

Examining Information Sharing Dynamics through Network Analysis in the Western Hardwood Manufacturing Sector

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Outline

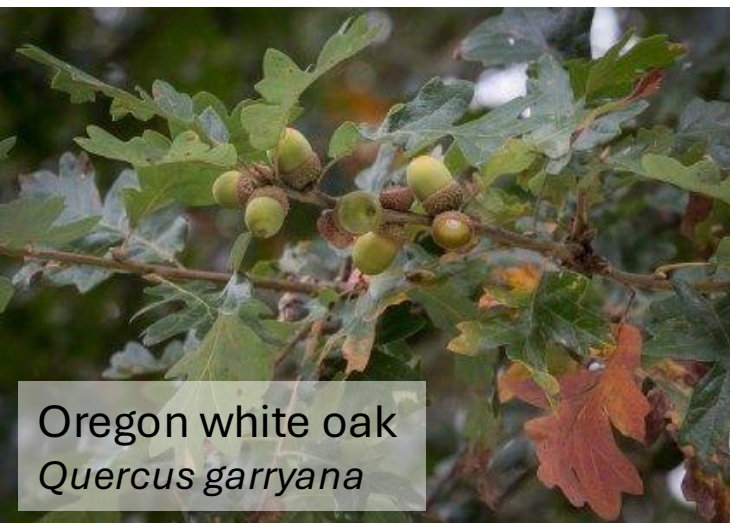
1. Western Hardwood Manufacturing Sector
2. Research Questions
3. Method – Social Network Analysis
4. Results
 1. Demographic
 2. Descriptive
 3. Model
5. Takeaways



Red alder

Native Plants PNW

The Hardwoods



Photos: Washington Native Plant Society, Wikipedia, Travel Oregon, St Kitts Villa, Green Home Solutions, Maverick Sawmill Services

Research Questions

Where do hardwood manufacturers source information?

What processes & conditions enable information transfer in the hardwood sector?

(Tsai, 2001; Van Wijk et al., 2008; Lee et al. 2021)



Bigleaf maple

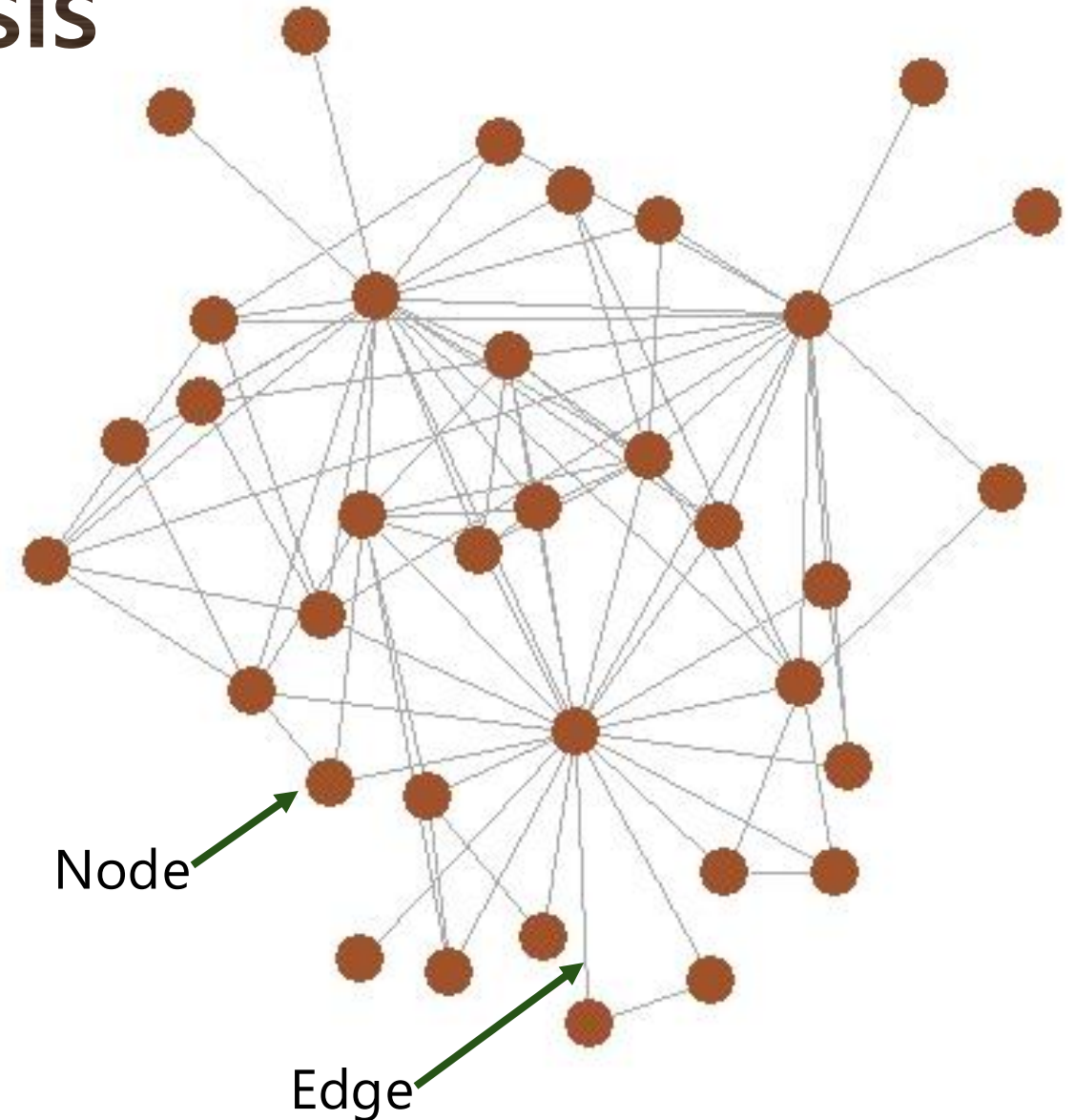
Kleekhoot Gold West Coast

Methods

Social Network Analysis

(Scott & Carrington, 2011)

- Analyzing organization of actors in a social system
- Assumes actors make meaningful decisions based on context
- Represents actors as nodes and relationships as edges



Exponential Random Graph Model

- Simulate networks based on basic structural features of the observed network
- Estimates the odds that a given characteristic will affect the formation of a relationship
- Do not tolerate missing data

(Harris, 2014)

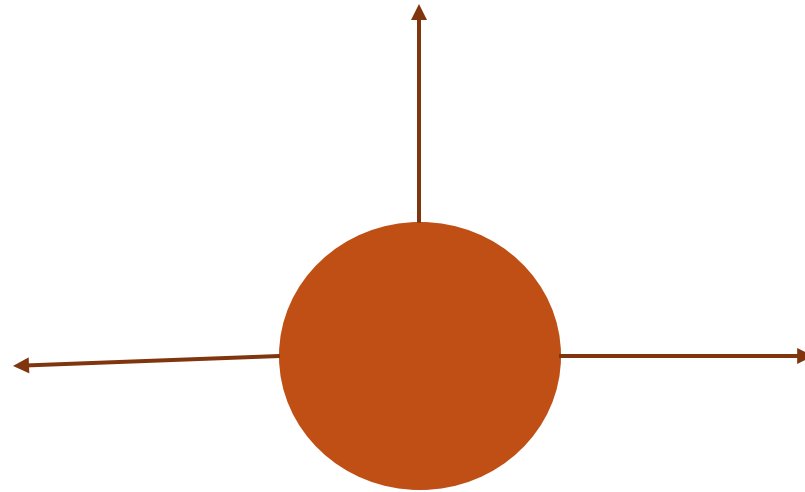
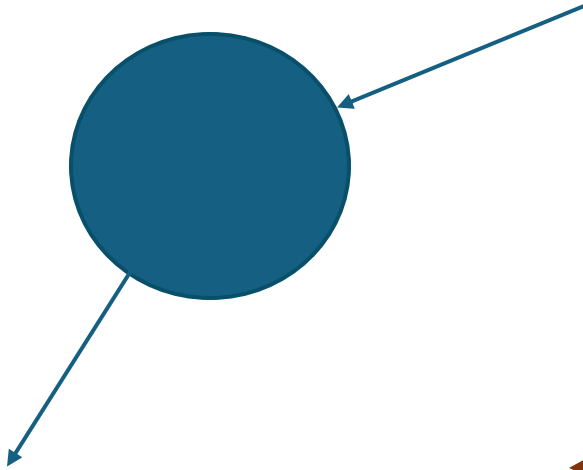


Oregon white oak

Data Collection

- Survey instrument developed based on results of earlier work
- Collected data on information sharing relationships
 - In both directions
 - Split into "technical" and "market" information
 - Each relationship has a "frequency" and "importance to the respondent" score
- 34 samples collected thus far (74% of known companies)

Network Structures



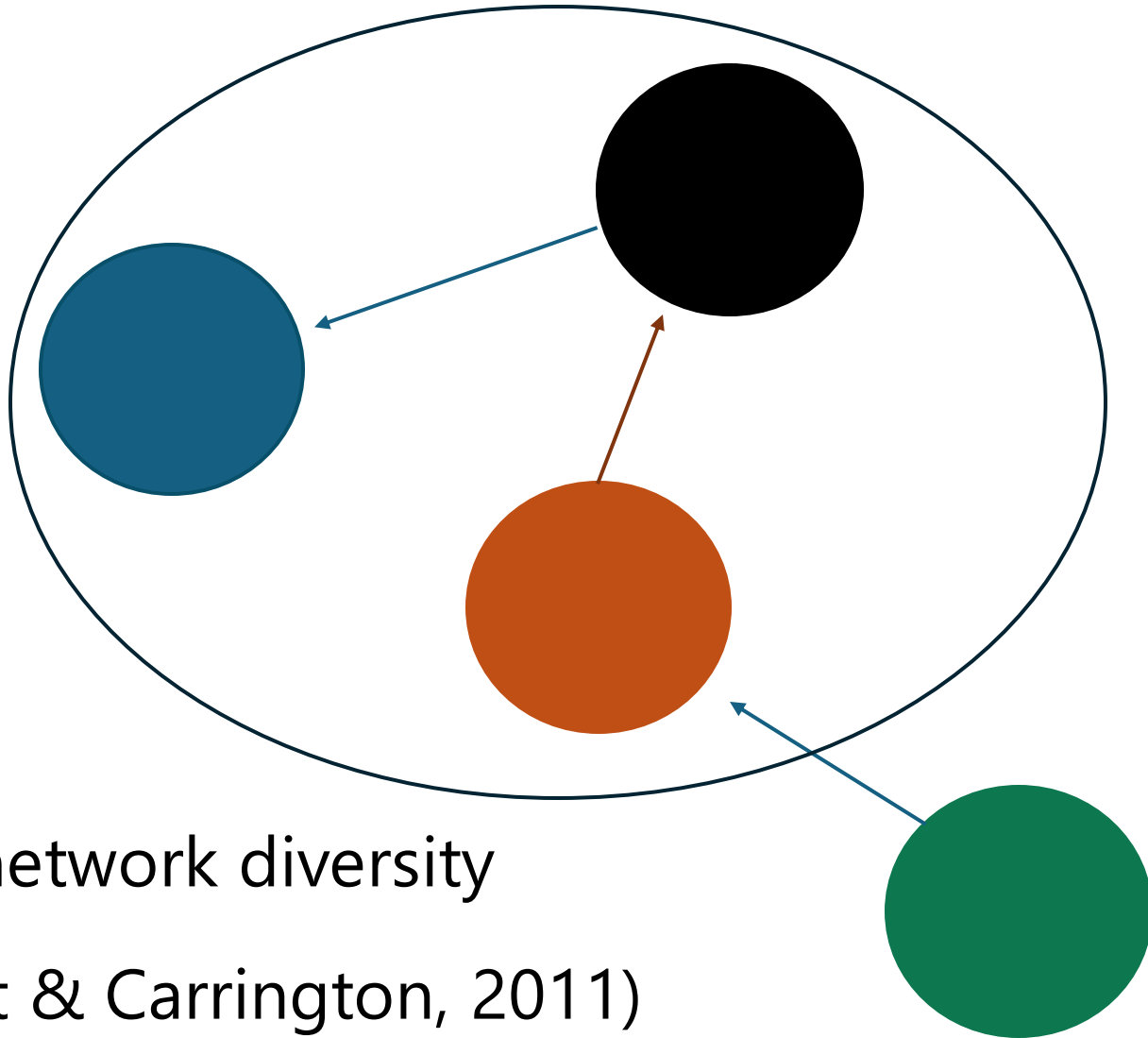
Degree centrality

(Marsden, 2002)



Myrtlewood

Network Structures

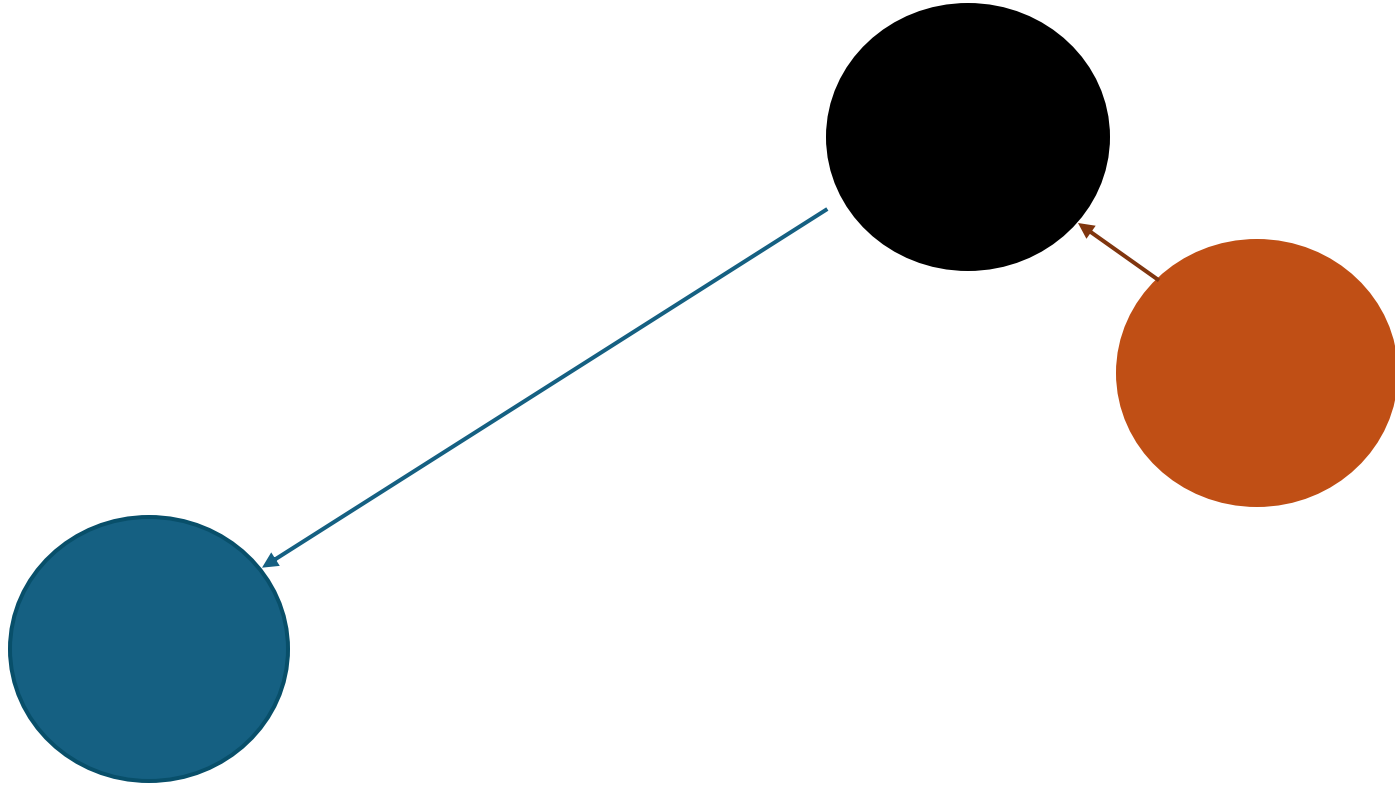


Ego network diversity
(Scott & Carrington, 2011)



Myrtlewood

Network Structures

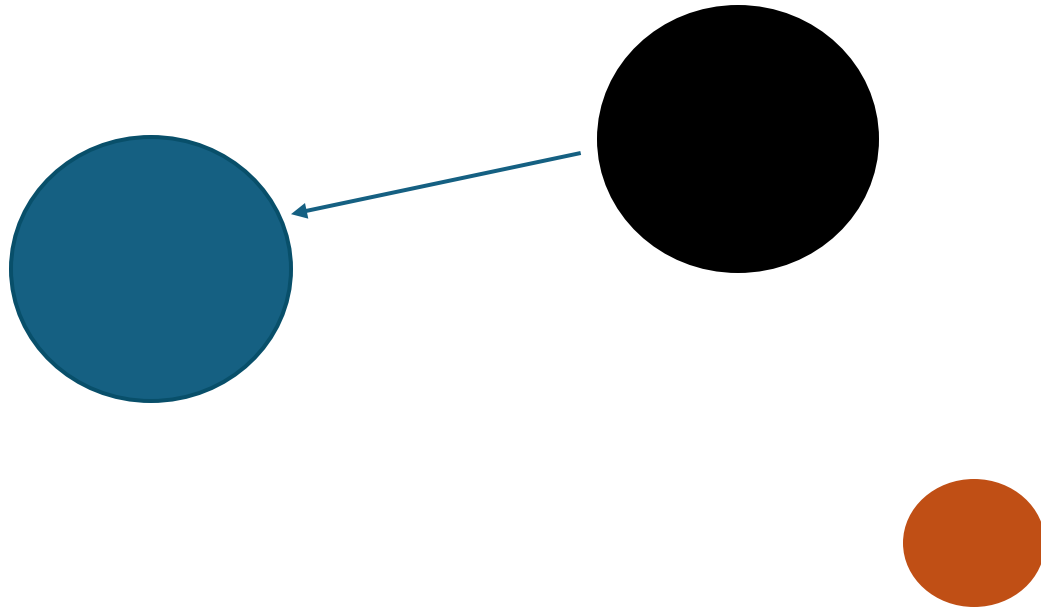


Geographic distance



Myrtlewood

Network Structures



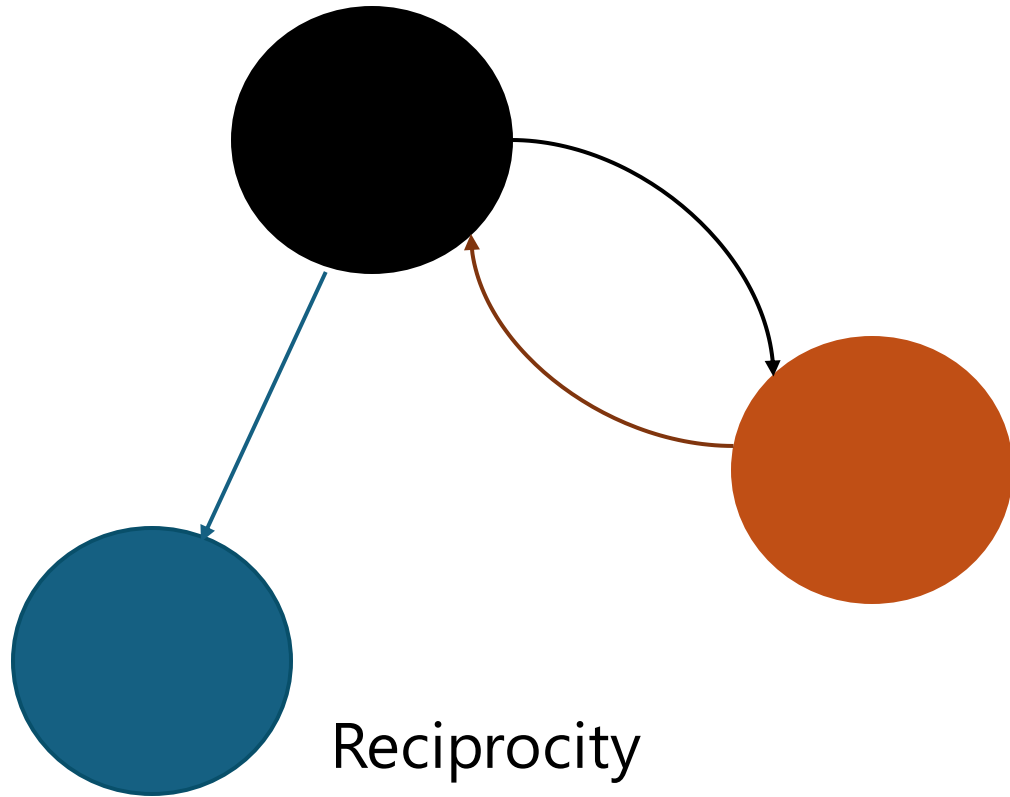
Homophily

(McPherson et al. , 2001)



Myrtlewood

Network Structures



(Obermayer and Toth, 2020;
Skerlavaj et al. 2010)

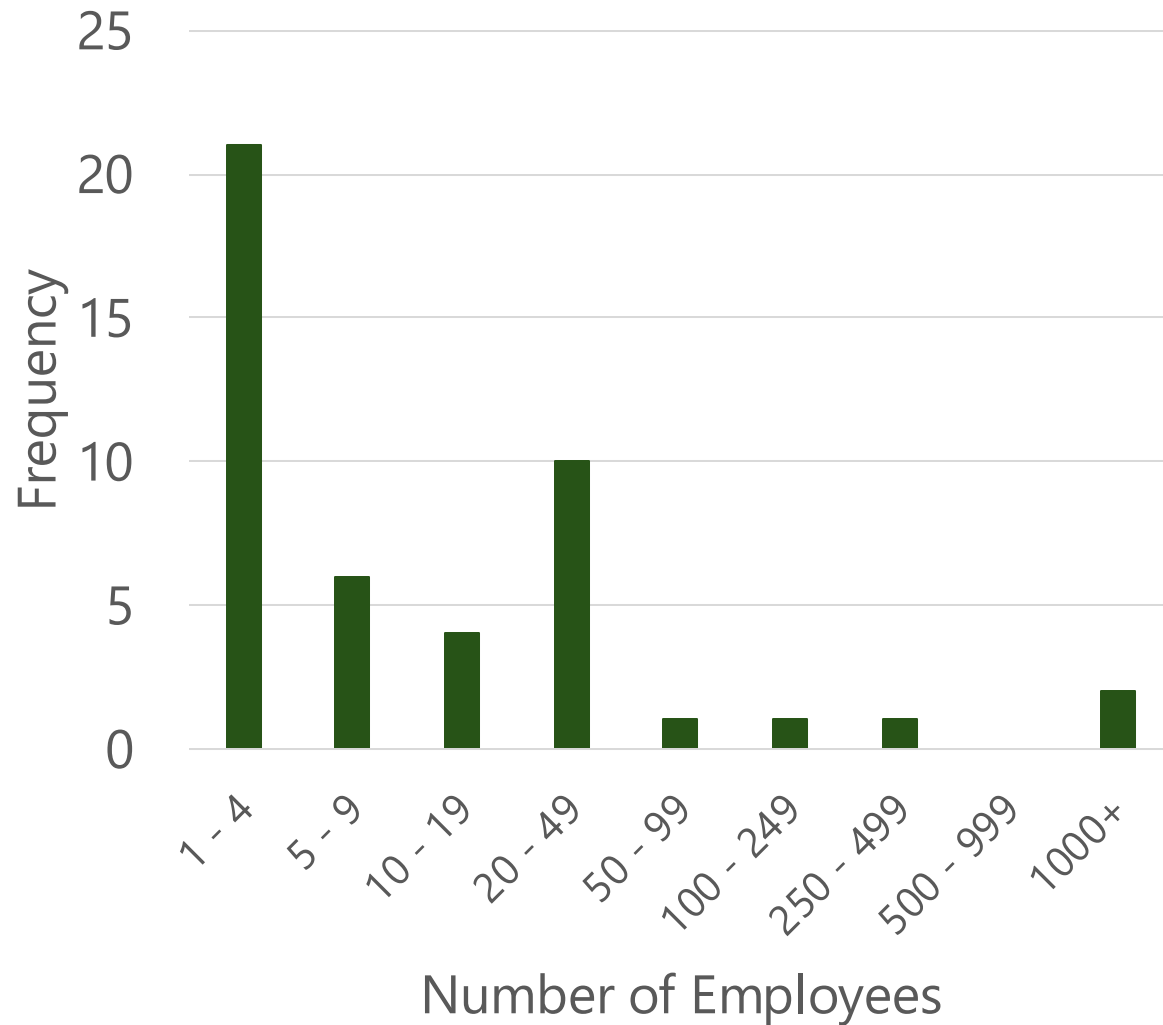


Myrtlewood

The top half of the image features a close-up, horizontal view of a wood grain. The grain is dark brown with lighter, wavy lines running across it, creating a textured appearance. Below this, the background is a solid, clean white.

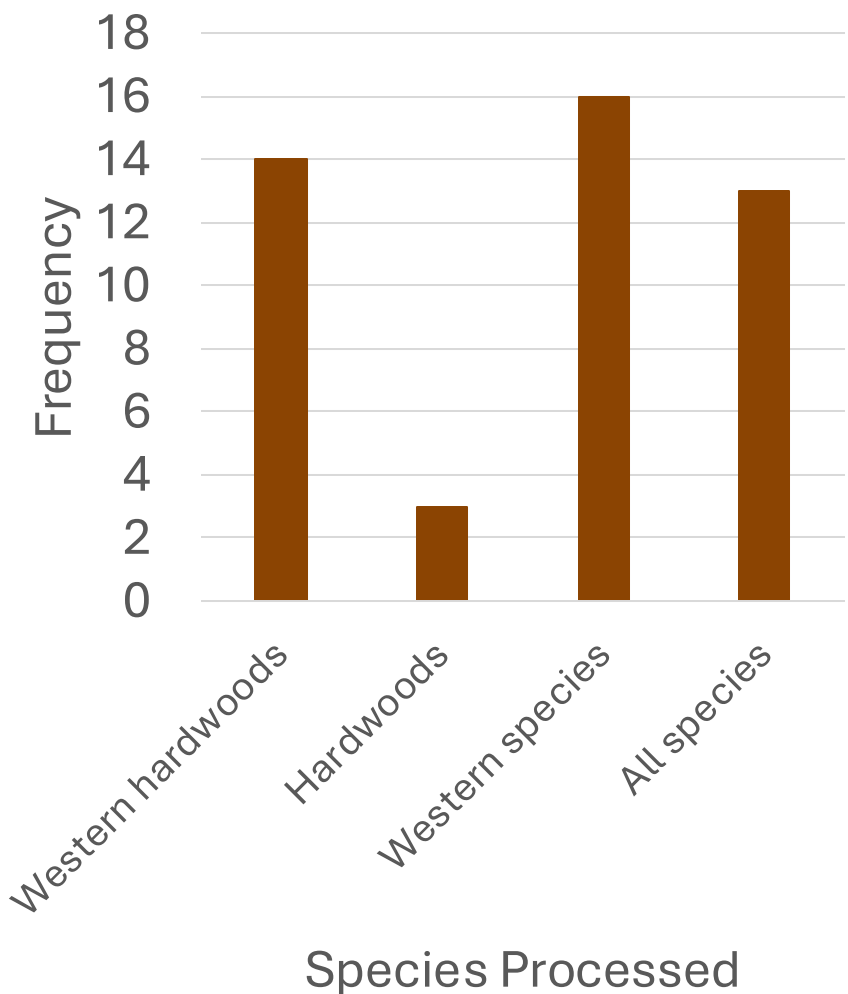
Results

Demographics

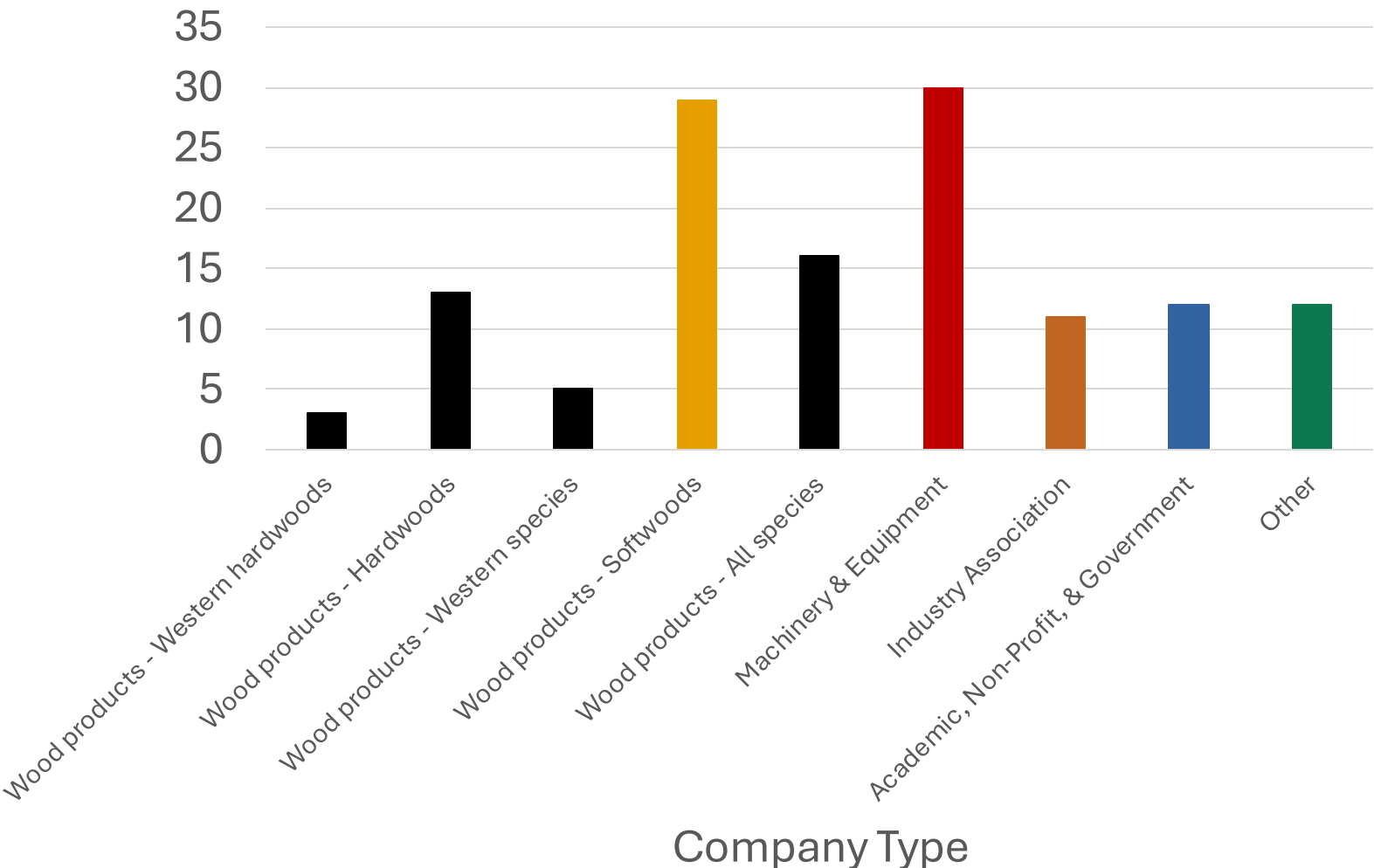


Demographics

Hardwood Companies



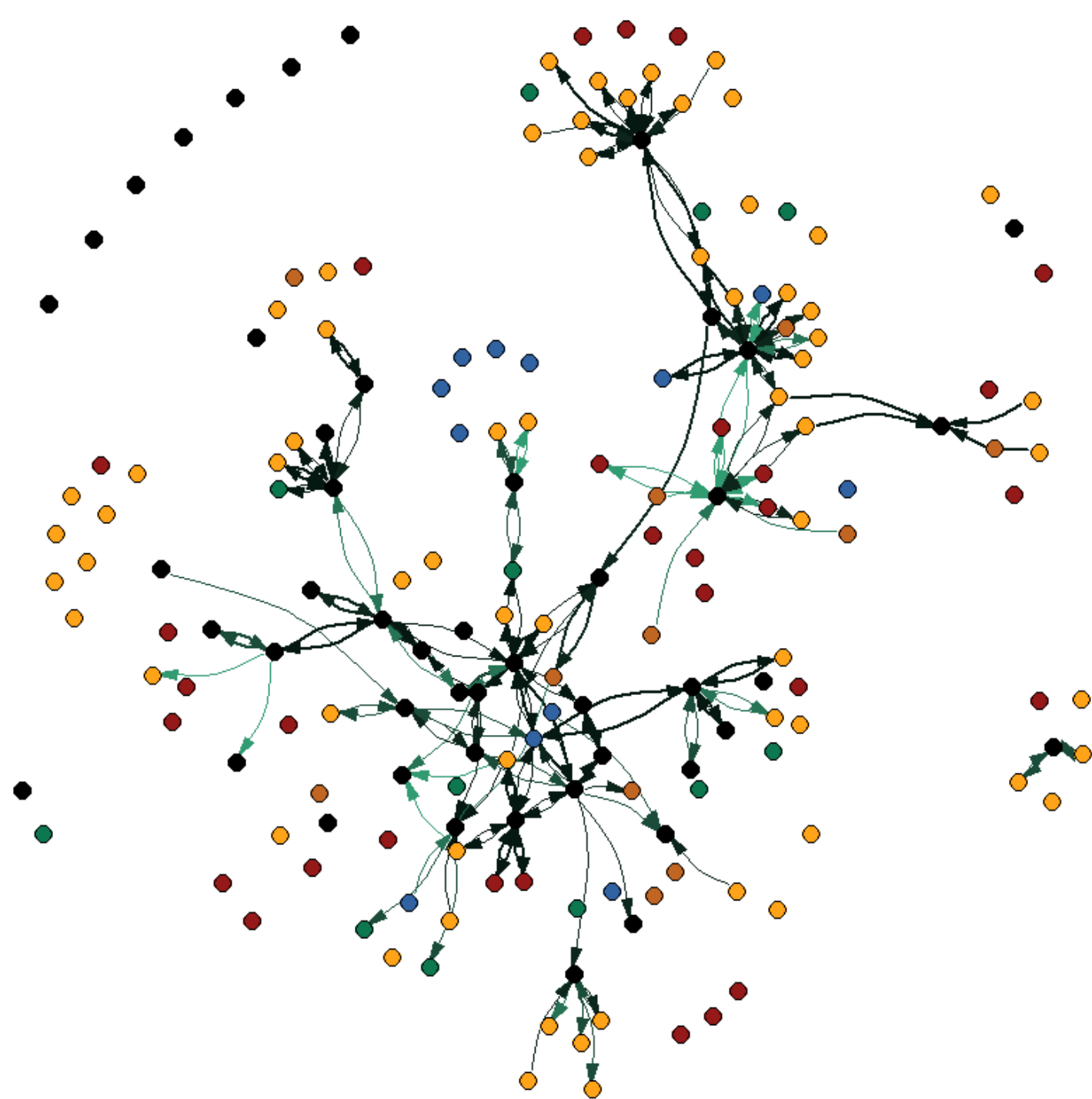
All Companies



Market Information

- Academic, Non-profit, & Government
- Hardwood Companies
- Industry Association
- Machinery & Equipment
- Other
- Wood Products Companies

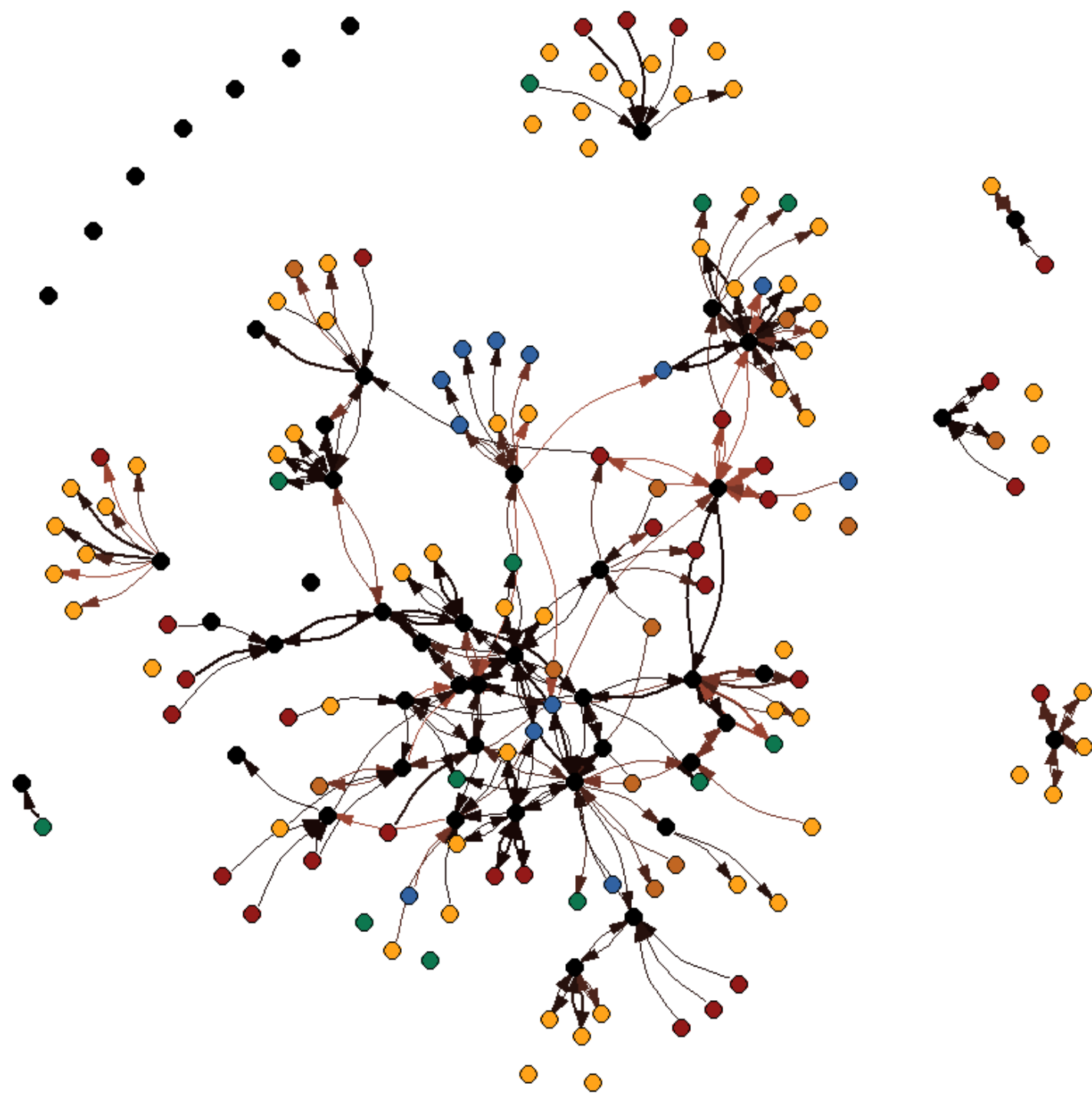
Darker edge = more important
Thicker edge = more frequent



Technical Information

- Academic, Non-profit, & Government
- Hardwood Companies
- Industry Association
- Machinery & Equipment
- Other
- Wood Products Companies

Darker edge = more important
Thicker edge = more frequent

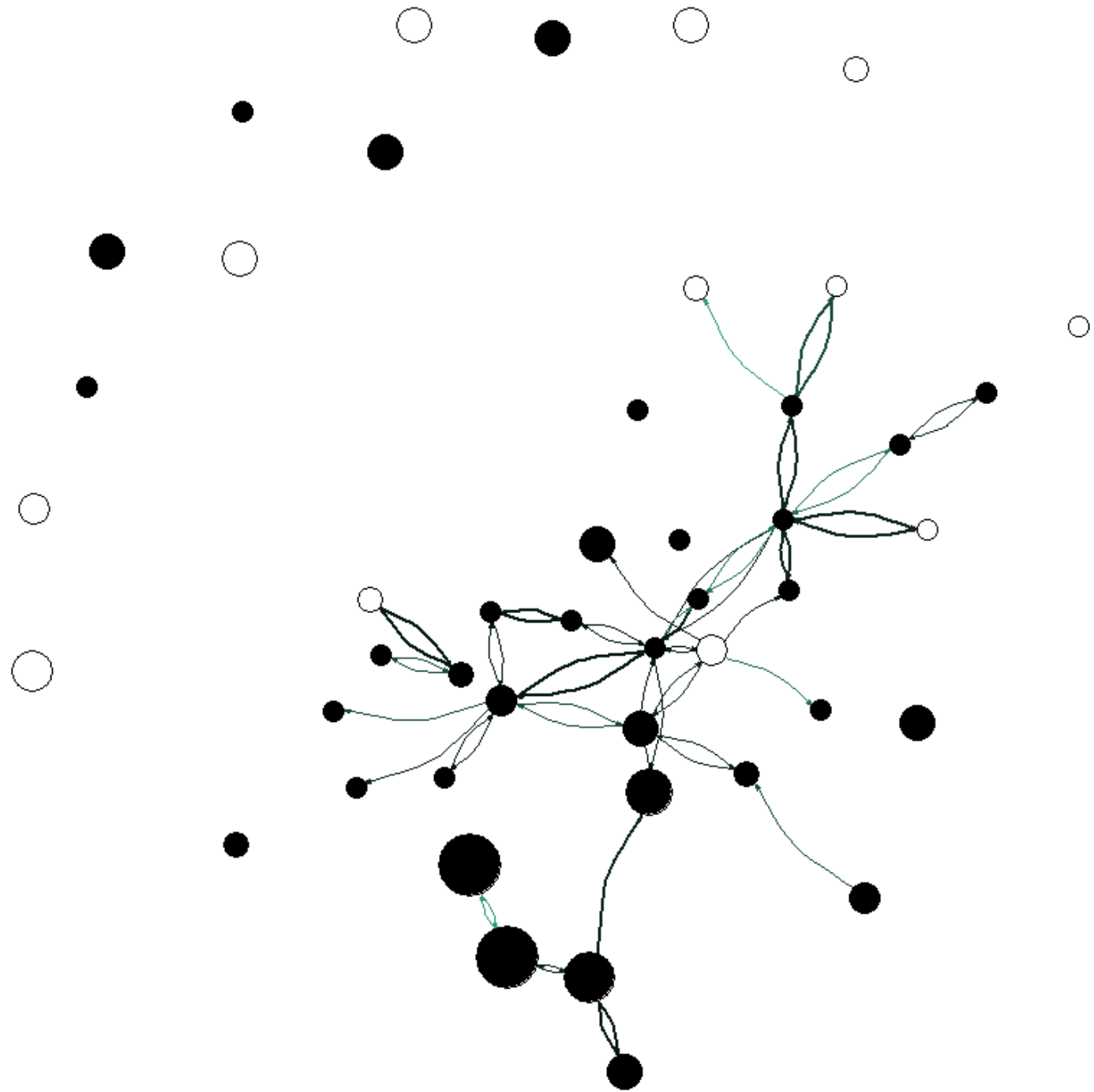


Market Hardwood Only

● Western hardwood company
(respondent)

○ Western hardwood company
(non-respondent)

Darker edge = more important
Thicker edge = more frequent
Larger node = larger company

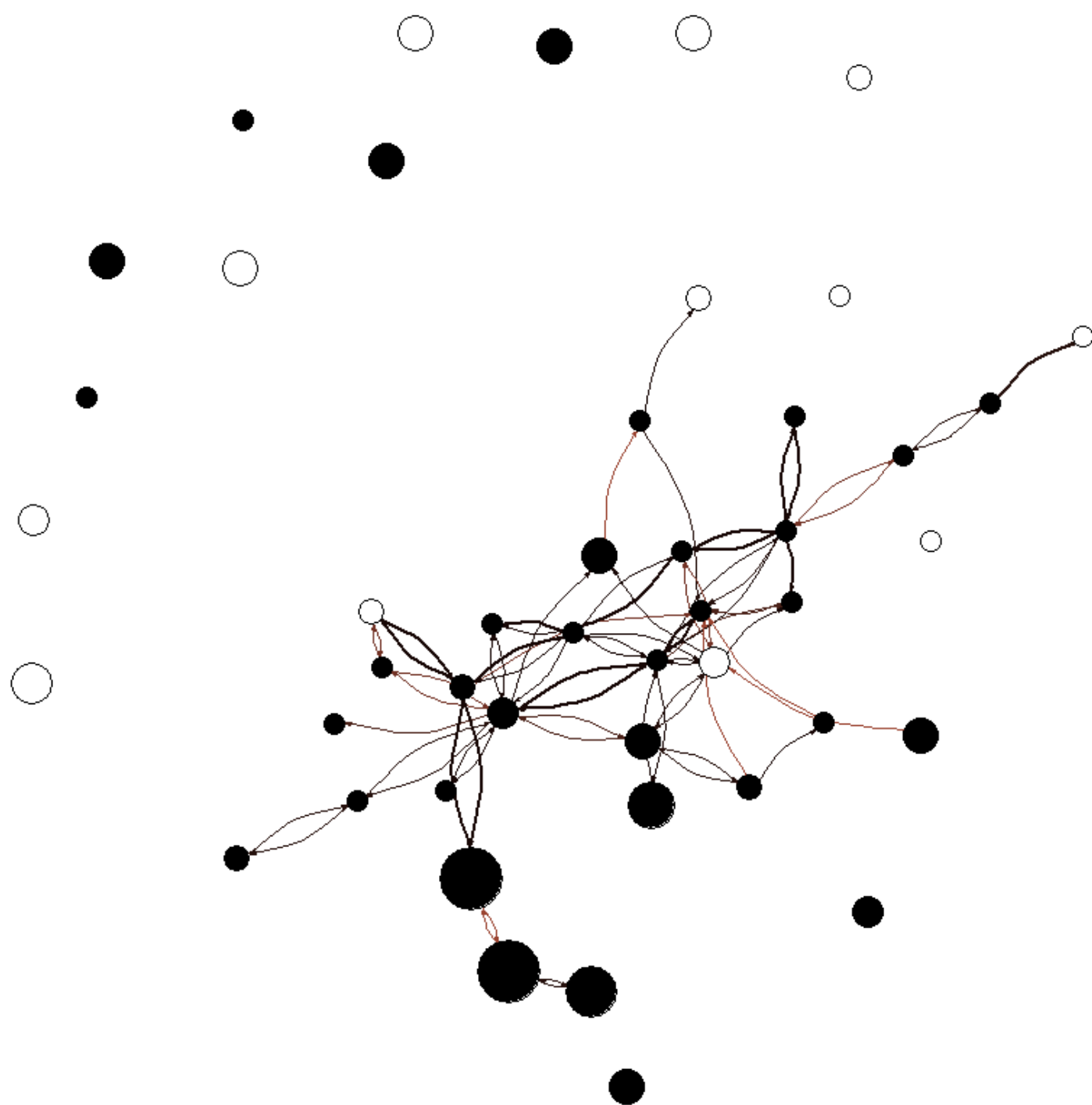


Technical Hardwood Only

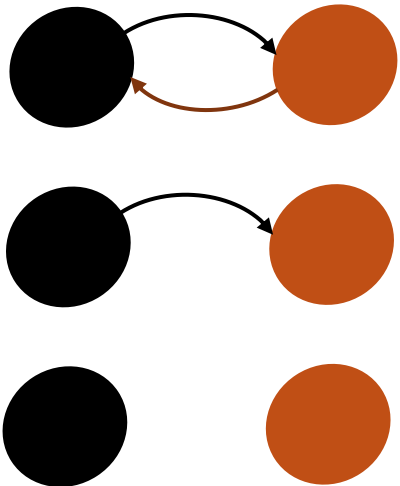
● Western hardwood company
(respondent)

○ Western hardwood company
(non-respondent)

Darker edge = more important
Thicker edge = more frequent
Larger node = larger company



Dyad Census



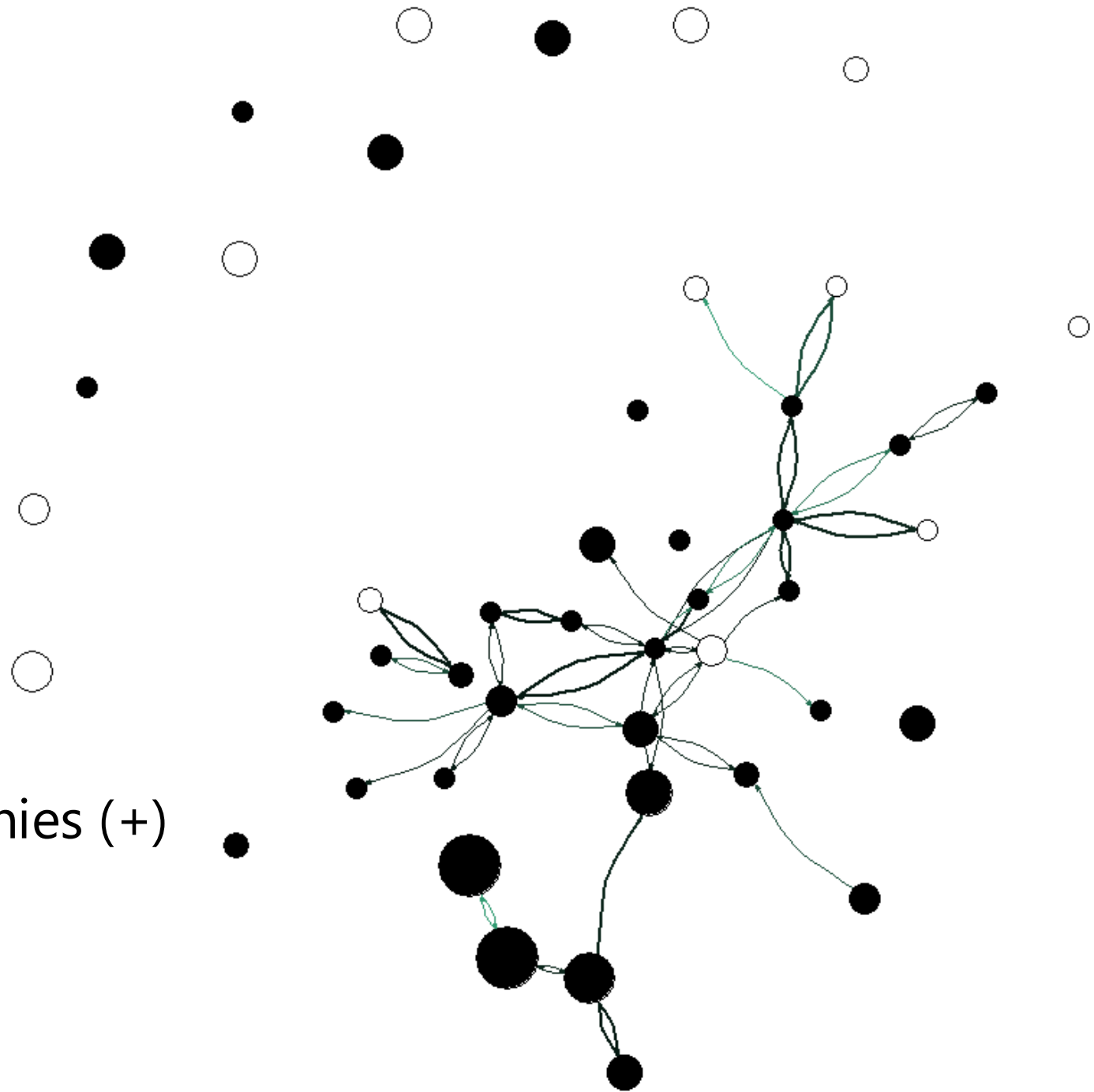
Configuration	Market		Technical	
	Full Network	Hardwood Companies	Full Network	Hardwood Companies
Mutual	75 (0.48%)	24 (2.32%)	76 (0.49%)	27 (2.61%)
Asymmetrical	36 (0.23%)	8 (0.77%)	94 (0.6%)	19 (1.84%)
Null	15465 (99.29%)	1003 (96.91%)	15406 (98.91%)	989 (95.56%)
Total	15576	1035	15576	1035

ERGM Results

	Market		Technical	
	Odds (Std. Error)	95% Conf. Int.	Odds (Std. Error)	95% Conf. Int.
Edges	0 (4.95)	[0, 0.01]	0 (3.94)	[0, 0.01]
Node Covariate (In) – Ego Diversity by Type	0.7 (1.75)	[0.23, 2.15]	0.73 (1.5)	[0.32, 1.65]
Node Covariate (Out) - Ego Diversity by Type	2.27 (1.7)	[0.79, 6.56]	4.19 (1.49)	[1.9, 9.26]
Node Covariate (In) - Ego Diversity by Association	4.31 (3.02)	[0.47, 39.39]	8.84 (2.4)	[1.53, 51]
Node Covariate (Out) - Ego Diversity by Association	0.72 (2.84)	[0.09, 5.78]	0.65 (2.37)	[0.11, 3.65]
Node Match - Size Class 1	1.3 (1.4)	[0.66, 2.56]	1.08 (1.33)	[0.61, 1.9]
Node Match - Any Other Size Class	2.55 (1.46)	[1.2, 5.41]	1.9 (1.39)	[0.98, 3.67]
Node Match - Association Membership	1.03 (1.28)	[0.63, 1.69]	0.88 (1.26)	[0.56, 1.4]
Edge Covariate - Distance Class	0.63 (1.19)	[0.44, 0.89]	0.71 (1.16)	[0.53, 0.95]
Reciprocity	4124.42 (3.35)	[367.2, 46326.06]	532.01 (2.26)	[104.02, 2720.88]
Node Covariate (In) - People Inside Company	1.42 (1.2)	[0.99, 2.04]	1.16 (1.14)	[0.89, 1.51]
Node Covariate (In) - People Outside Company	0.94 (1.26)	[0.6, 1.49]	0.93 (1.2)	[0.65, 1.34]
Node Covariate (In) - News and Social Media	1.3 (1.15)	[0.99, 1.72]	1.32 (1.12)	[1.04, 1.66]
Node Covariate (In) - Reliance on Publications	0.65 (1.2)	[0.45, 0.93]	0.67 (1.18)	[0.48, 0.93]
Node Covariate (In) - Reliance on Industry Associations	1.31 (1.2)	[0.91, 1.88]	1.2 (1.18)	[0.86, 1.68]

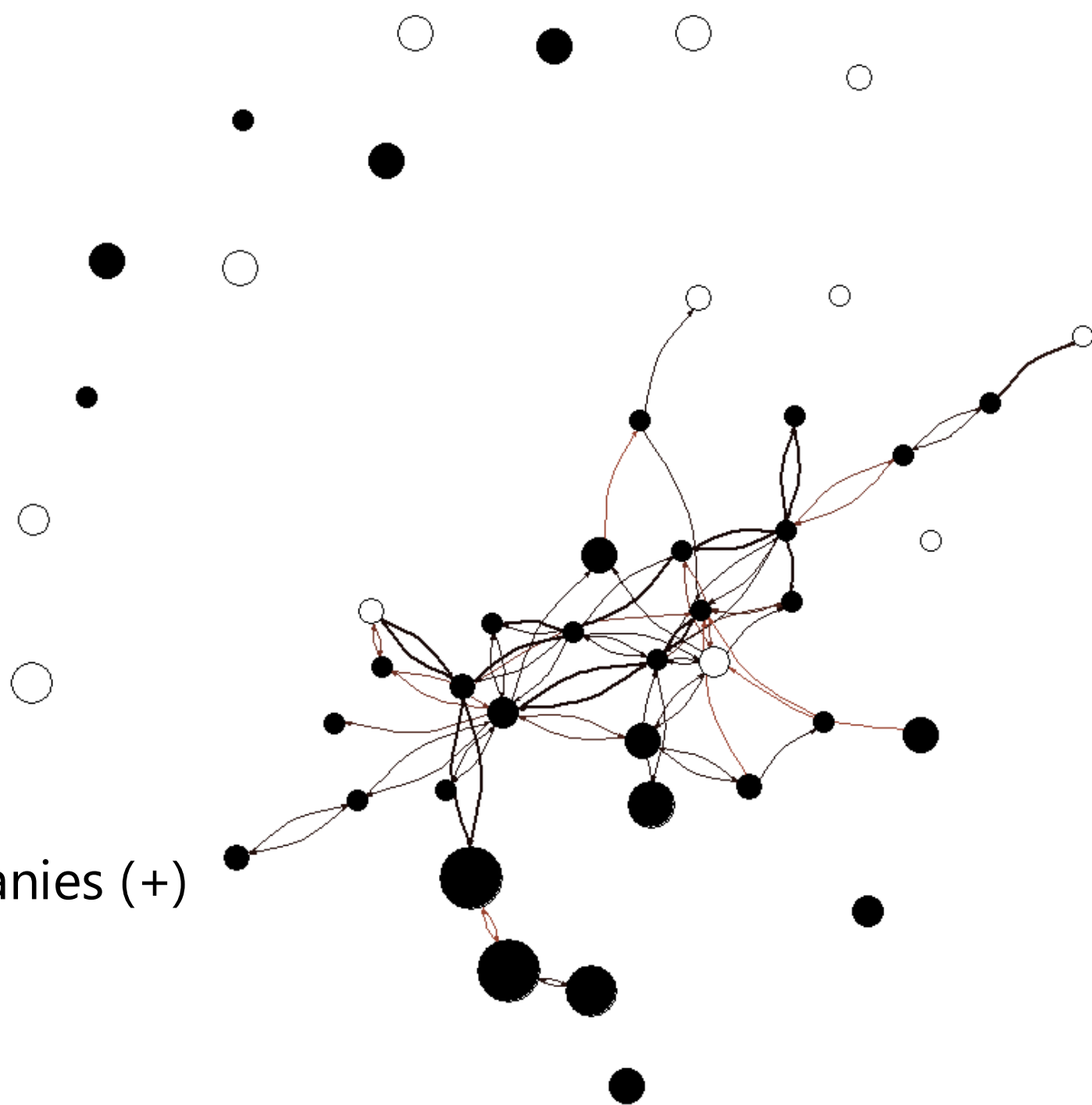
Market Hardwood Only

- Edge density (-)
- Geographic distance (-)
- Importance of publications (-)
- Homophily among larger companies (+)
- Reciprocity (+ + + + +)



Technical Hardwood Only

- Edge density (-)
- Geographic distance (-)
- Importance of publications (-)
- Ego diversity by type (+)
- Ego diversity by association (+)
- Homophily among larger companies (+)
- Reciprocity (+ + +)



Key Takeaways

- Reciprocity had the largest effect
- Market information
 - Trust
 - Motivation
- Technical information
 - Training and mentorship
- Limitations



Thank you

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