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

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Outline

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- 2. Research Questions
- 3. Method Social Network Analysis
- 4. Results
 - 1. Demographic
 - 2. Descriptive
 - 3. Model
- 5. Takeaways



The Hardwoods

Oregon white oak

Quercus garryana



Madrone

Arbutus menziesii

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

Bigleaf maple

Acer macrophyllum

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)



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)



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)

Degree centrality

(Marsden, 2002)







Geographic distance







(McPherson et al., 2001)





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





Results

The Wood Database

Demographics



Demographics

Hardwood Companies 18 35 16 30 14 25 12 Frequency 20 10 15 8 10 6 5 4 0 Academic, Non-Profit, & Government 2 Wood products Western hardwoods Wood products . Western species Wood Products Hardwoods Nood Products - Softwoods Wood Products - All species Machinen & Equipment other 0 Westernhardwoods Westernspecies Allspecies Hardwoods Company Type

All Companies

Species Processed

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	Hardwood		Hardwood	
	Network	Companies	Full Network	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%)	
	15465	1003	15406	989 (95.56%)	
Null	(99.29%)	(96.91%)	(98.91%)		
Total	15576	1035	15576	1035	

	Market		Technical	
EKGIVI Kesuits	Odds	95% Conf. Int.	Odds	95% Conf. Int.
	(Std. Error)		(Std. Error)	
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		[367.2,		[104.02,
	4124.42 (3.35)	46326.06]	532.01 (2.26)	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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