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Typical social networks of family forest owners in timber trade

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Abstract

This study sought to identify the most typical timber trade network structures among Finnish family forest owners. Finding the most typical networks means that owners' *structural equivalence* is defined. From a forest policy perspective, structurally equivalent owners, i.e. those who have the same kind of network structure, can be reached in similar ways. Data were collected via a mail questionnaire. The questionnaire was sent to 2084 Finnish family forest owners. Response rate was 59.7. After multiple imputation, social networks of 753 forest owners were included in the examination. The four most typical social-network structures in timber trade were identified through a cluster analysis. The members of *FMA-partners* have always connection with an advisor of the local Forest Management Association (FMA). This connection is often bi-directional and exclusive. Connections of *Independent timber sellers* are directed mainly towards a timber buyer. *Relationship builders* have the greatest number of connections compared with other groups. *Non-committed FMA-members* have a dense connection with FMA and relationships also with a timber buyer and their family. Knowledge of owners' networks helps service providers to offer support in timber trade and in other concrete decision situations. Service preferences of the identified owner groups need, however, more in-depth study.

Keywords: ego-centered social networks, structural equivalence, TwoStep Cluster Analysis

1. Introduction

1.1 Timber procurement challenge in Finland

In Finland, non-industrial private owners hold 60% of forest land (Forest Finland in Brief, 2009). These family forest owners also play a key role in forest industry's timber procurement. Their share of yearly cutting removal from Finnish forests is about 80%, i.e. about 45 million m³. On average, a private forest owner makes a timber trade approximately every third year (Hänninen et al., 2010).

A common change all around Europe and in the U.S. in private forest ownership structure seems to be that forest owners are ageing and the importance of the cutting incomes to their family economy is decreasing (Butler and Leatherberry, 2004; Butler, 2008; Karppinen and Tiainen, 2010). In addition, many forest owners are not living next to their forest holdings anymore, so they are becoming estranged from their forest property and thus often also from the local forestry community (Karppinen et al., 2002; Hänninen et al. 2010; Hänninen and Karppinen, 2010). Also, the structure of forest holdings is still fragmenting. All these changes mean additional challenges to forest industry enterprises in their timber procurement: new ways to reach and activate increasingly variable forest owners need to be found through modifying and better targeting marketing and communication activities.

1.2 Ways to conduct a timber trade

Both stumpage and roadside trade types are in use and depending on the area, about 80% of timber trades are stumpage trades. Stumpage trade means that the forest owner sells the logging rights of standing trees to a timber buyer and the buyer takes care of the cuttings and transportation. Roadside trade means that the forest owner himself is responsible for carrying out or arranging (and paying for) the timber cutting and transportation to the roadside. The specific characteristic of timber market in Finland is that the buyer very often represents one of the three major forest industry enterprises.

In Finland, a forest owner can offer his/her timber for sale in two different ways: 1) the forest owner can sell timber directly to a forest industry enterprise, either as a contract customer or a 'free agent', or 2) the forest owner can empower a local Forest Management Association (FMA) to conduct the timber trade. Being a contract customer with a certain forest industry enterprise usually means a specifically defined price guarantee for forest owner from the timber sold. Industry enterprises underwrite to buy timber that their contract customers are willing to sell and, on the other hand, forest owners are encouraged, but not obliged, to favour their contract enterprise while selling timber. The share of empowered trades via FMA is about 40–50% depending on the region. In an empowered trade, FMA is assumed to have good knowledge about local timber trade situation. FMA asks offers from timber buyers on behalf of the owner and recommends the best offer for the owner who makes the final decision. The roles of different actors and possible contorting effects related to timber trade have been under debate in Finland.

1.3 Social network analysis

Social network analysis (SNA) is a multidisciplinary method and research approach. Its origin is in disciplines of psychology, anthropology and sociology but also in the graph theory from mathematics (Knoke and Yang, 2008; Wassermann and Faust, 1994). A social network describes relationships between individuals or organizations, and the significance and roles of these relationships (Wassermann and Faust, 1994). SNA can be a theoretical framework, an analysis technique and a way to collect data. Through his or her social relationships, an individual gathers social capital (Bourdieu, 1979; Burt, 1992). This study assumes that social capital enables the owner to get profound information for timber trade and to consider this information reliable. Forest owners use the information that they gather through the network in their decision making. On the other hand, social network reveals the personal communication channels through which different forest owners could be reached based on their existing network.

Social network analysis has not been used much in forest owner related studies, although Moreno developed sociogram as early as in 1930s (Moreno, 1934) and although SNA has gained popularity in, e.g. epidemiology, management research and business economics during the last decades (Wassermann and Faust, 1994). Some numerical results have recently been published from the U.S., where Rickenbach (2009) has studied landowners' co-operation. Social networks can support forest owners in practical decision-making situations, and more widely, it opens opportunities for peer-to-peer learning or the enhancement of owners' social identity (Hujala and Tikkanen, 2008).

In this study, social networks around family forest owners are studied. These kinds of networks, concentrated around one actor, *ego*, can be called ego-centered networks (Wassermann and Faust, 1994). The members of network are called *alters*. In this study, the relationships, i.e. *ties*, between ego and alters were identified, and the possible relationships between different alters remain unknown.

Structural equivalence is an SNA-related concept and it describes how similarly actors have positioned in their networks. In this study, the focus is on forest owners and due to the ego-centered approach forest owners are always at the centre of their networks. As a result, structural equivalence actually describes how similar forest owners' networks are. To illustrate the idea of structural equivalence, all studied forest owners can be placed in a same network (Fig. 1). The forest owners who have same kinds of ties in this network are structurally equivalent.

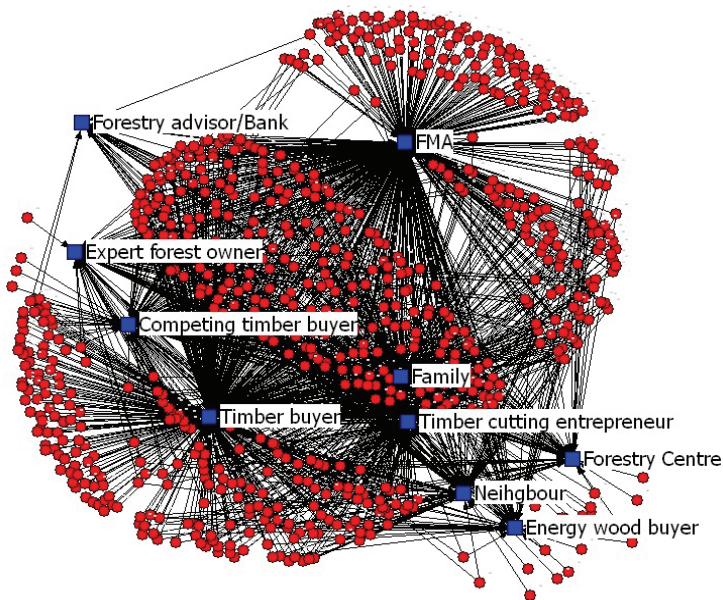


Figure 1. Illustration of structural equivalence. The gray circles are the studied 753 forest owners, white squares are different alters that are members of forest owners' networks and the lines between the circles and the squares show existing ties of the forest owners in their recent timber trade.

2. Objectives

In this study, social networks are considered as information flow channels. Different forest organizations, such as timber buyers or public agencies, try to reach different forest owners in different ways in their marketing and communication activities. For example, they try to activate them to sell timber. The main objective of this study is to define the most typical social networks of forest owners in a context of a timber trade process. This will reveal channels for reaching different owners. In addition, we will study the background variables of owners in the identified networks.

3. Data and methods

Network data on forest owners' latest timber trade were collected via a mail questionnaire from Finnish family forest owners in autumn 2009. The questionnaire was sent to those forest owners who had already answered to an earlier mail questionnaire of the large "Finnish Family forest owner 2010" study (Hänninen et al., 2010). In the large family forest owner study, non-response analysis was also carried out and in the calculations of the results a reasoned weighting was used so that the responses correspond to the Finnish population of family forest owners. The same weights were also used in this study as the remarkably significant differences between the respondents and non-respondents were perceived only among Swedish-speaking forest owners, who were located in the area of regional Forestry Centre on the coast (Rannikon Metsäkeskus) and among genders. The response percentage of Swedish-speaking forest owners was lower due to the questionnaire appearing only in Finnish, but their share of sample was only 6%. The share of women among respondents was lower than among non-respondents and this needs to be taken into account when interpreting the results.

Questionnaire was sent to 2084 forest owners and 1244 valid responses were received. Due to the earlier questionnaire, the response rate in the latter questionnaire was as high as 59.7%. The questionnaire included three parts with different focuses. The third part of the questionnaire concentrated on the forest owner's latest timber trade, if such was done less than 5 years ago. The questionnaire section included detailed questions about the network that was part of the decision making in this trade. In the network question, forest owners were given ten possible alters (Fig. 2) and they were asked to define if they had been in contact with those alters during their latest timber trade. Forest owners were asked to specify contact occasions, the direction of relationship (indegree or outdegree), and the importance of the relationship for the success of timber trade (Fig. 2). Outdegree direction means that the forest owner had been more active in contacting the alter and as opposite to this, indegree means that the alter had been more active in contacting the owner. In this study, different alters, for example the workers of FMAs, are thought to represent the same alter in different forest owners' network, which means that they are in the same place in the network (Fig 1).

C5 Specify the number of personal contacts (meeting, phone call, email) with the actors below.

	There was a contact between me and the actor	The actor contacted me	I contacted the actor	Importance
	Number of contacts	(you may cross both)		Rate (4-10)
Forestry organizations				
1 FMA – local advisor	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2 Forestry centre person	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3 Timber buyer	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4 Competing timber buyers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5 Energy wood buyers	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
6 Timber cutting entrepreneur	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
7 Bank's forestry advisor	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Near-by persons				
8 Neighbouring forest owners	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
9 Expert forest owner	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
10 My own family (spouse, children, parents..)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
11 Other, define? _____	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Figure 2. The network question in which forest owners were asked to specify contact occasions, direction of relationship and importance of relationship with ten potential alters in their latest timber trade. Importance was not used in this study.

The grouping method for finding the structural equivalence was TwoStep Cluster Analysis (Norusis, 2004; SPSS Inc., 2010a p. 404–411). TwoStep Cluster Analysis was used as grouping method because of the great size of data. Grouping variables were contact occasions and direction of the contact. Contact occasions were classified 0-2 (0 = no contact, 1= one or two occasions, 2= three or more occasions). Indegrees and outdegrees were coded 0 or 1 (1 = indegree connection, 0 = no indegree connection). Missing occasions and directions were imputed with multiple imputation procedure in SPSS to get large enough data for several groups (Allison, 2001; SPSS Inc., 2010b p. 17–43). Only the cases, with either missing occasions or missing directions were imputed. If both were missing the forest owner was omitted from the analysis. The variables used in the regression model in imputation to explain missing occasions and directions of the relationships were age, socio-economic position, language, place of living, education, ownership form and existence of forest plan. These variables (according to a separate variance t-test) were best able to explain the missing variables.

In the final data, 31% of the occasions and 18% of directions were missing and they had to be imputed. Imputation is never perfect and it is

thus important to know how imputation affects to the data. Imputation was performed five times. Grouping was done in all imputation occasions. The same final groups with similar lines of interpretation were found in four different imputations and in perfect data with no imputations (n = 373) (Fig 3). The percentages of the groups were only slightly different among imputations and only imputation number 3 gave somewhat different groups. Each forest owner was defined to belong to the group in which s/he belonged to in most of the imputations. Final data after imputations included 753 forest owners.

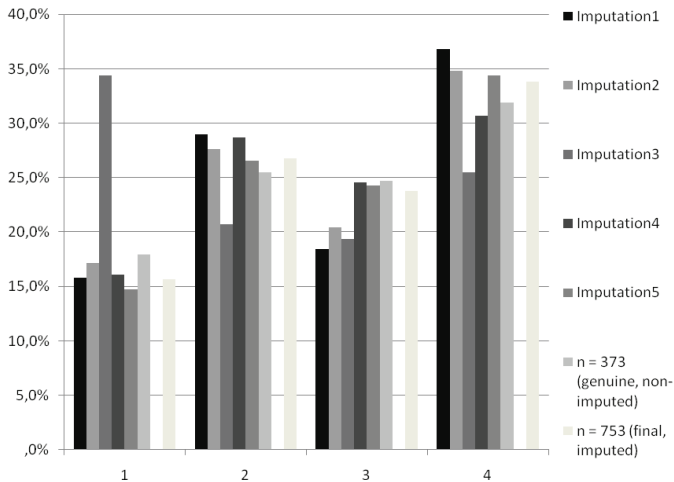


Figure 3. Division of four groups in five different imputations, in non-imputed data (n=373) and in final data, imputed with majority rule (n=753).

4. Results

The cluster analysis resulted in four network structures that Finnish family forest owners had had during their latest timber trade between years 2005-2009 (Fig 4). The most distinct were three groups; *FMA-partners* (15% of owners), who had connections often only with forest management association; *Independent timber sellers* (27%), who had connection mainly with timber buyer; and *Relationship builders* (24%), who had notably more connections than others. The fourth group, *Non-committed FMA-members*

(34%), is an intermediate group between FMA-partners and Relationship builders.

FMA-partners had a strong, bi-directional contact with the local Forest Management Association (Table 1). They did not have a straight contact with the timber buyer and they only had 1.3 alters on average. The strong connection with the advisor of FMA means that the advisor took care of the whole timber trade. The relationships of Independent timber sellers were directed to the timber buyer and owners had self-actively created these contacts. The members of this group had approximately two alters. Besides the timber buyer, they had commonly connections with family members, timber cutting entrepreneurs or competing timber buyers (who were asked for an offer but with whom a contract was eventually omitted). Relationship builders were the ones who had the greatest number of alters in their timber trade decision making, approx. 5.3. Connections with the timber buyer, FMA, a competing timber buyer, family, and a timber cutting entrepreneur were most typical. Non-committed FMA-members had always a connection with FMA but they could also have a straight connection with the timber buyer. They had approximately three connections; besides FMA and the timber buyer also with their family or a timber cutting entrepreneur.

Table 1. Connection percentages with alters by groups. The last column to the right shows the average commonness of alters weighted by the share of groups.

	FMA-partners	Independent timber traders	Relationship builders	Non-committed FMA-members	Average
Timber buyer	3	92	99	61	69
FMA local advisor	100	1	82	100	69
Family member	3	37	65	49	42
Timber cutting entrepreneur	3	23	63	29	31
Competing timber buyers	4	12	72	4	22
Neighbouring forest owner	1	10	45	14	18
Expert forest owner	2	13	37	13	17
Energy wood buyer	3	9	20	11	11
Forestry centre	3	6	23	11	11
Bank's forestry advisor	1	2	19	4	6

With respect to the background variables of forest owners, FMA-partners are elderly and more often retired than others are. They are the ones who are not living next to their forest holdings as often as others are. Half of them have done less than five timber trades during the time they have owned forest. Independent timber sellers sell timber more often than average, but the size of their timber trade (m³) is smaller than average. Together with Relationship builders, they are more active to conduct silvicultural operations such as planting, pre-commercial treatments of young stands and thinning by themselves than FMA-partners are. Relationship builders are more active to sell timber than owners in other groups are and they have the largest forest holdings (approx. 56 hectares). They also sell more cubic meters per trade than others. Relationship builders have the highest indegree of timber buyers and competing timber buyers, which is due to the large size of holdings and greatest amount of timber sold; this group is thus the most interesting customer segment for forestry enterprises. Non-committed FMA-members have the smallest forest holdings (approx. 35 hectares) but during the time they have owned forests, they have made more timber trades than FMA-partners. As many as 81% of FMA-partners had conducted their latest timber trade by empowering Forest Management Associations to do it, and among Non-committed FMA-members the corresponding percentage is 58. Fifty-three per cent of Independent timber traders and 43% of Relationship builders were contract customers with timber buying companies in their latest timber trade.

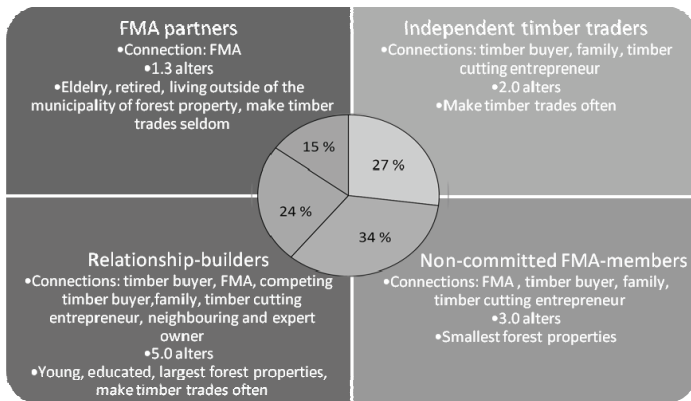


Figure 4. Family forest owners' most typical networks in timber trade and the share of the groups (n=753).

5. Conclusions

This study aimed at identifying the most typical timber sale network structures among Finnish family forest owners by applying a rather new kind of approach. Social network analysis can be a useful methodology for studying forest-related decision-making situations. Its results can, e.g. help to develop forest owners' guidance, forest planning services and planning systems so that owners can better be supported in their practical decision making.

Half of the studied forest owners; FMA-partners and Non-committed FMA-members, had always connection to the FMA in their recent timber trade. The position of FMA will probably remain strong also in the future as far as forest owners are ageing and the average size of forest holding remains relatively small. The other groups that were identified, Relationship builders and Independent timber sellers, have often direct connections with timber buyers and they also sell timber more frequently.

With respect to timber procurement of forest industry, Relationship builders and Independent timber sellers can be thought as the most easily attainable customers. Opposite to this, FMA-partners are the ones who need to be encouraged or even pushed to timber trade. FMA-partners are not living next to their forest holdings and they are maybe not that familiar with their forests or which operations to conduct next in the forest. The easiest way to reach them is through FMA because they already have connections and they probably also trust local FMA advisors. FMA-partners might not be willing to use more of their time to timber trade or forestry issues.

Attempts to increase the forest holding size in Finland have been initiated to improve the cost-efficiency of forestry operations and profitability of family forestry as well as access to timber resources. So far, easily attainable services and contact from one place are essential for small-scale forest owners. Producing and developing these services is important to persuade the future forest owners to sell timber. Results of this study suggest that the services offered by FMA could include basic activating features while private entrepreneurs and forest companies could incorporate also more advanced-level services.

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