

UNL STEM Faculty Networks & Climate

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Acknowledgments

- UNL Office of Research
- BOSR
- Megumi Watanabe
 - graduate research assistant
- Mary-Anne Holmes
 - director of ADVANCE-Nebraska



Two Surveys: Topics & Response Rates

1) Network Survey

(administered by BOSR March 2008)

Topics

- Network Integration
 - research exchange
 - friendship
 - committee co-membership

Response Rate

- Department (55%-95%)
 - 19 out of 26 departments that contain 341 faculty



Two Surveys: Topics & Response Rates

2) **COACHE Survey**

(administered by Harvard April 2008)

Topics

- Departmental Climate Perceptions
- Tenure & Promotion Process Clarity
- Organizational Commitment

Response Rate

- Faculty (54%)
 - 245 out of 452 faculty across 26 departments



Overview

Part 1: Department

- a) describe the characteristics of department network structure
- b) investigate how department network characteristics associate with measures of academic climate

Part 2: Individual

- a) describe characteristics of a faculty member's location within the departmental network
- b) investigate how actor location:
 - associates with climate perceptions
 - varies across race and gender



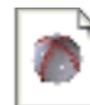
Social Networks (15 actor network at UNL)



Net 26 midsize res.x3d



Net 26 midsize soc.x3d



Net 26 midsize com.x3d



A social network is a finite set of actors and the relations among them.

Two Components

1. **Network Actors** (nodes or dots)

- 341 UNL Faculty in 19 STEM departments

2. **Relational ties** (lines)

- any form of social interaction that connects two actors in the network
 - research collaboration/consultation, friendship interactions, committee service



Network Integration Questions (Relational Ties)

- **Research Exchange**

- provide or receive research help, advice, or equipment

- **Friendship**

- non-work related interactions: spent free time together or discussed personal matters

- **Committee Co-membership**

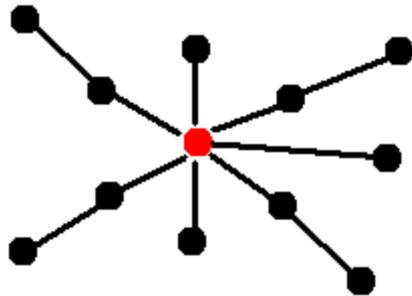
- serve on a service or graduate student committee together



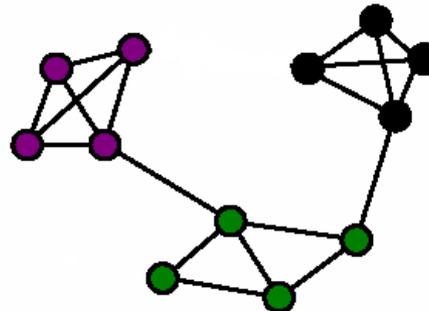
Department Level Research Question #1

How can we characterize the network structure of STEM departments at UNL?

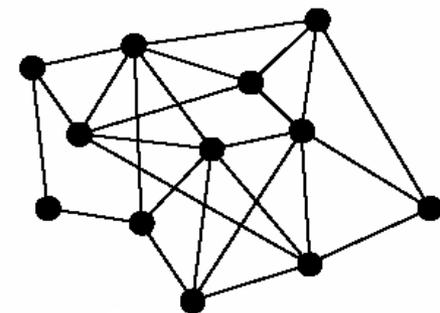
Social network analysis: a set of *relational* methods for systematically identifying connections among actors in a network



Centralized



Clustered

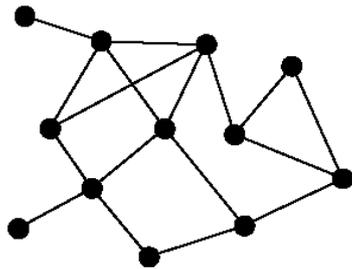


Dense



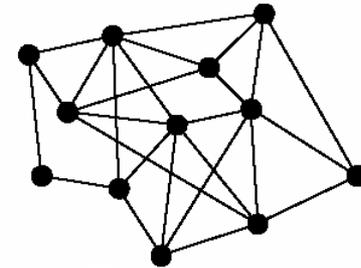
• Density

- the percentage of possible ties within an network that are actual ties (range: 0% to 100%)



25% Density

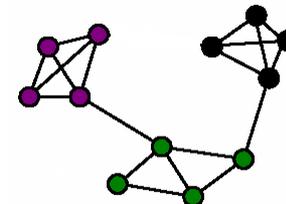
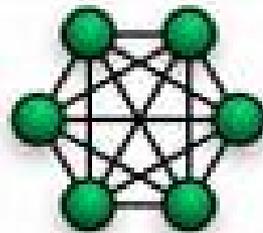
two 12 actor
networks



40% Density

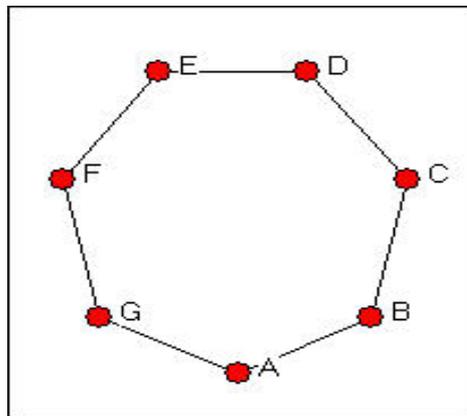
• Clustering

- the tendency towards dense local neighborhoods in a network (range: 0= no clusters to 1= high clustering)

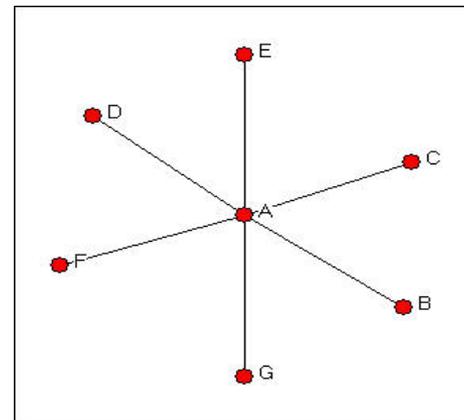


- **Centralization**

- the extent to which one actor in the network is more prominent than the other actors in the network
 - » range: 0 = not centralized to 1 = centralized



Centralization = 0



Centralization = 1

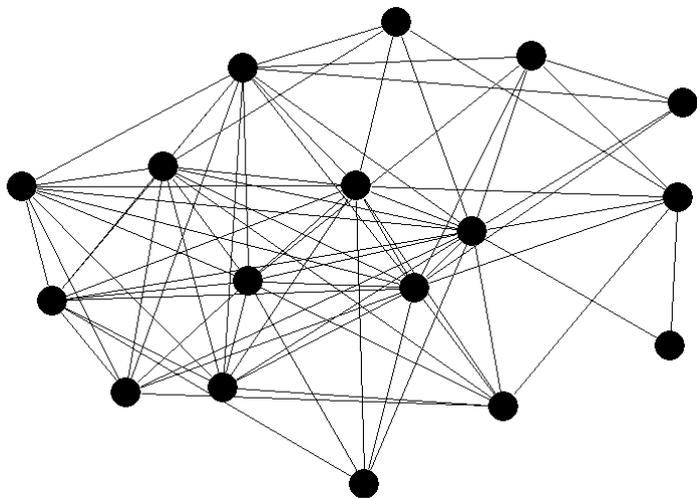
Department Level Network Structure Measures

Research Exchange	<i>Standard</i>		<u>Min</u>	<u>Max</u>
	<u>Mean</u>	<u>Deviation</u>		
Density	.40	.18	.15	.71
Clustering	.65	.10	.39	.83
Centralization	.46	.17	.19	.79

N= 19 STEM departments

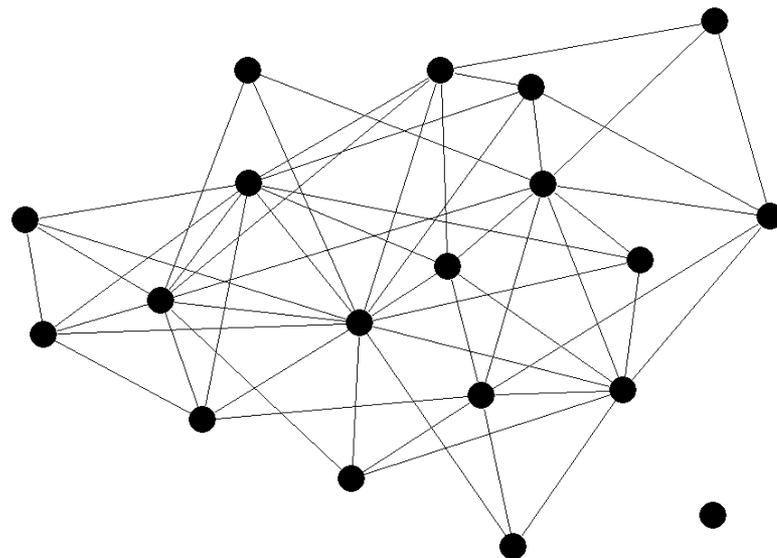
Committee Co-Membership

den. = 55%



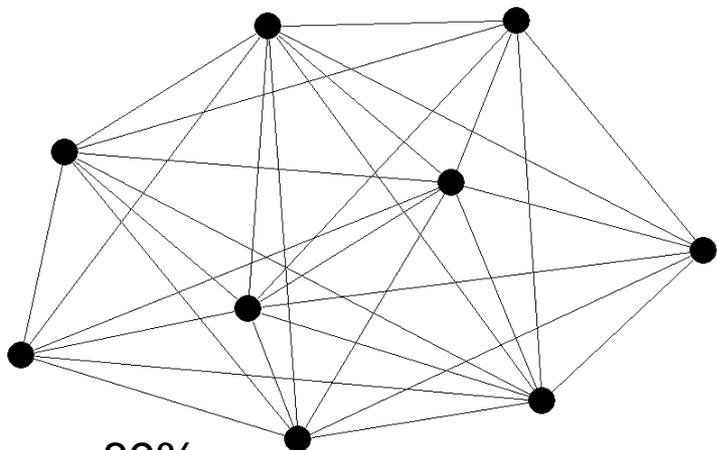
high density

den. = 32%

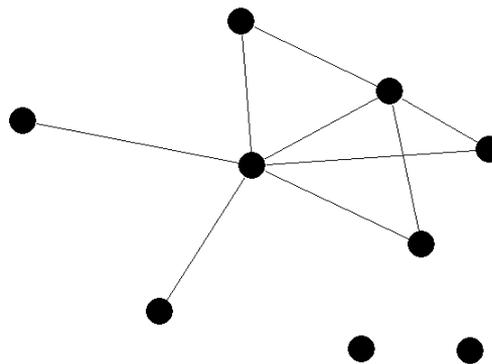


low density

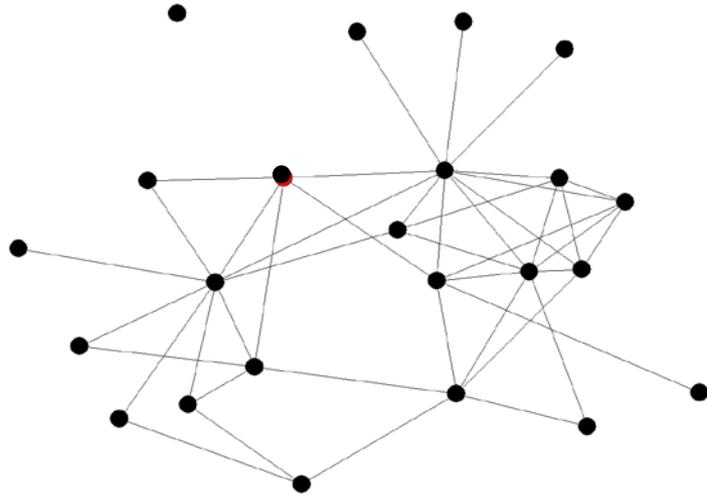
den. = 89%



den. = 25%



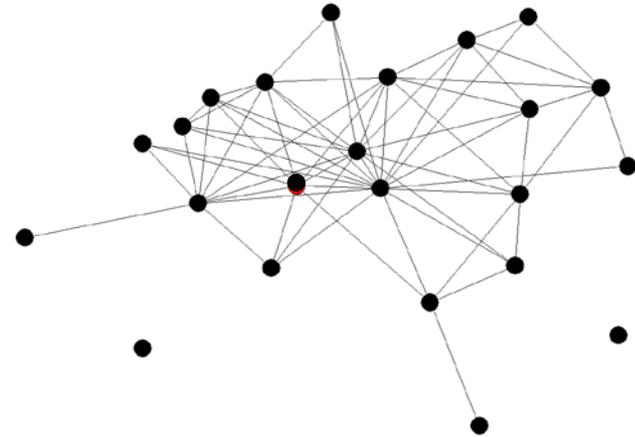
cent. = .36



moderate centralization

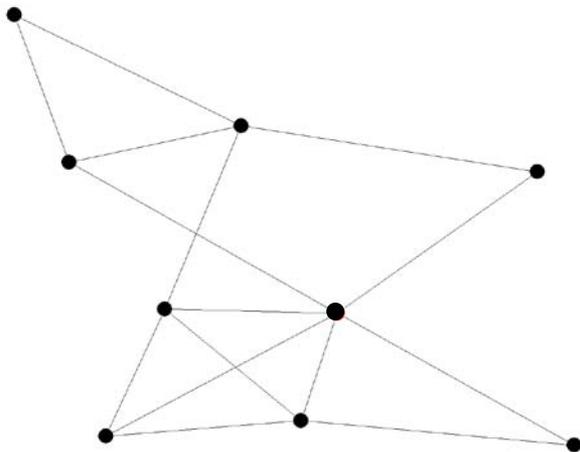
Friendship

cent. = .57

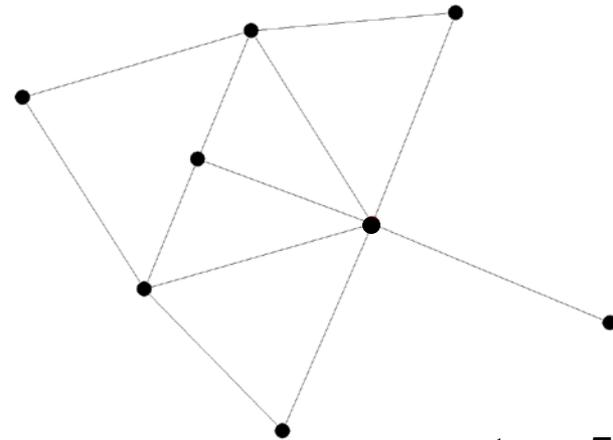


high centralization

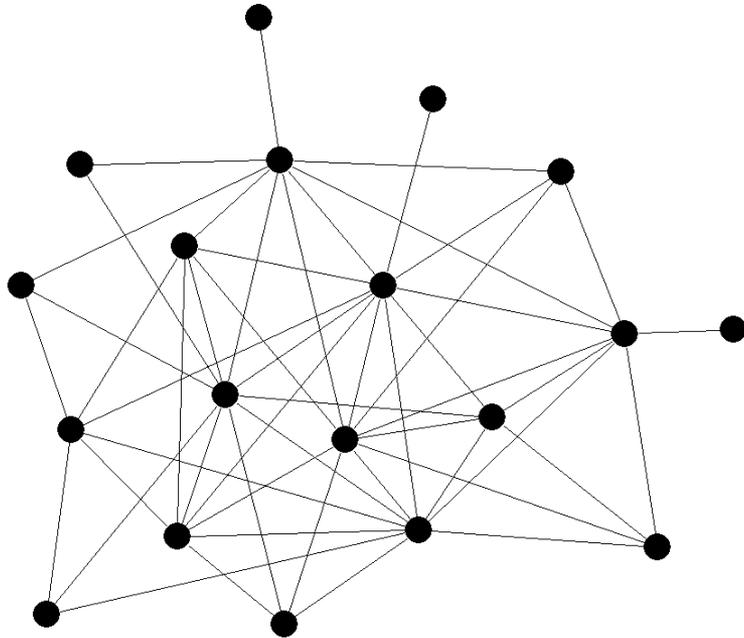
cent. = .29



cent. = .57

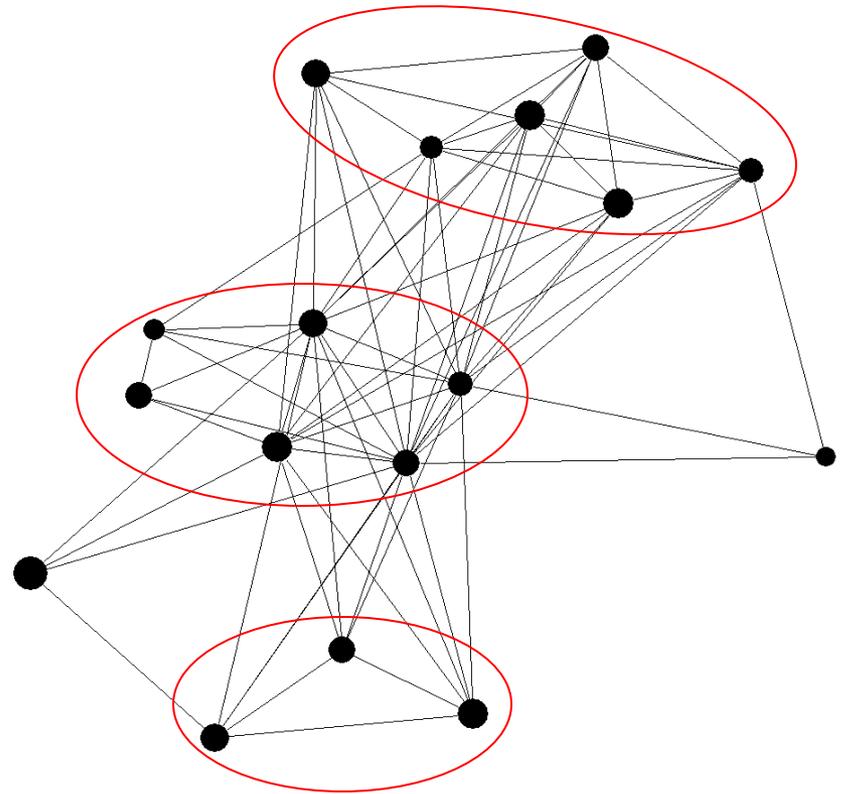


Research Exchange



moderate clustering

clust. = .49



very high clustering

clust. = .77



Summary

How can we characterize the network structure of STEM departments at UNL?

On average, UNL STEM Department Networks:

- are highly clustered
- have moderate levels of density and centralization



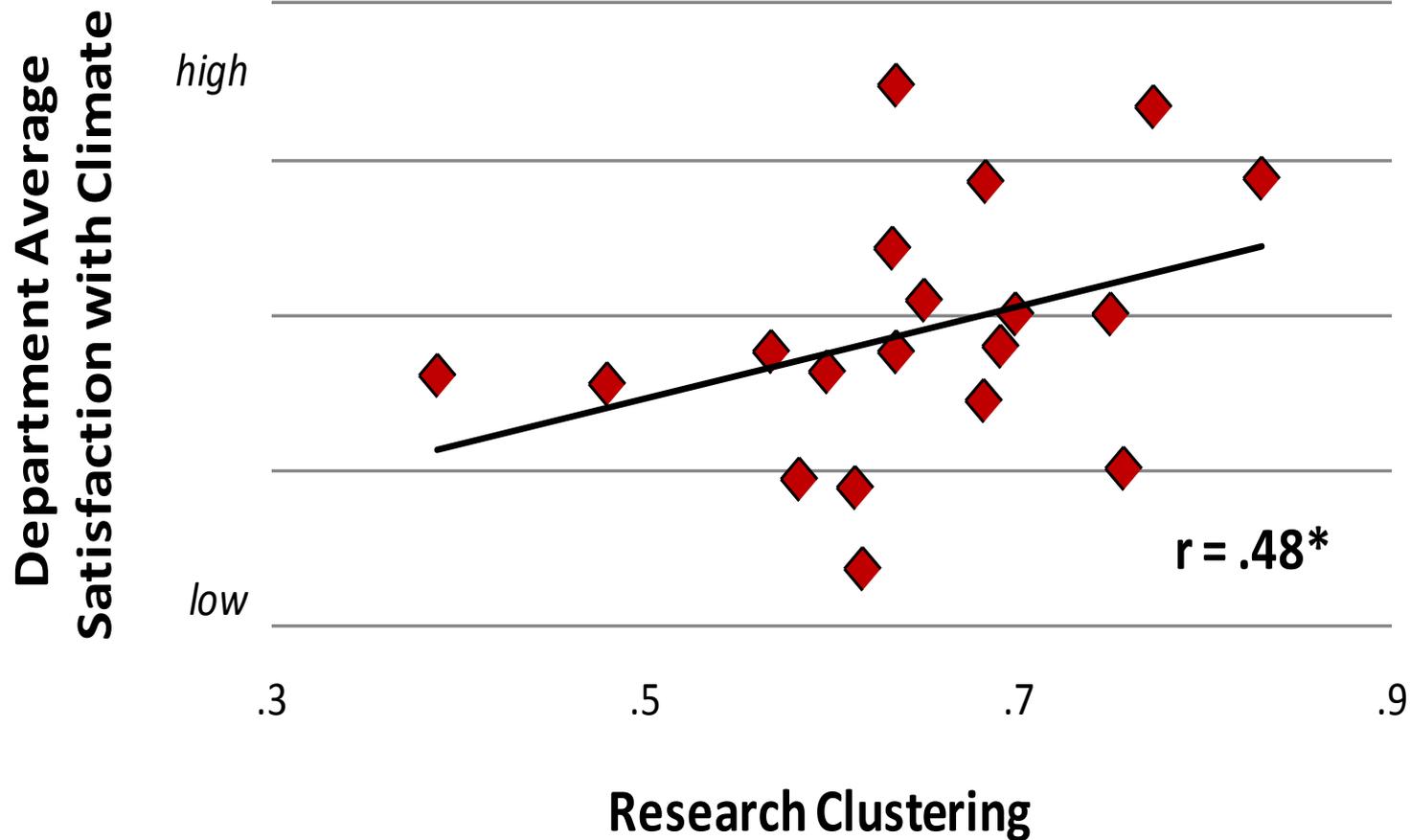
Department Level Research Question #2

How are department network structures associated with academic climate?

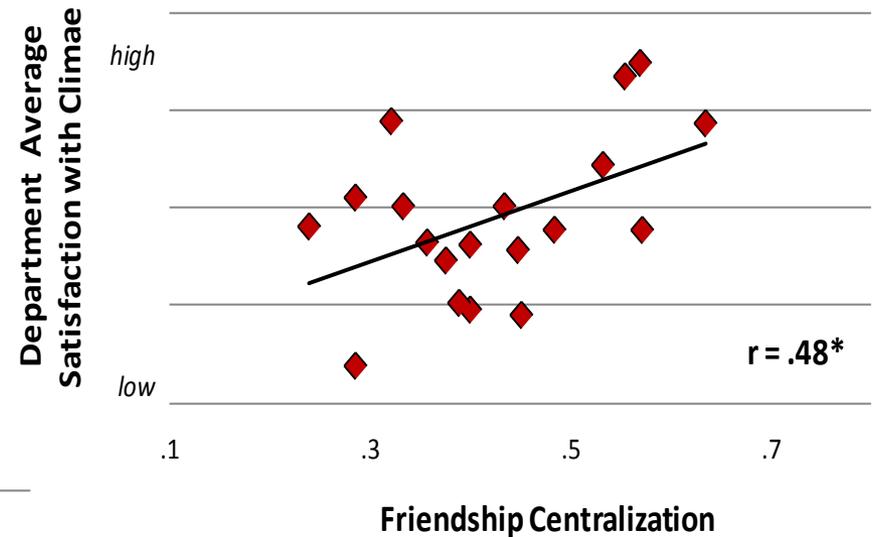
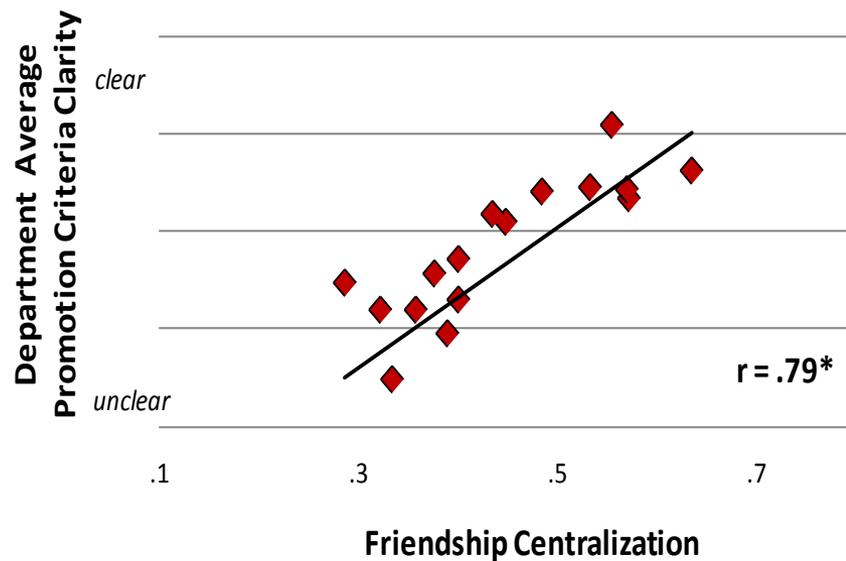
- Department Average for:
 - Climate Perceptions
 - collegiality, belonging, vitality, work value
 - Tenure & Promotion Process Clarity
 - criteria, standards, body of work
 - Organizational Commitment
 - intention to remain at UNL



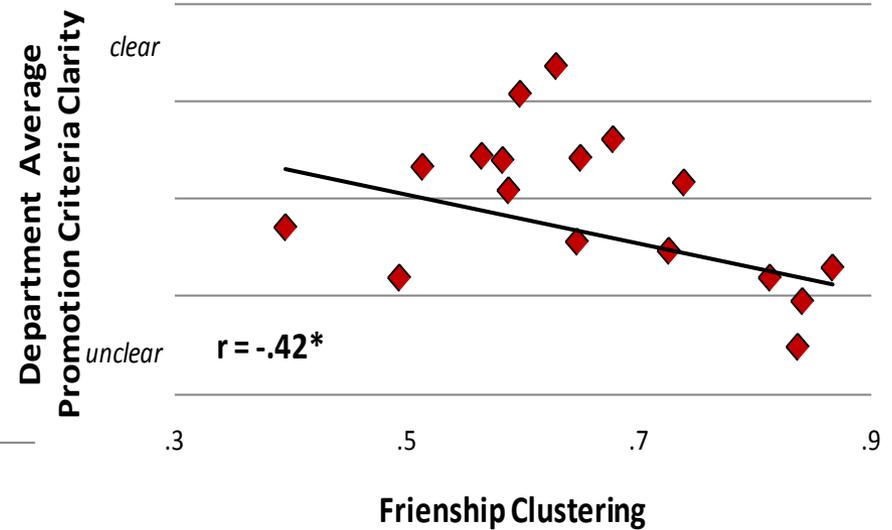
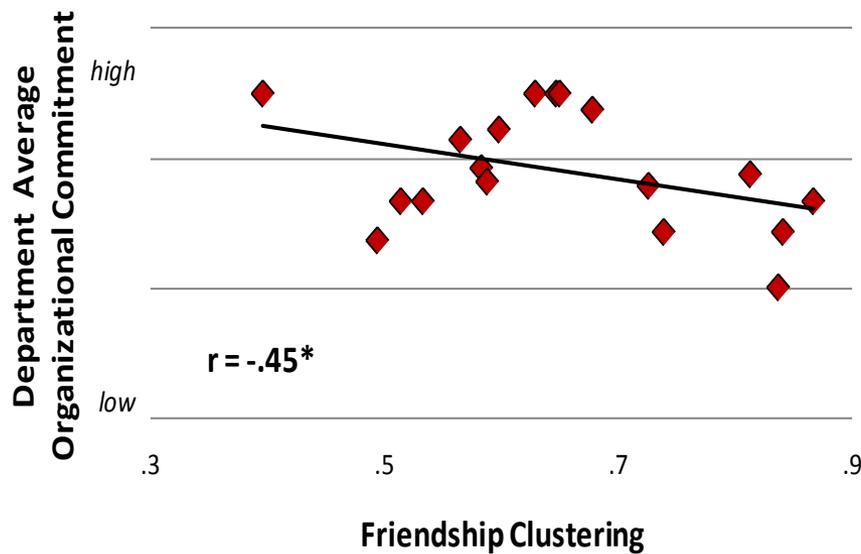
Clustering within Research Networks is good!



Centralization within Friendship Networks is good!



Clustering within Friendship Networks is bad!



Summary

How are departmental network structures associated with academic climate?

- a) Departmental climate perceptions are more positive in departments with:
 - higher clustering in research exchange networks
 - higher centralization in friendship networks

- b) Departments with higher clustering within friendship networks tend to have:
 - less clarity in the promotion process
 - less organizational commitment



Overview

Part 1: Department

- a) describe the characteristics of department network structure
- b) investigate how department network characteristics associate with measures of academic climate

Part 2: Individual

- a) describe characteristics of a faculty member's location within the departmental network
- b) investigate how actor location:
 - associates with climate perceptions
 - varies across race and gender



Individual Level Research Questions #1 & 2

In general, how connected are faculty within their departments?

How is a faculty member's location within their department networks associated with their perceptions of climate?

- Departmental Climate Perceptions
- Tenure & Promotion Process Clarity
- Organizational Commitment



Actor location within a network



Net 6 midsize res.x3d

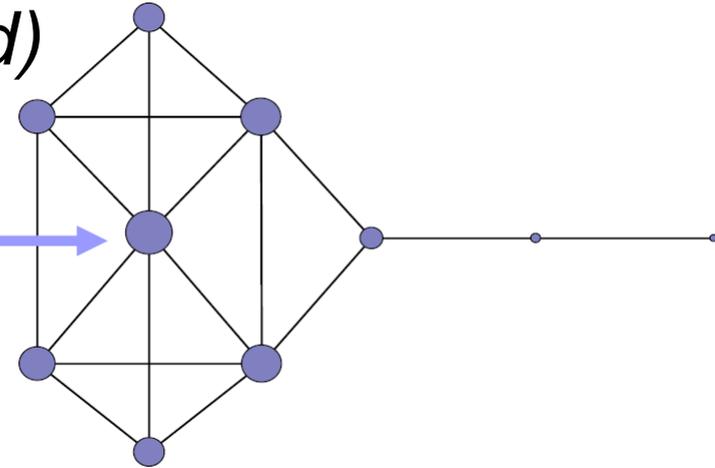


Actor Location Measures

- **Degree** (*isolated or integrated*)

- the number of direct ties

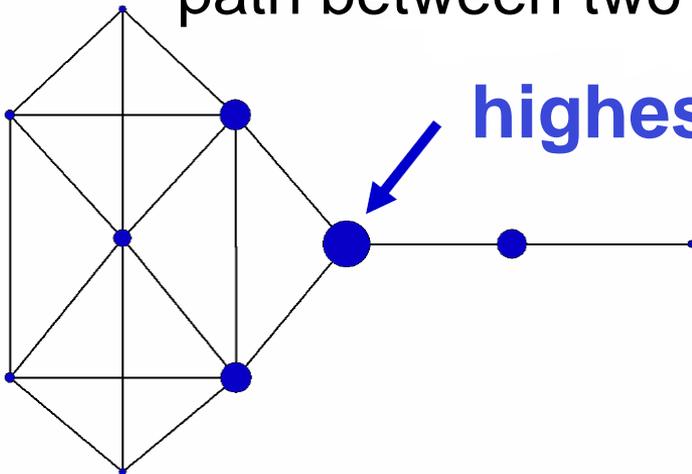
highest actor degree →



- **Betweenness** (*intermediary*)

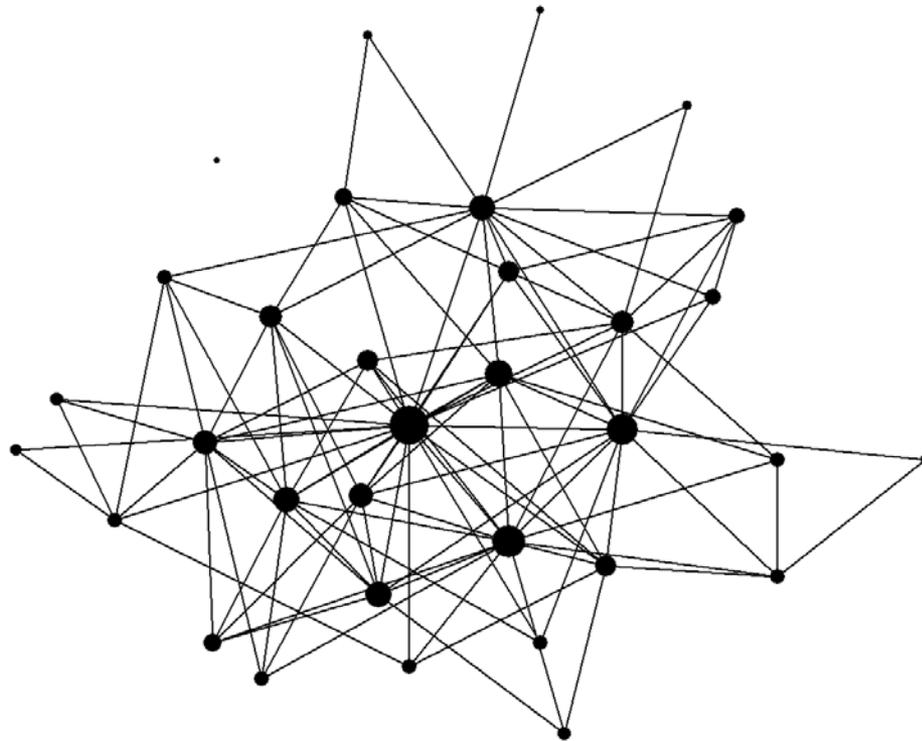
- number of times that an actor lies along the shortest path between two actors without a direct connection

highest betweenness actor



Actor Location Measures

- **Actor Power** (*central actor*)
 - the extent to which an actor is well connected to actors who are also well connected (weighted degree)



Actor Level Network Integration

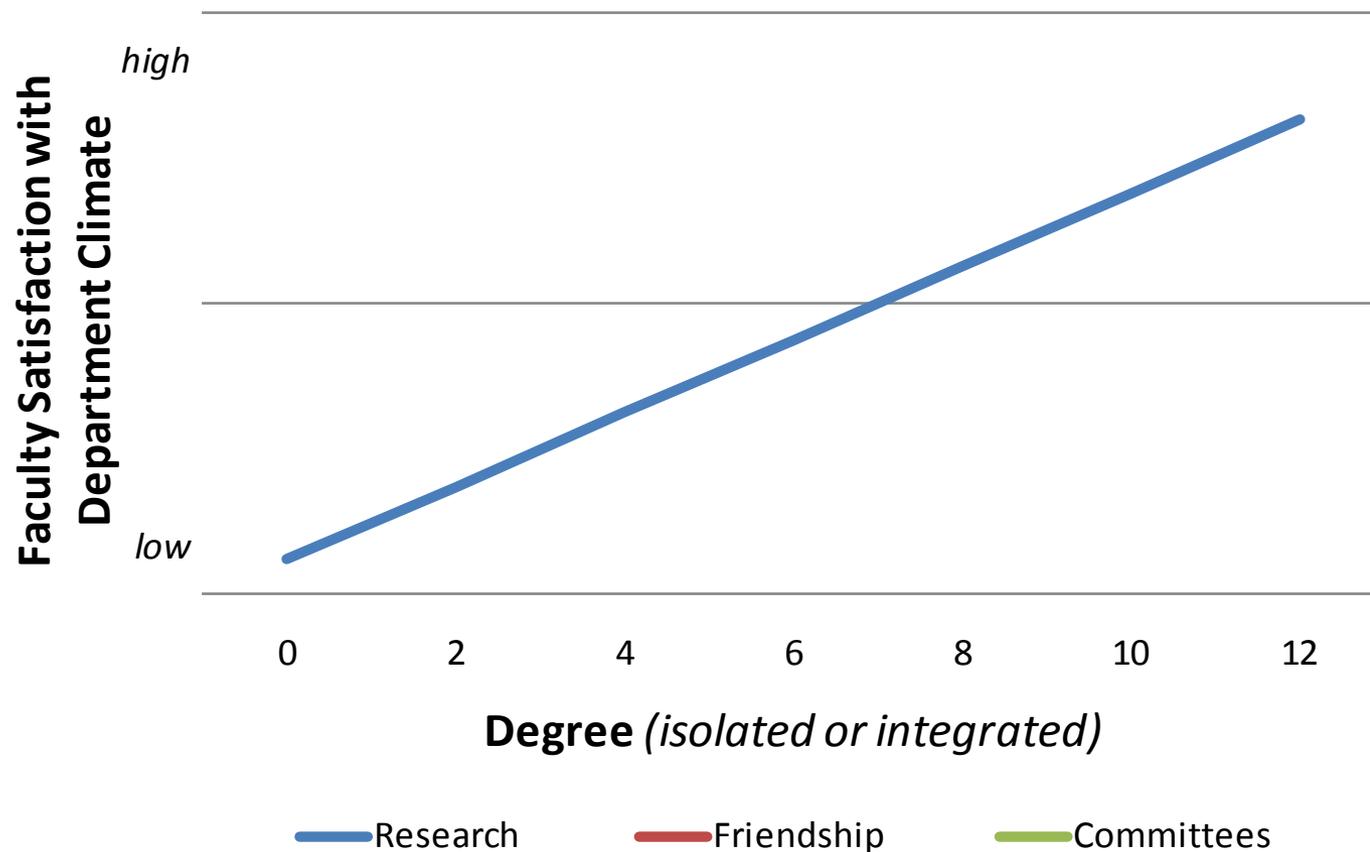
<i>Degree (isolated or integrated)</i>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Min</u>	<u>Max</u>
Research	5.9	3.2	0	11
Friendship	5.3	3.4	0	11
Committees	7.5	4.4	0	15

N = 305 faculty



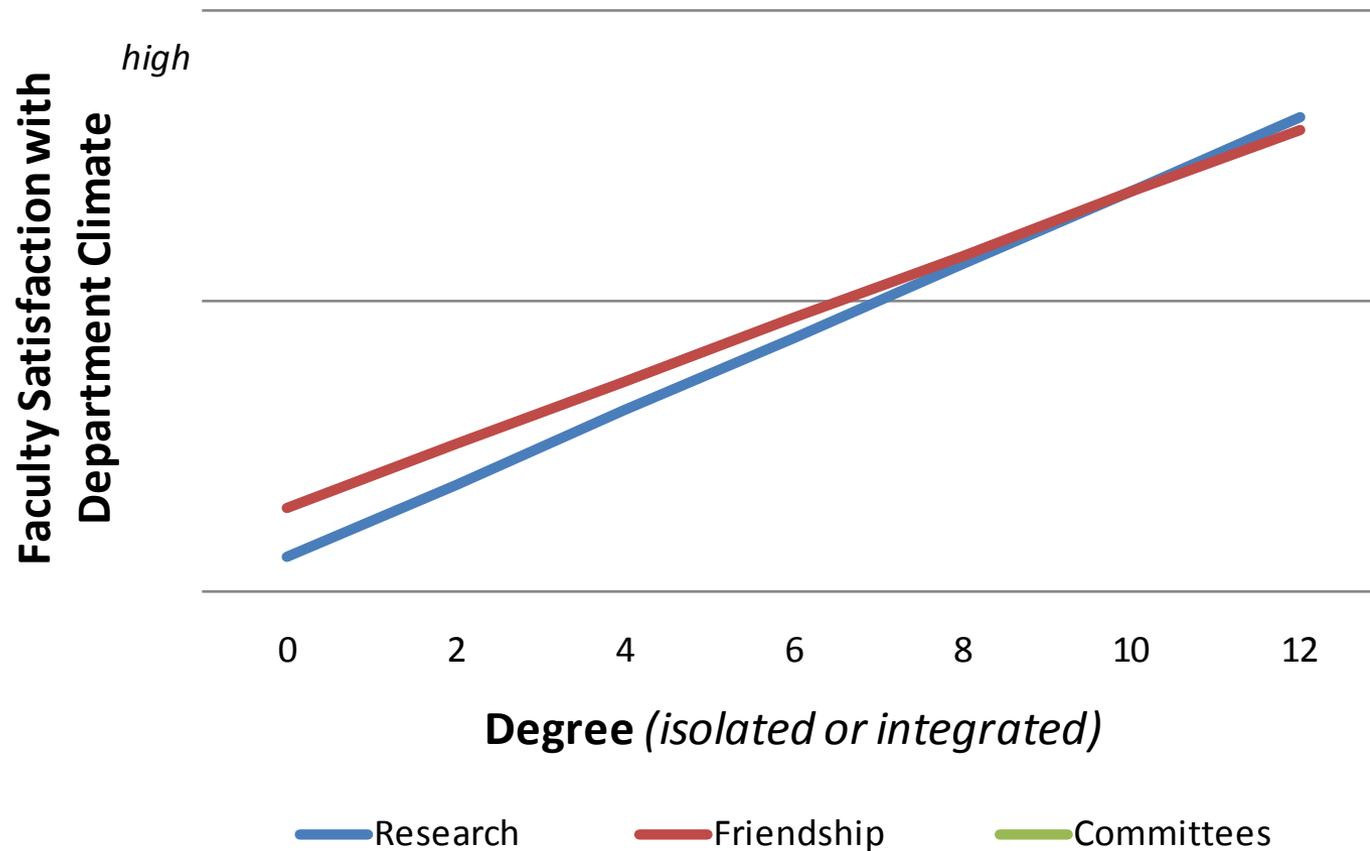
Isolation- bad!

Integration- good!



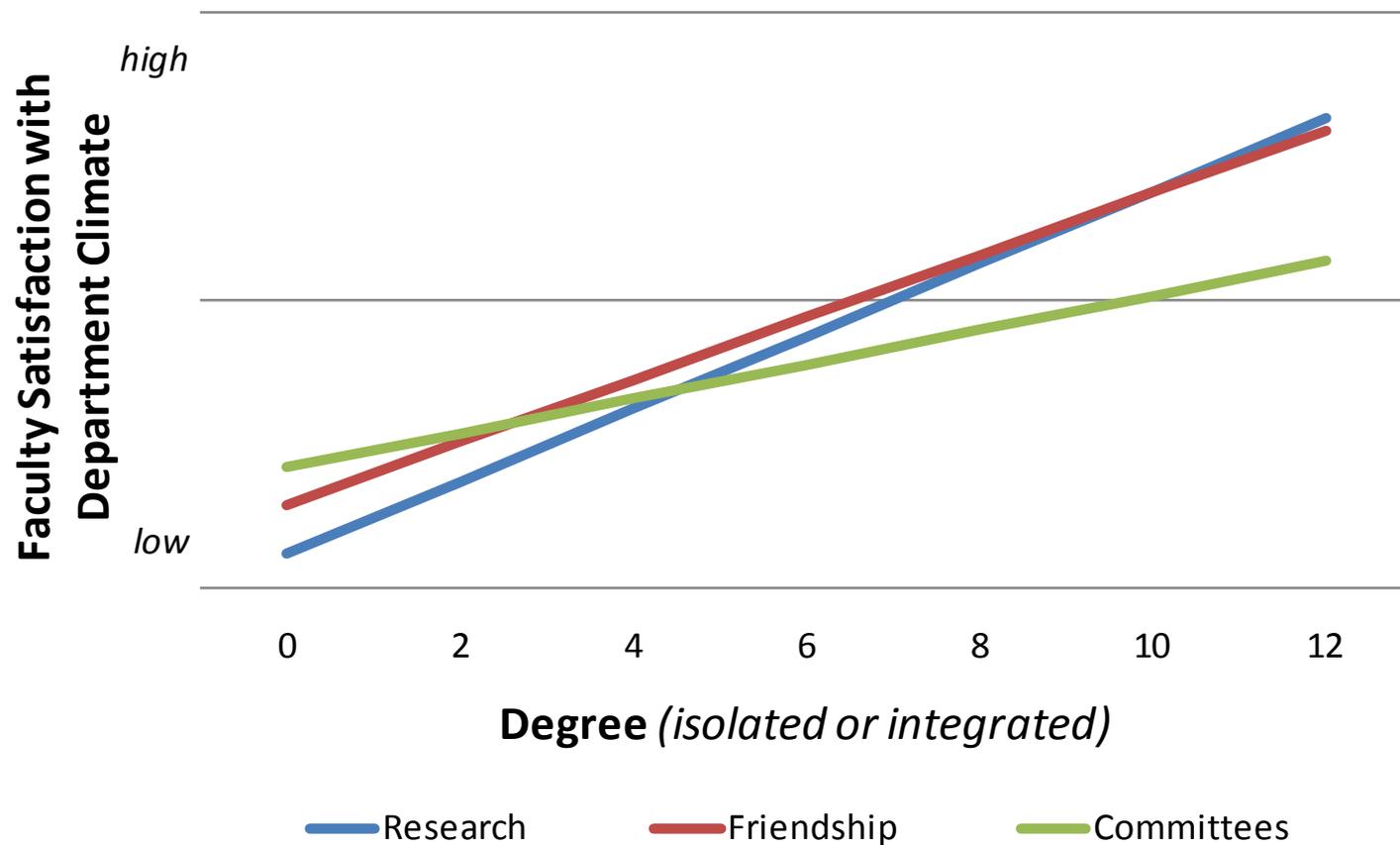
Isolation- bad!

Integration- good!

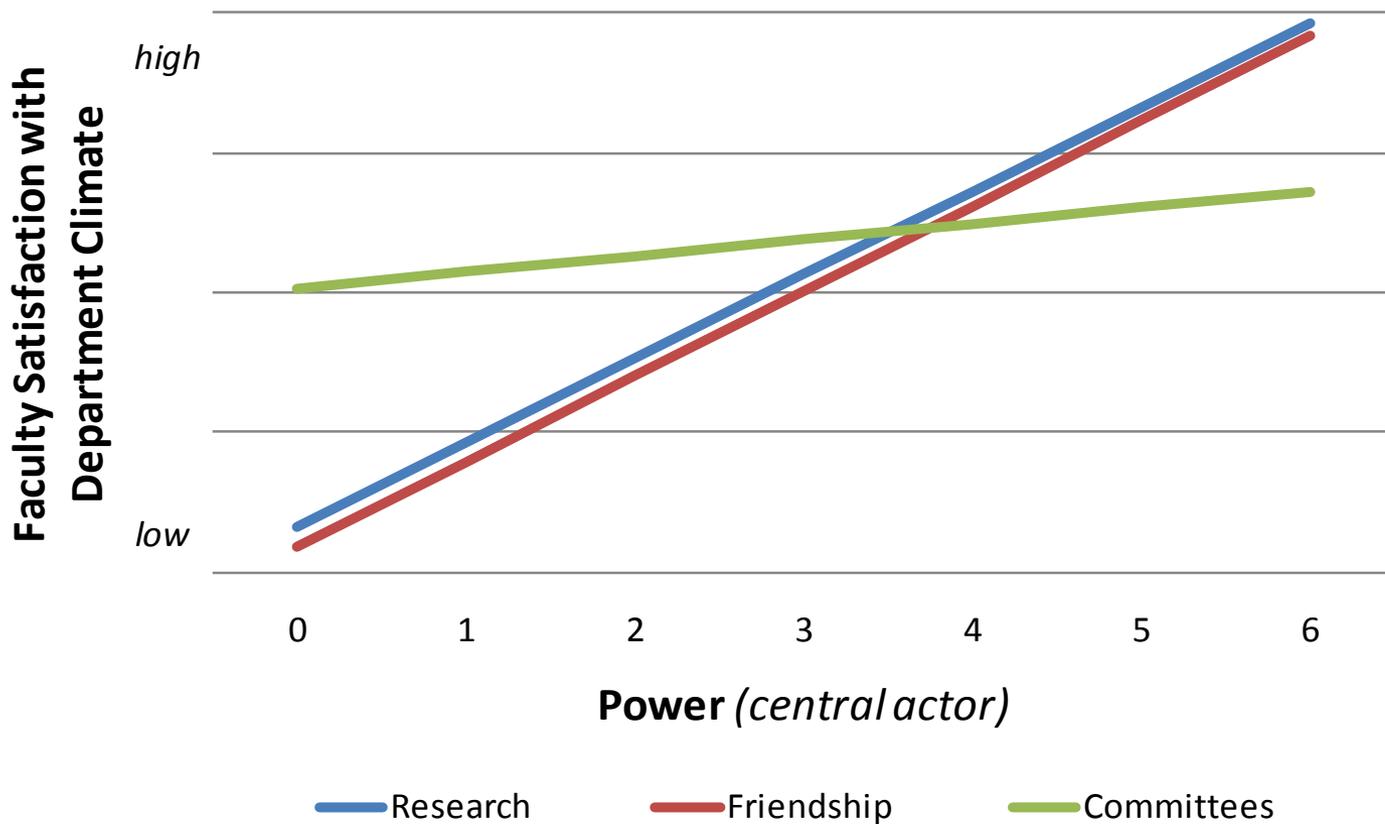


Isolation- Bad!

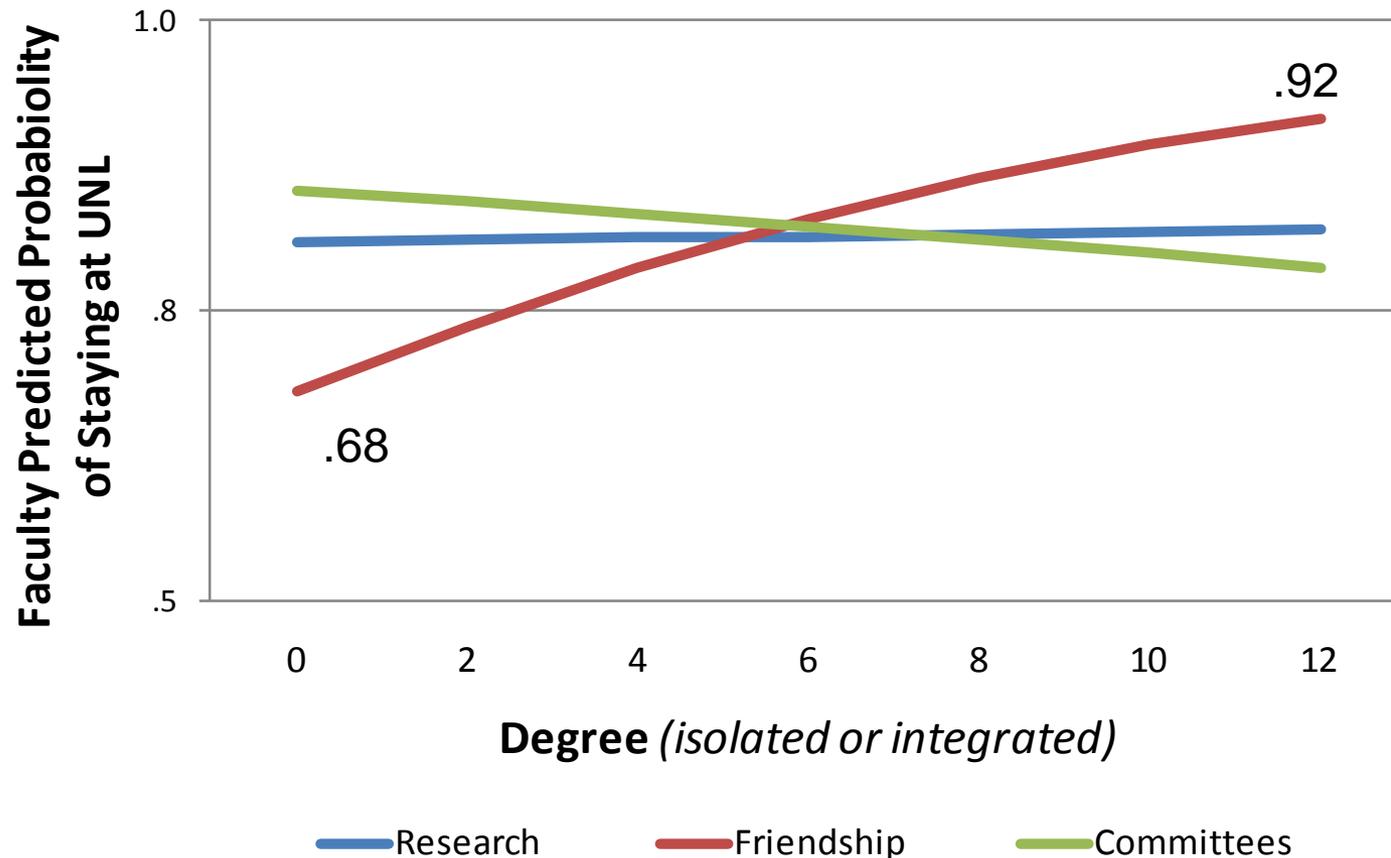
Integration- Good!



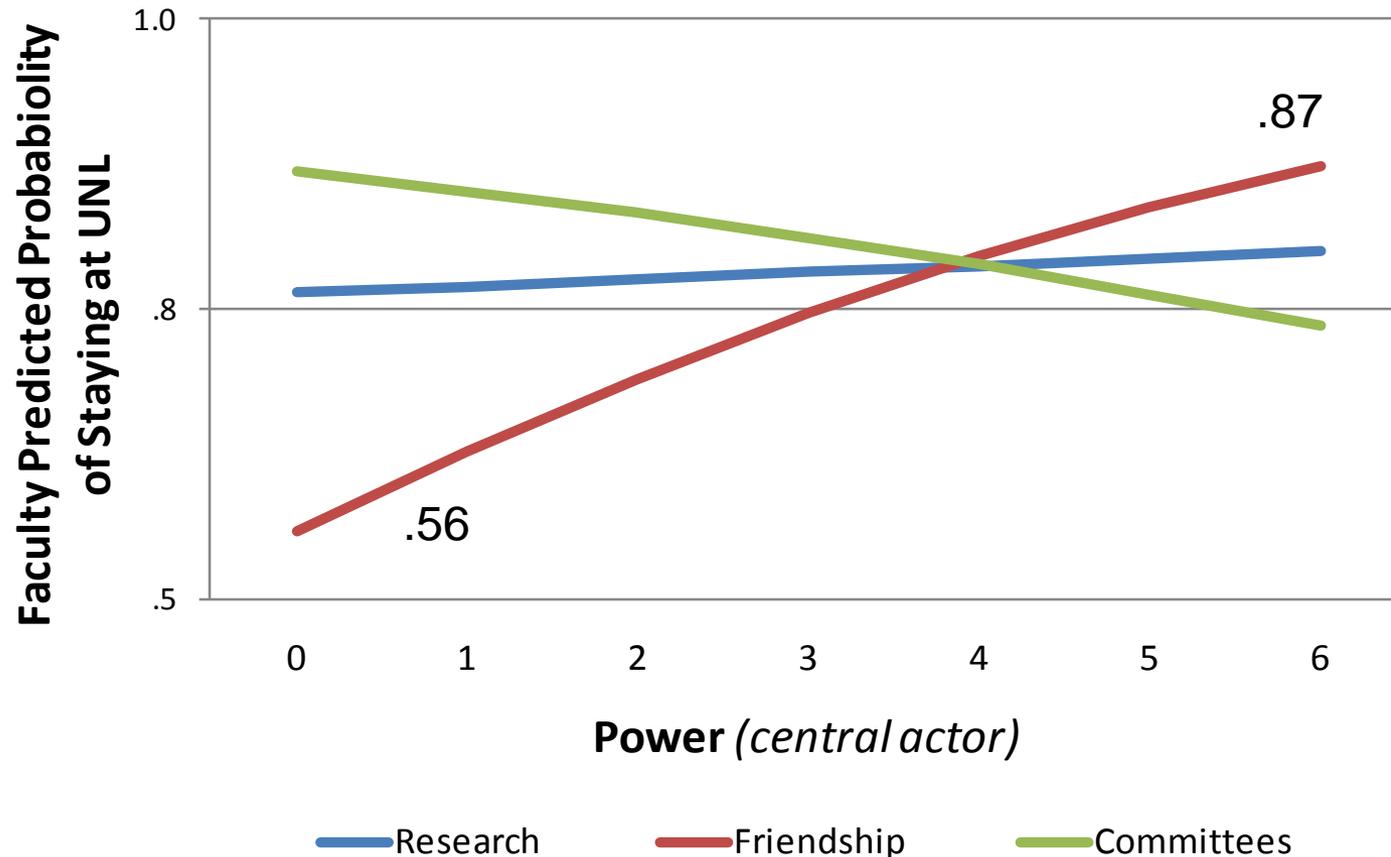
Central actors in research or social networks have more positive climate perceptions



The predicted probability of staying at UNL by type of network connections



The predicted probability of staying at UNL by type of network connections



Friendships matter for retention!



Summary

How connected are faculty within their departments?

- on average, faculty engage in research exchanges with six other faculty, have five friends in their departments and serve on committees with eight different faculty

How is a faculty member's location within their department network associated with their perceptions of climate?

- marginalization in research, friendship or committee networks is associated with less positive perceptions of climate
- marginalization in friendship networks is also associated with less organizational commitment



Individual Level Research Question #3

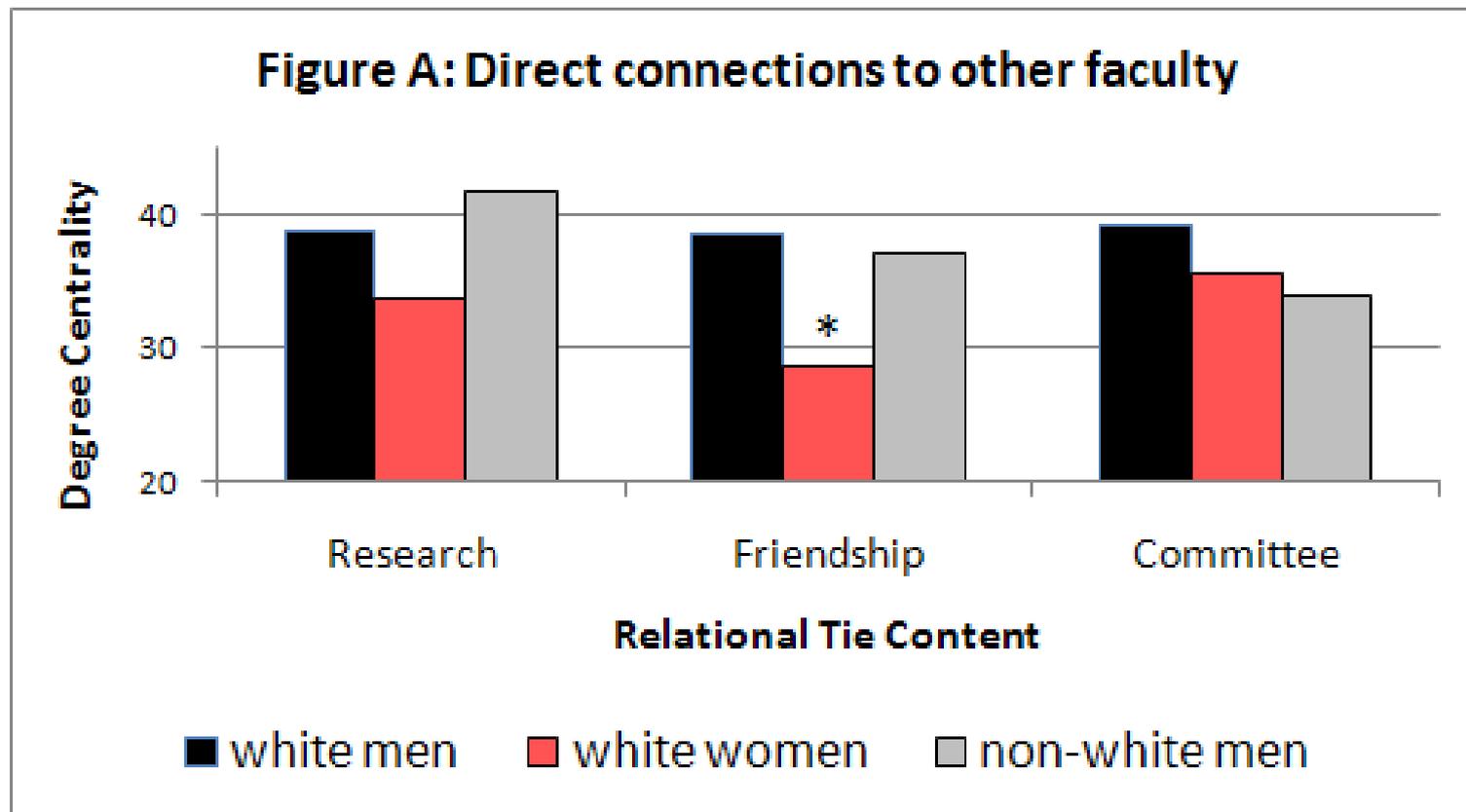
Does a faculty member's location within their department network vary by race and gender?

- comparing across three groups of faculty:
 - white men
 - non-white men
 - white women

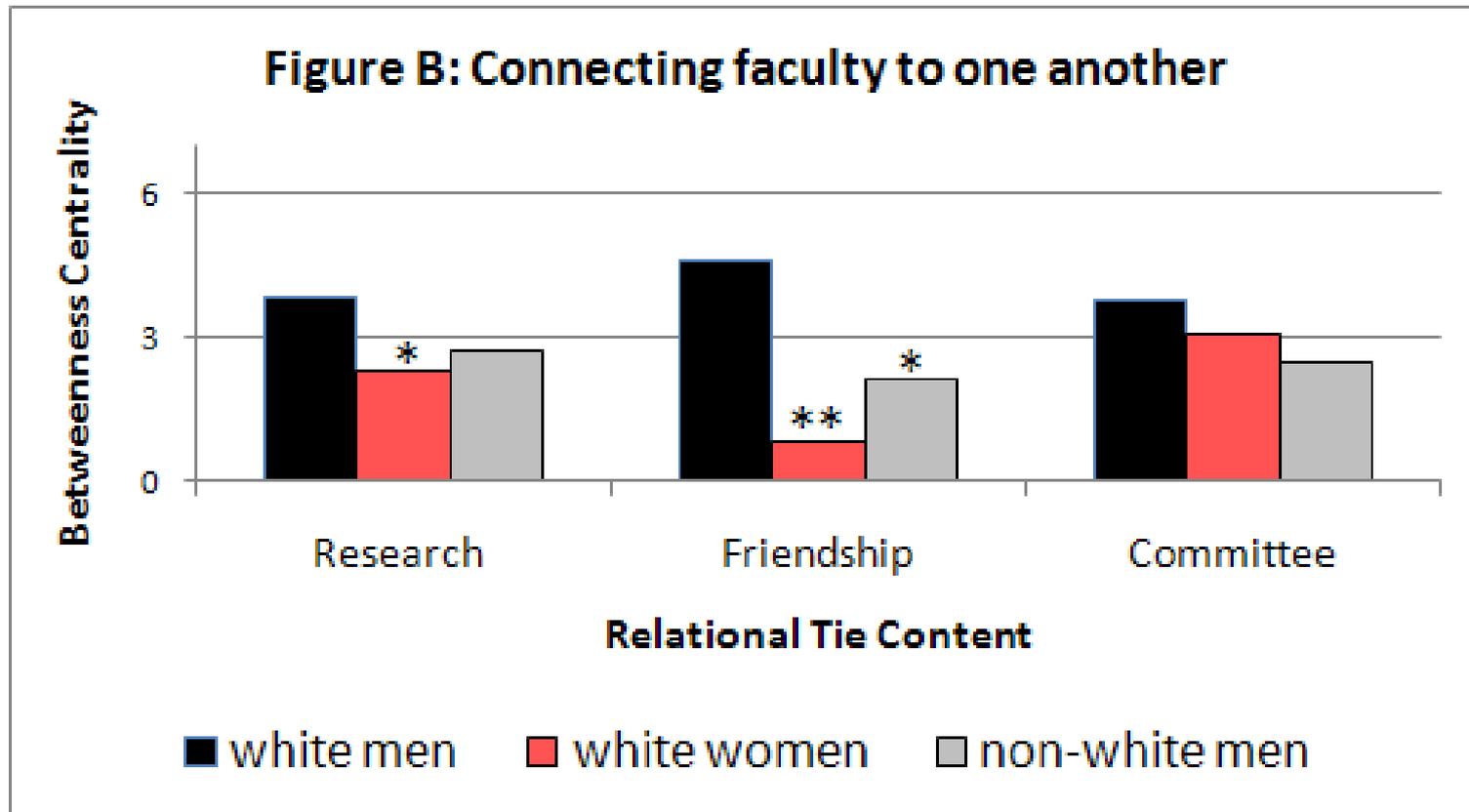
note: unable to compare non-white women because the subgroup size is too small



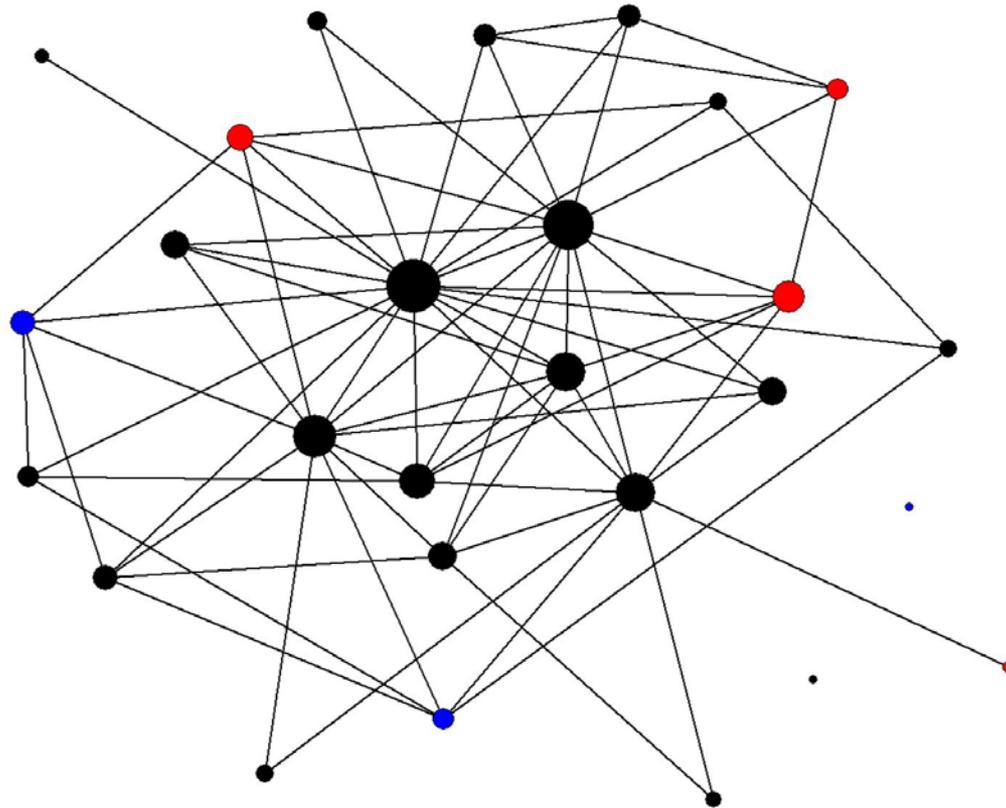
Women have fewer friends!



Intermediaries also differ by race and gender



Friendship Network

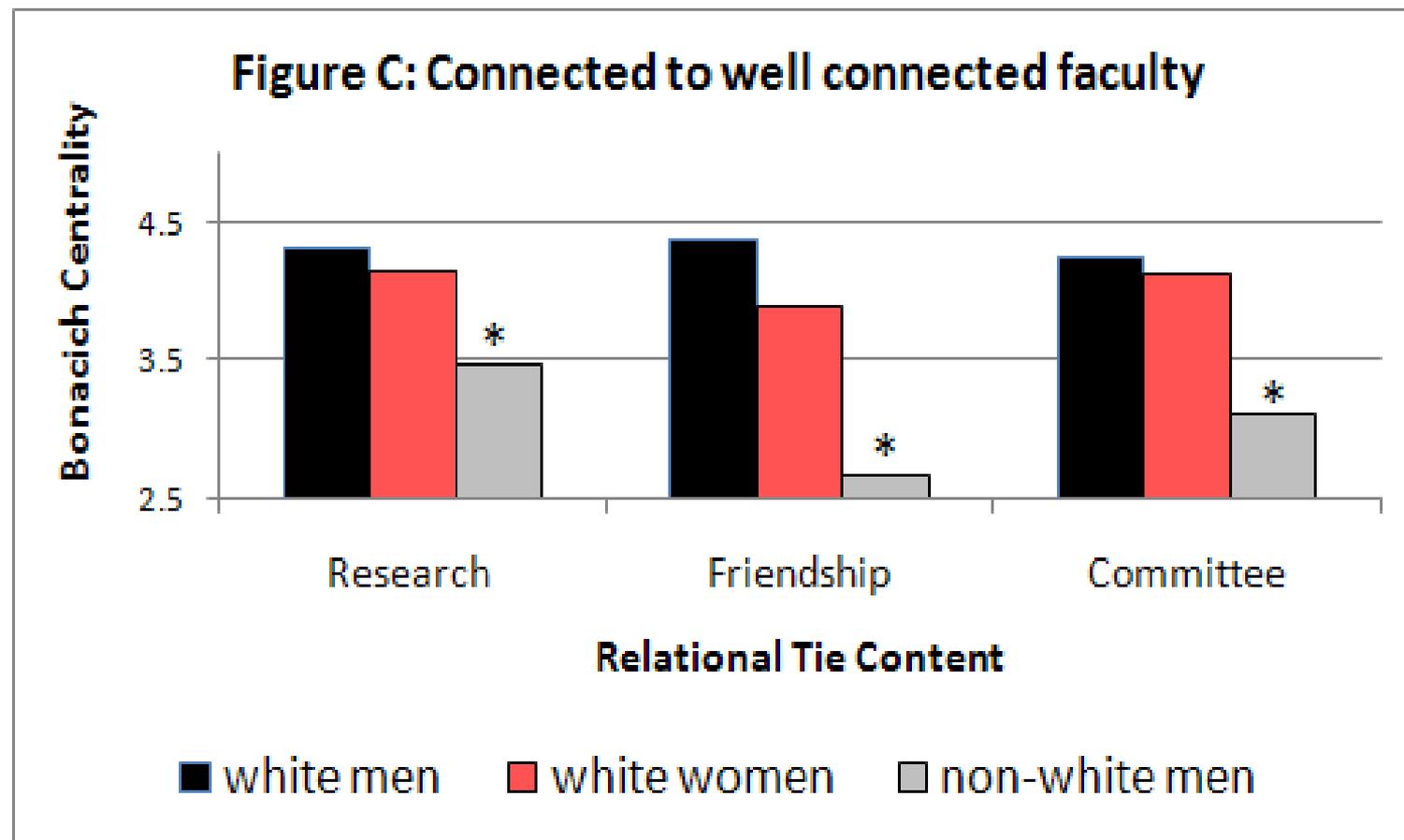


- white females
- non-white males
- white males

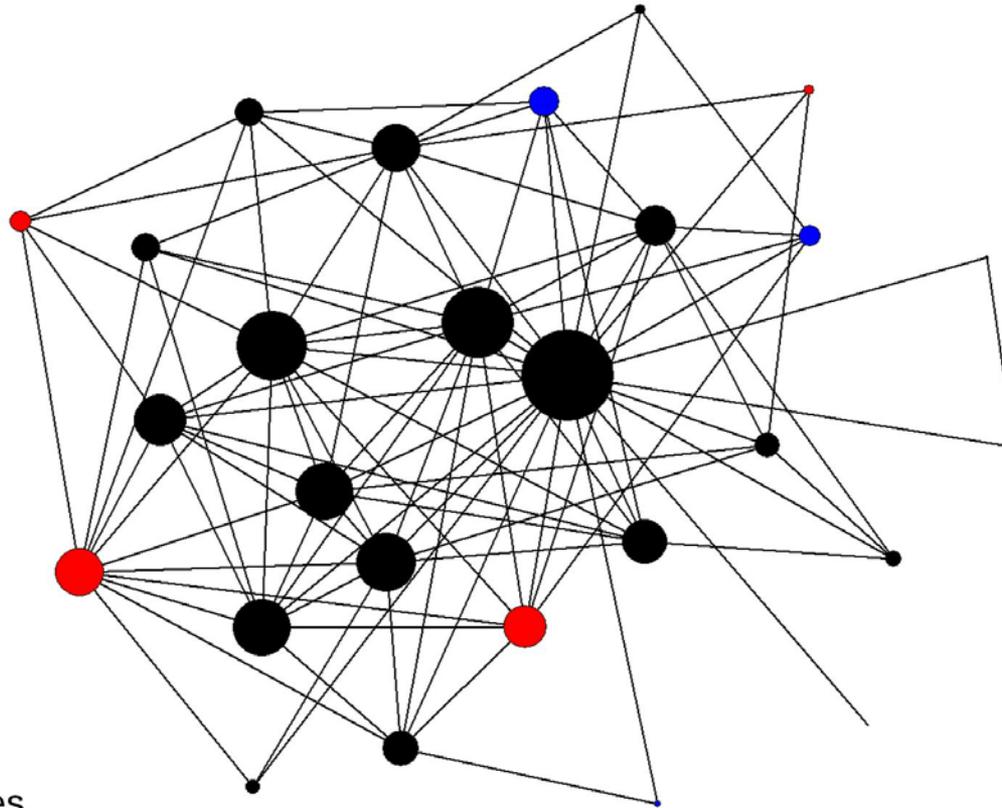
node size is proportional to
betweenness (intermediary) score



Non-white men are less likely to be the most central actors in all networks!



Research Network



- white females
- non-white males
- white males

node size is proportional to power
(central actor) score



Summary

Does a faculty member's location within their department network vary by race and gender?

- women and non-white men are more likely to be peripheral actors in departmental networks
 - women have fewer direct connections to other faculty and are less often intermediaries
 - non-white faculty members are less likely to be connected to well-connected faculty

remember: peripheral actors in the network have less positive climate perceptions and lower organizational commitment



next data collection
Spring 2011

Wait there is more!



Academic Climate Measures

- **Work Value:** The value faculty in your department place on your work
- **Belonging and Comfort:** How well you "fit" (e.g., your sense of belonging, your comfort level) in your department
- Collegiality
- Tenure/Promotion Clarity



Faculty Outcomes

- **Job Satisfaction**

- All things considered, how satisfied or dissatisfied are you with your department as a place to work?

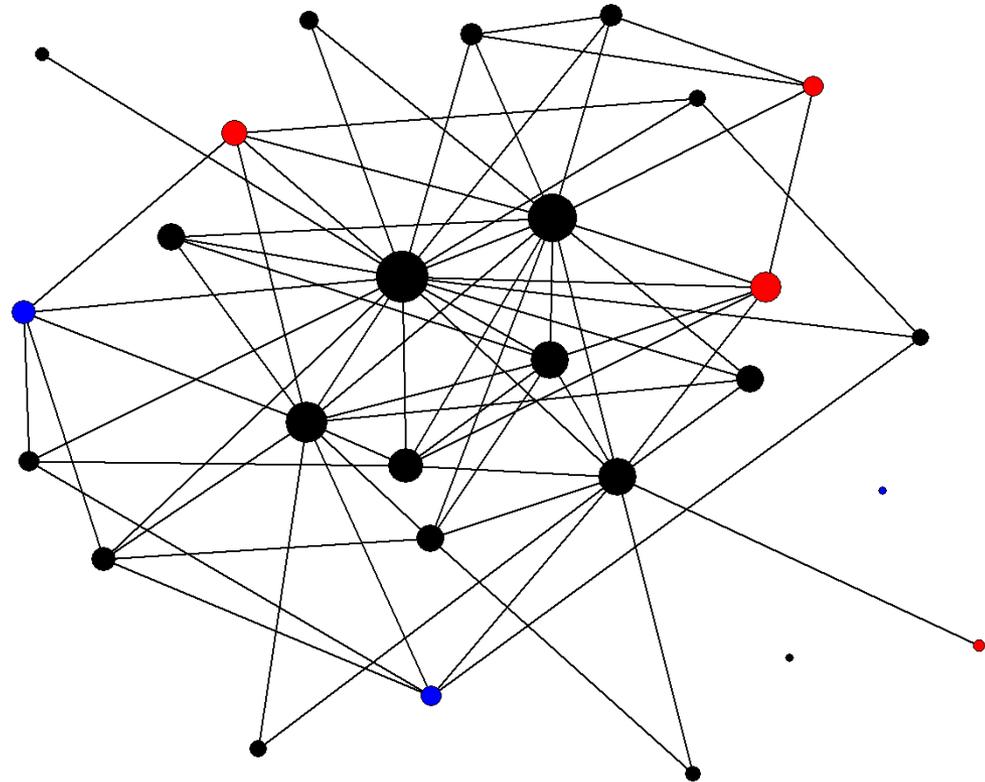
- Organizational Commitment

- Research Productivity



Network Map A: Faculty Friendship

(node size is proportional to betweenness centrality)



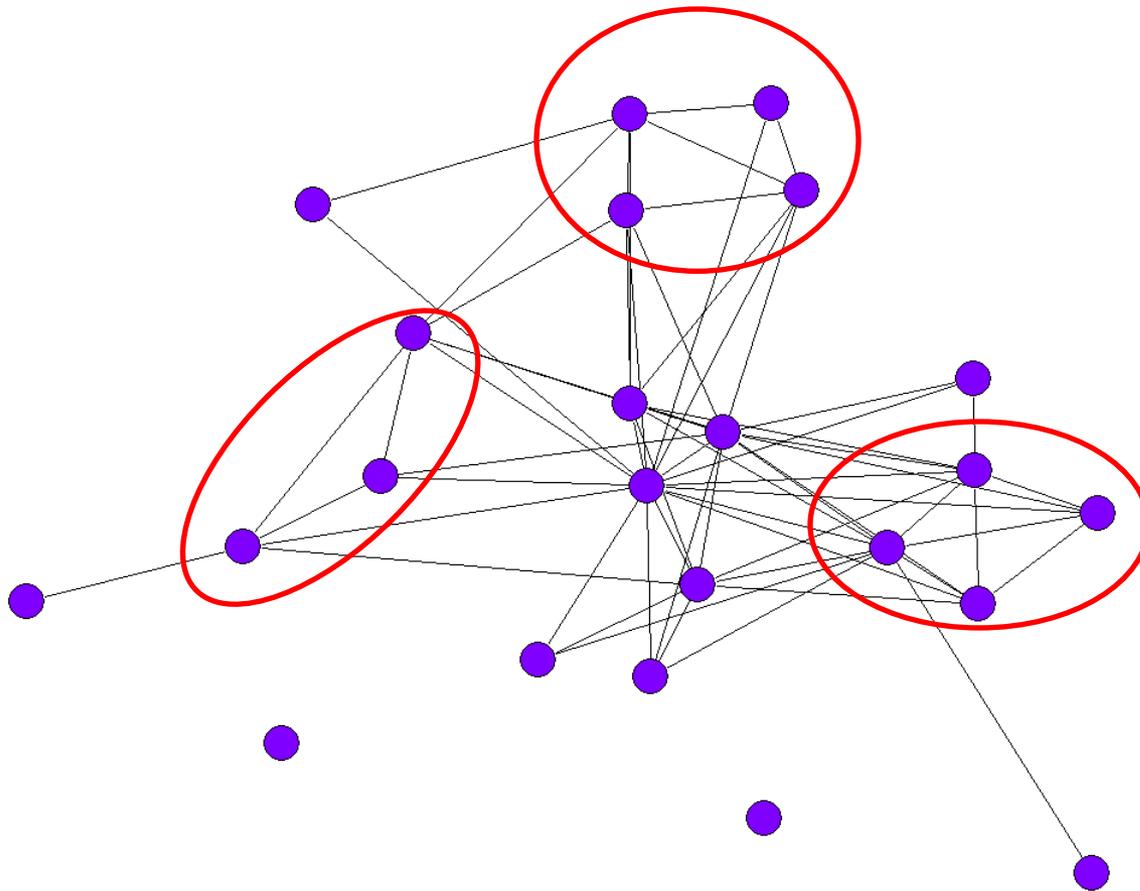
-  white females
-  non-white males
-  white males



Actor location and climate perceptions

	Work Value	Belonging & Comfort	Job Satisfaction
Research Exchange			
Degree	+	+++	+
Betweenness	+	+++	+
Bonacich	+++	+++	+++
Social Connections			
Degree	++	+++	++
Betweenness	+	+++	+
Bonacich	+++	+++	+++
Committees			
Degree	++	++	
Betweenness			
Bonacich	++	+	++

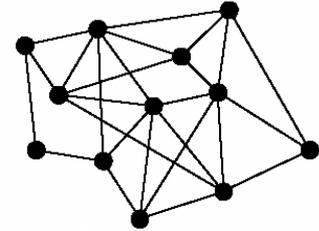




High Clustering – social ties



Department Network Structure Measures



- **Density**

- the percentage of possible ties within a network that are actual ties (range: 0% and 100%)

$$\text{density} = \frac{L}{g(g-1)/2}$$

L = number of lines present

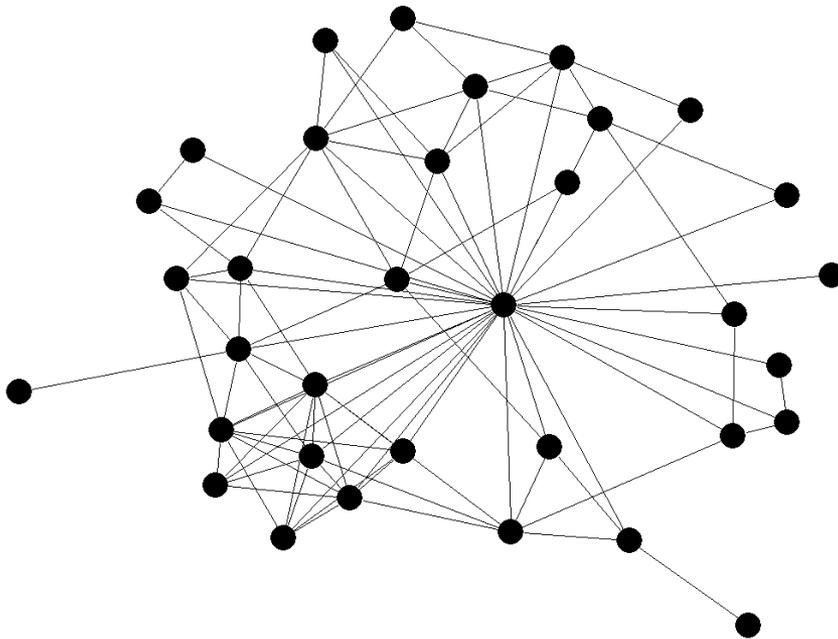
g = number of actors



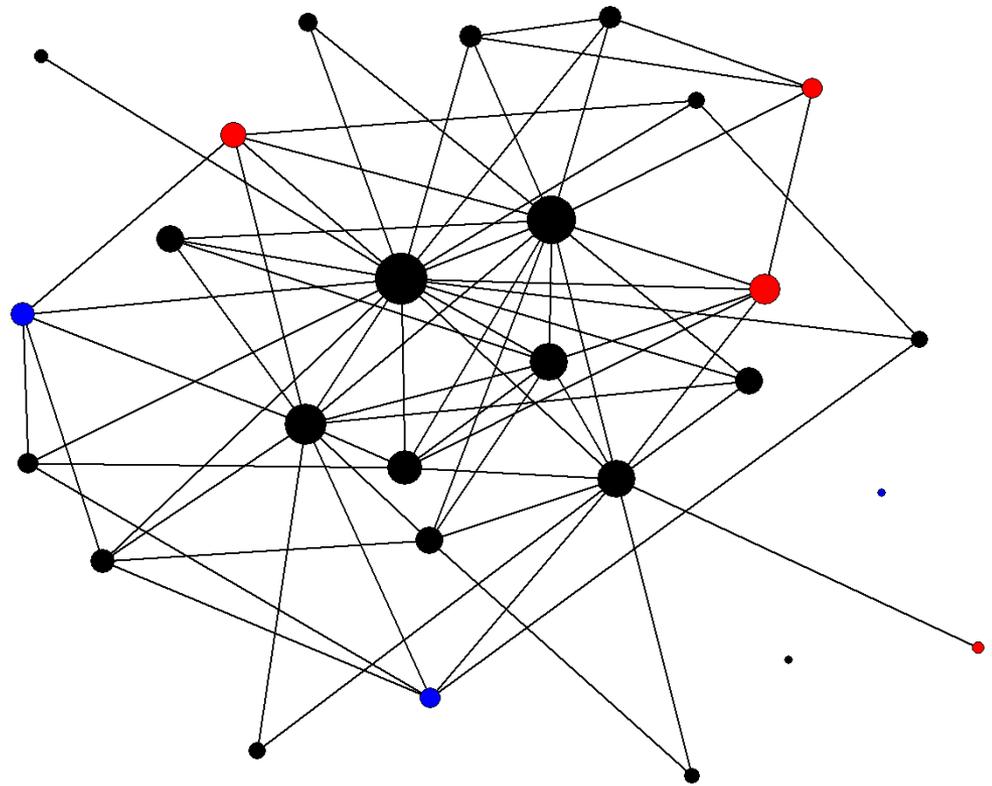
Research Exchange

high centralization

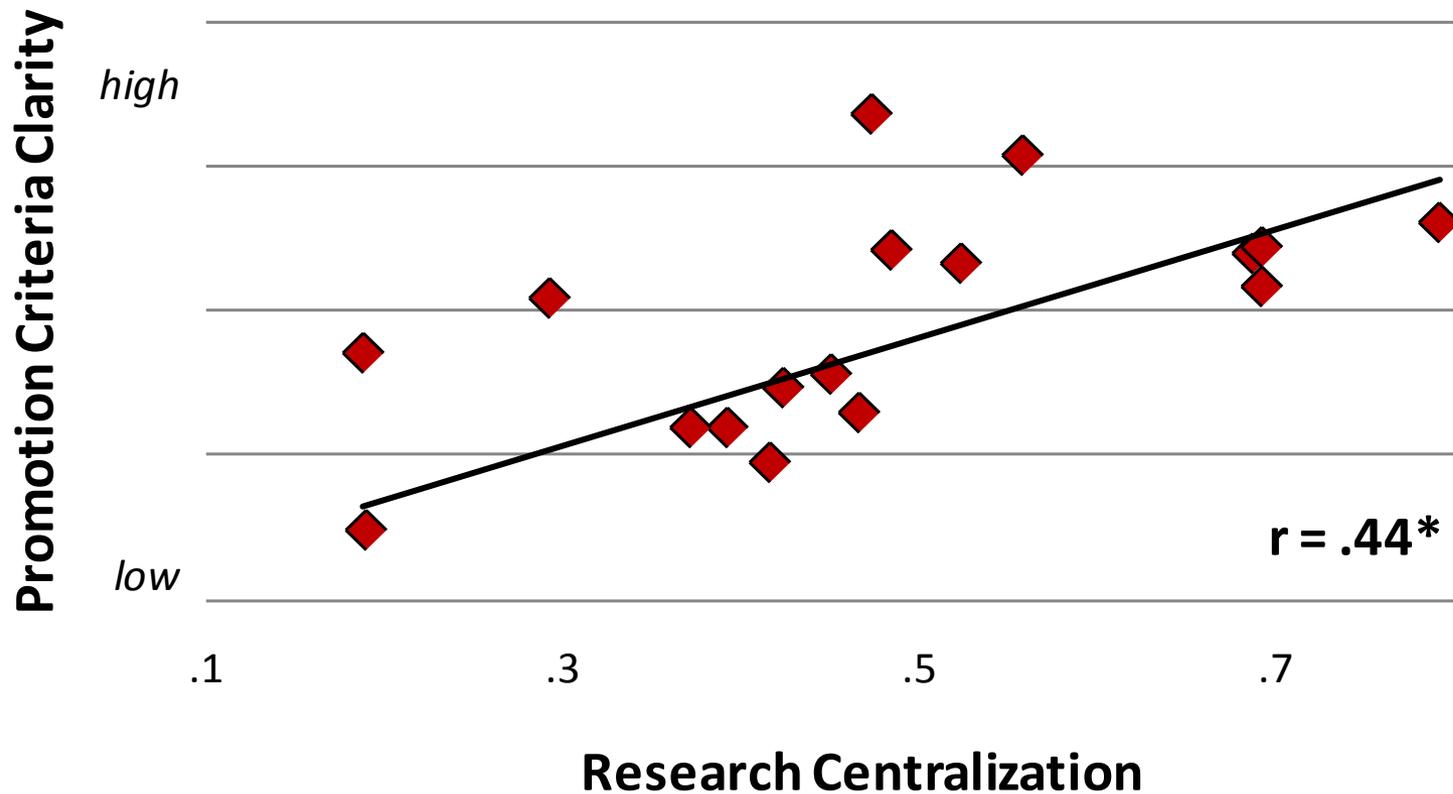
cent. = .79



-  white females
-  non-white males
-  white males



Centralization in Research Networks is good!



Implications

- faculty need to be integrated within research, friendship, and committee co-membership networks to promote positive climate perceptions
- friendship connections might be the most important factor for faculty retention
- ???



Possible Implications

- ?????



