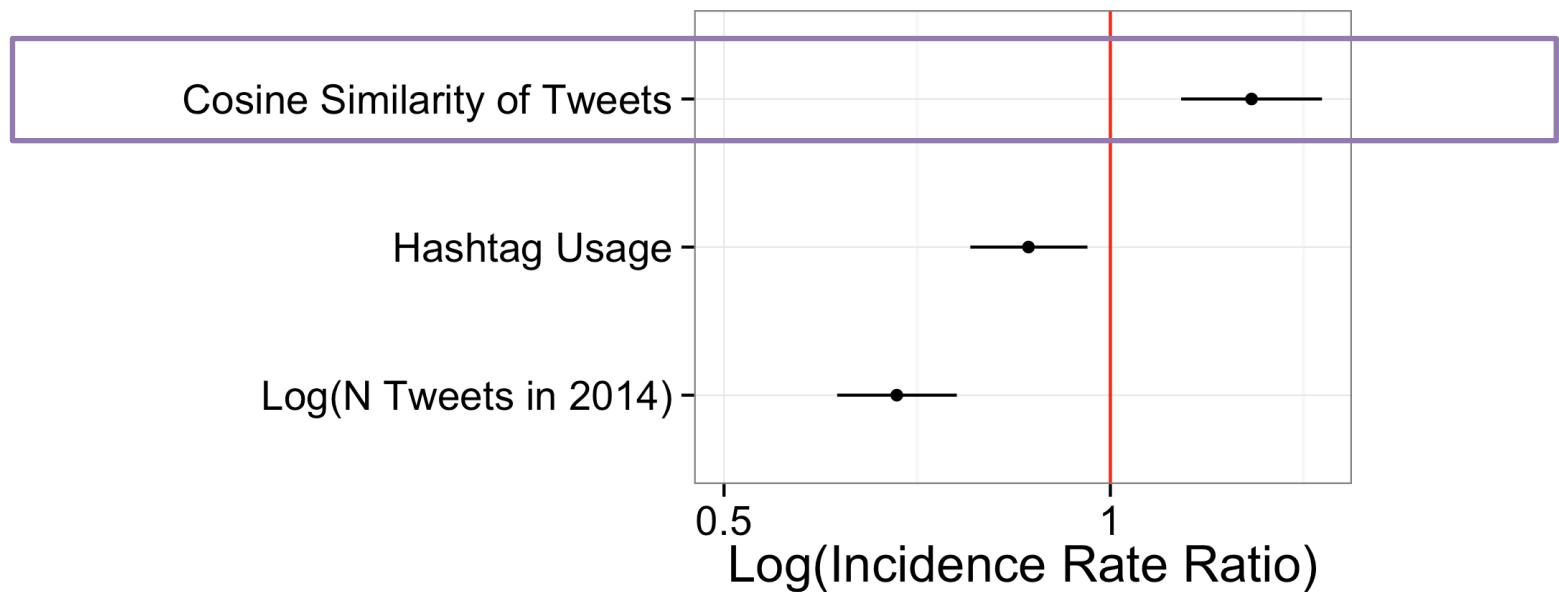
The more strong cultural preferences one has, the more strong social ties one has



Data shows **no** support for **H3**

# Results for H4 (closure)

The more strong/weak cultural preferences one has, the more/less closed one's ego network is

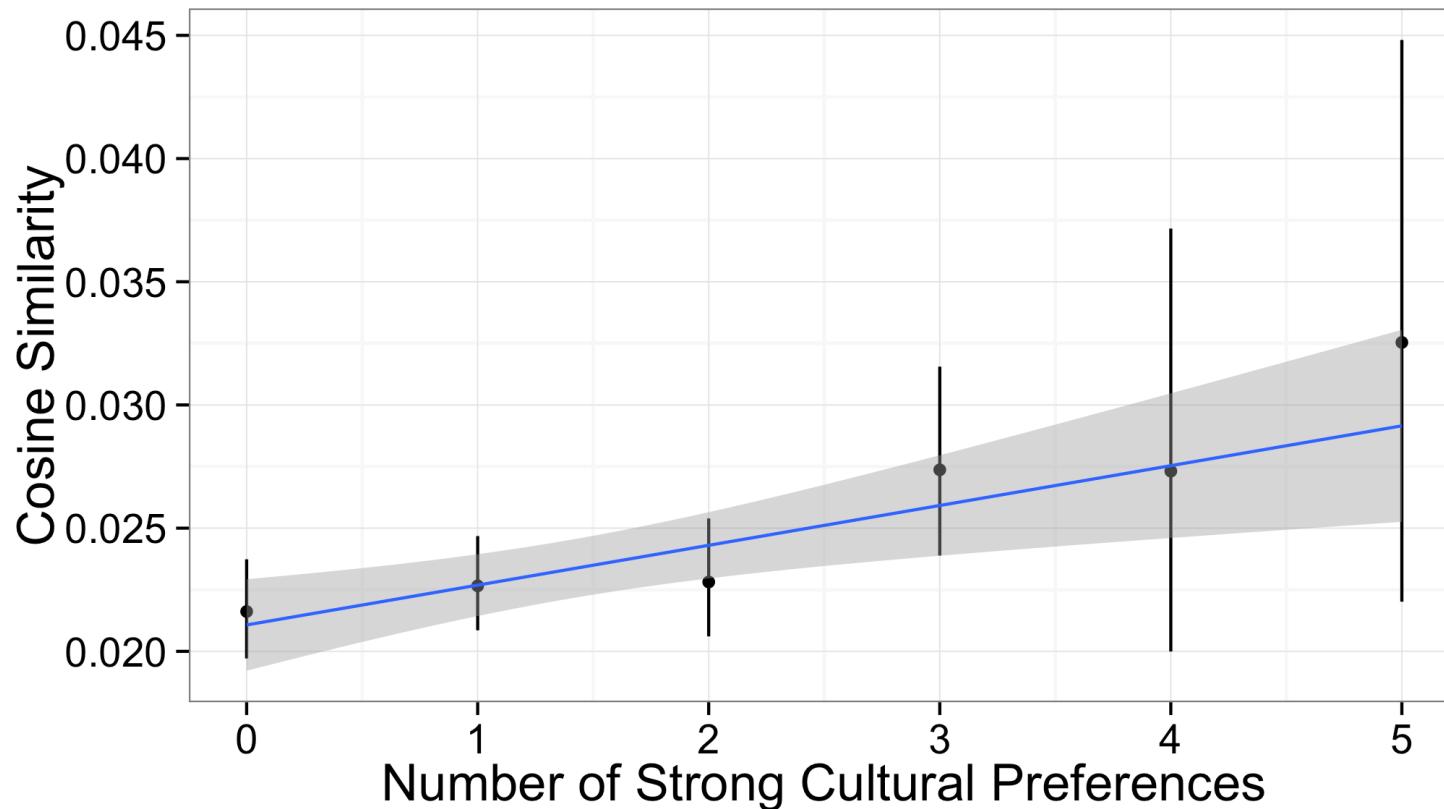


No support for H4

# Overview of results

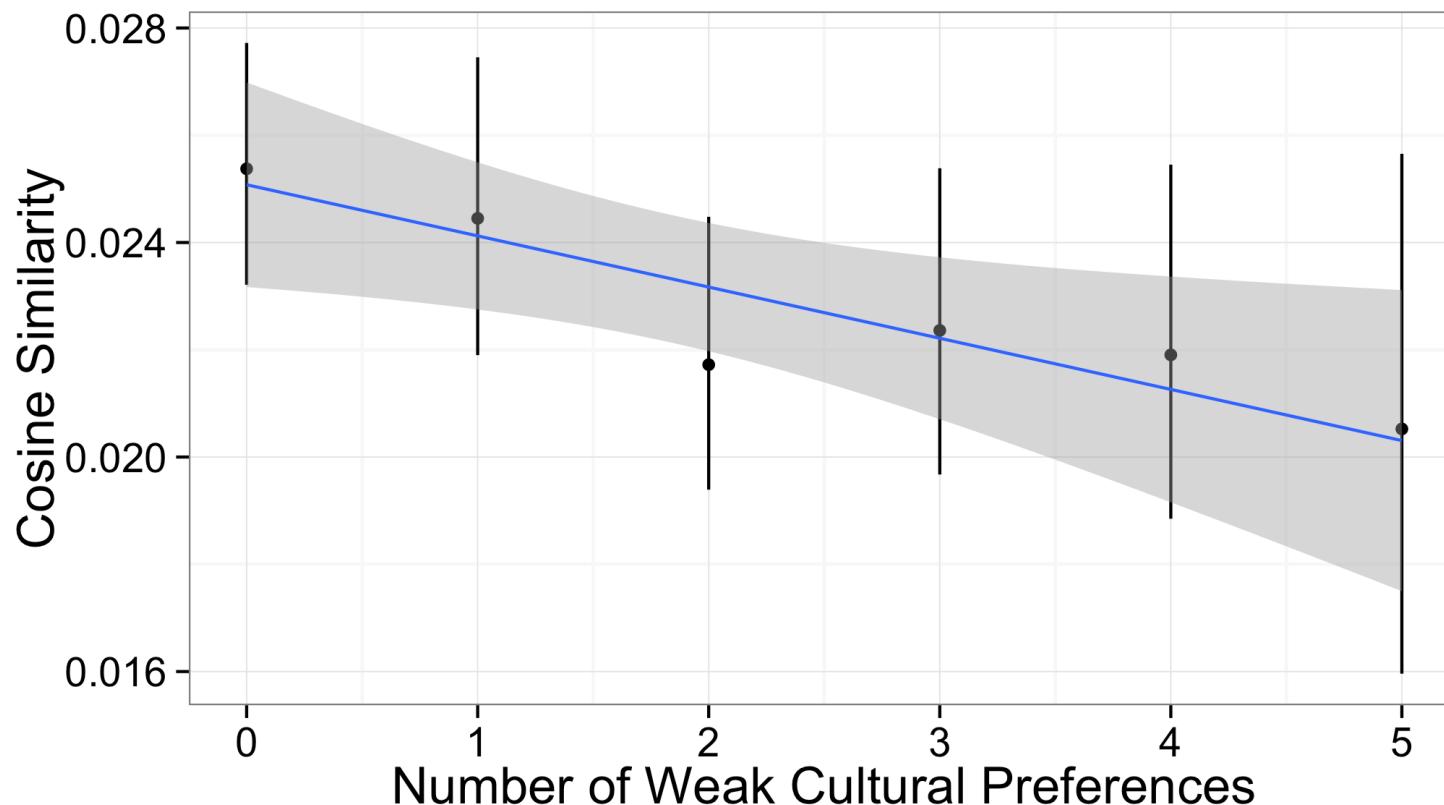
- Support for weak tie hypotheses, none for strong tie/closure hypotheses
  - **Methodological/data issues/differences (paper)**
  - Twitter is a weak tie platform (e.g. Gilbert, 2012)
- Cosine similarity correlated with smaller, more closed networks
  - **Consistent with networks and language coevolving**
  - Strong culture -> more cosine similarity?
  - Weak culture -> less cosine similarity?

# Is language associated with culture vars?



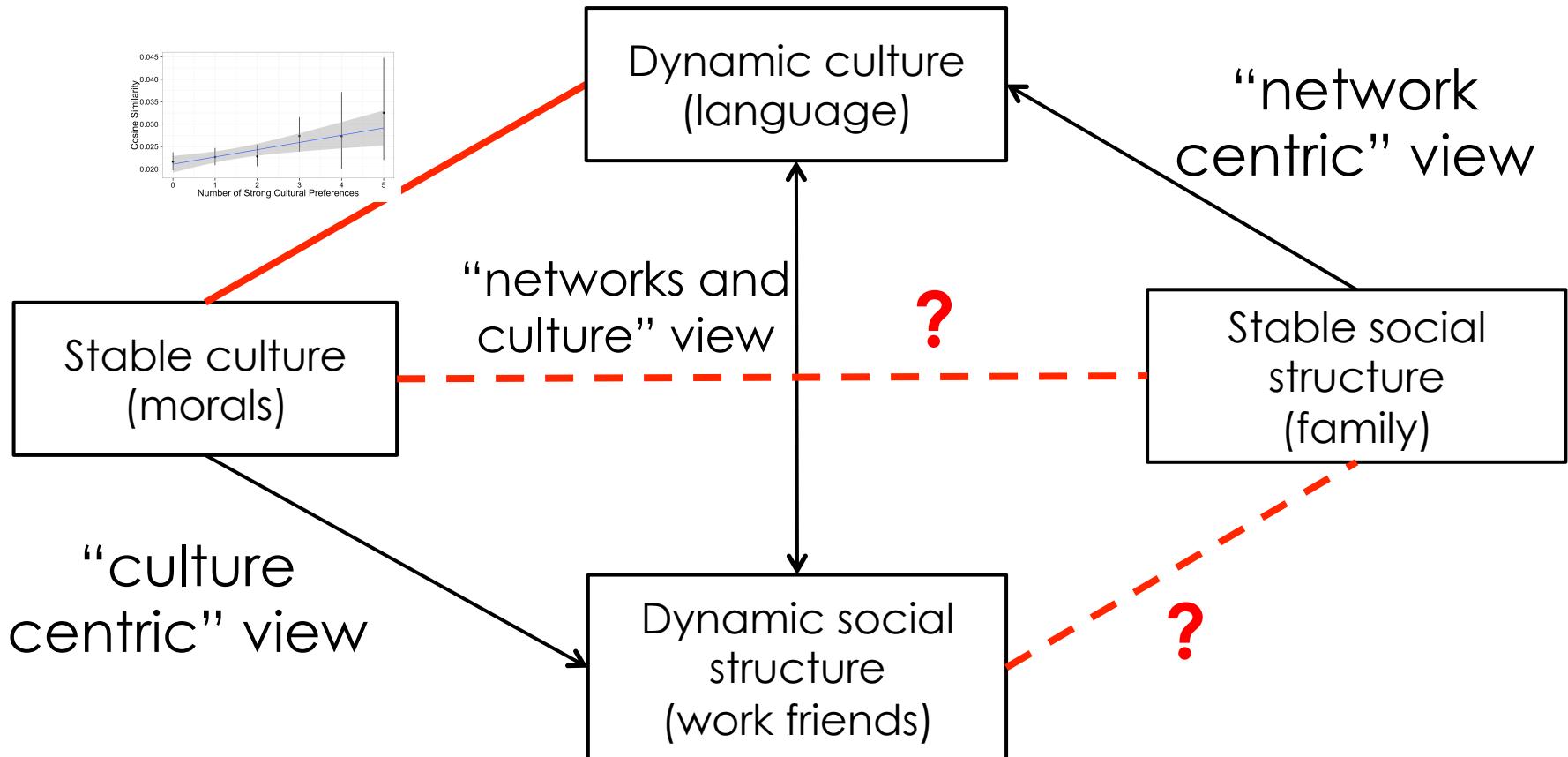
Language coherence **positively** correlated with **strong** cultural preferences

# Is language associated with culture vars?



Language coherence **negatively** correlated with **weak** cultural preferences

# An interesting takeaway...



Culture, networks are “dynamically stable”  
(Patterson 2014, pg. 22)

# Conclusion

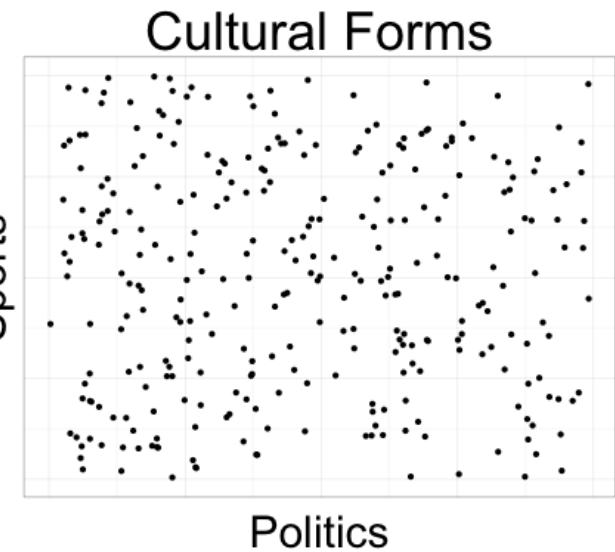
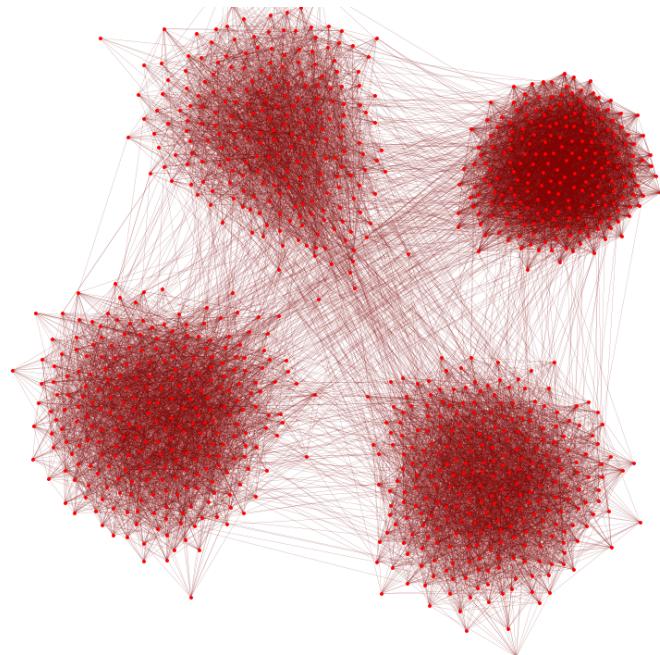
- Tested theory of networks and culture using social media data
  - Yay for sociological computation!
- Theory didn't really hold up
  - Twitter is a weak tie platform (e.g. Gilbert, 2012)
  - **Methodological/data issues/differences (paper)**
- Future work in **formalizing** “dynamically stable” networks and culture

# Thanks!!

- Poster paper @ ICWSM '15
- Replication data+code, full version of paper at  
[https://github.com/kennyjoseph/icwsm\\_lizardo](https://github.com/kennyjoseph/icwsm_lizardo)
- Me:

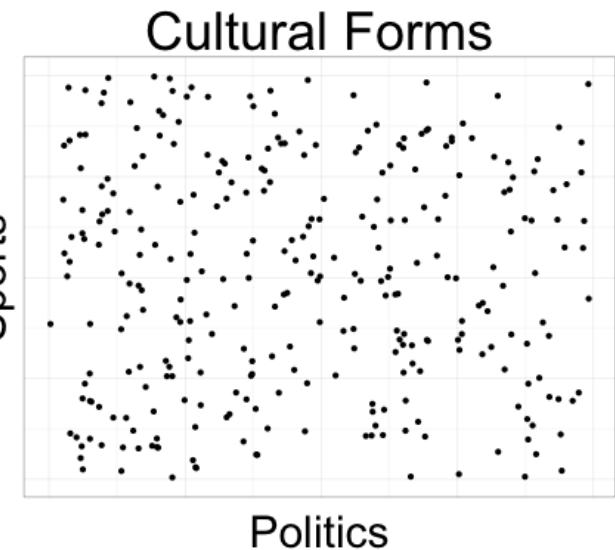
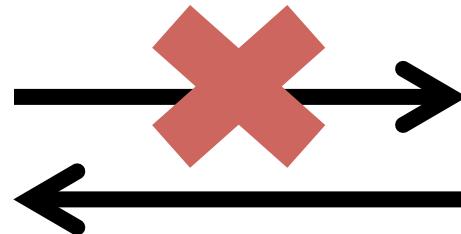
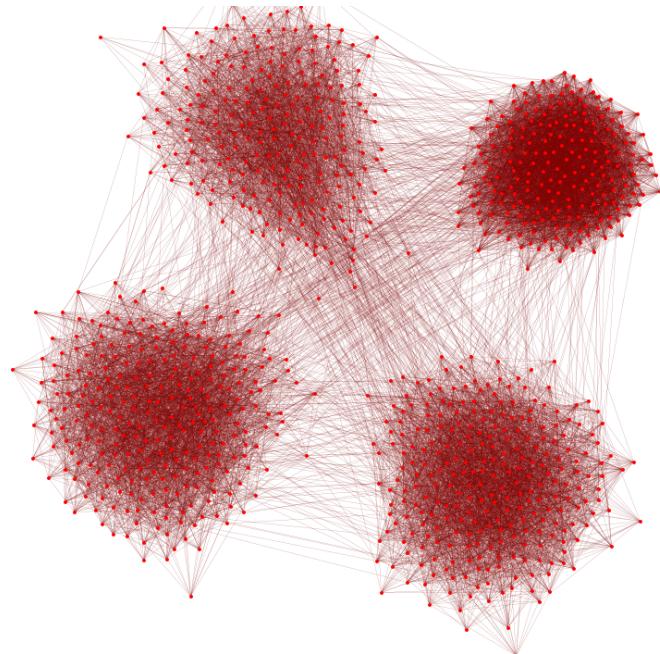
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Networks form because of shared culture (Vaisey, 2010)