Structures and dynamics of transnational cooperation networks: evidence based on Local Action Groups in the Veneto Region

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Paper prepared for presentation at the 3rd AIEAA Conference
"Feeding the Planet and Greening Agriculture: Challenges and opportunities for the bio-economy"

25-27 June, 2014
Alghero, Italy

Summary

The paper assesses the structures and the dynamics of transnational cooperation projects promoted by Local Action Groups (LAGs) in different periods (from LEADER II to LEADER Axis) using Social Network Analysis (SNA) in a specific case study: the Veneto region in Italy. The classical indexes of SNA have been critically examined, moreover the paper presents innovative indexes able to capture the peculiarity of transnational cooperation: disaggregated densities of the network and transnational centrality of the node. These indexes are useful in order to quantify how transnational a network actually is, and to measure the power-information that each actor (LAG) can acquire through its transnational contacts. The methodology can become an instrument for Managing Authorities to implement new forms of evaluation of transnational cooperation of LAGs.

Keywords: rural, transnational cooperation, LEADER, social network analysis, evaluation

JEL Classification codes: O22, O18

1. INTRODUCTION

Since the 1950s rural areas have been extensively analyzed and evaluated using a sectorial approach, allowing the comparison to certain urban standards and, consequently, depriving them of

their peculiar characteristics (Saraceno, 2013; Bell *et al.* 2010; Sotte, 2006). In the last 30 years a new narrative has emerged considering each rural territory as a unique environment, which comprises the local combination of social, economic and institutional factors (Saraceno, 2013). The rural space is now conceived as a multifunctional territory and the diversities of rural areas are reckoned as potential economic opportunities, complementary to the urban ones (Saraceno, 2013; Sivini, 2006; Sotte, 2006; Leon, 2005). The importance of a territorial approach to rural development has been officially recognized by the European Commission (EC 1997, 1996, 1988) and the concept has been applied through the LEADER (*Liaison Entre Actions de Développement de l'Économie Rurale*) initiative, which proposes an 'area-based', 'bottom-up' and 'multi-sectorial' approach (EC No 1698/2005 and EC No 1305/2013). According to its principles, LEADER tries to promote each territory preserving and fostering its specificities and diversities, which are considered as relevant economic opportunities (Saraceno, 2013) but with a peculiar socio-institutional method that distinguishes LEADER from other classical rural development programs and projects. Thanks to this method, local actors should be embedded in a process of territorial regeneration realized through innovative local governance, structured on a 'new social order' (Papadopoulou *et al*., 2011). In order to highlight strengths and weaknesses when passing from ambitious theoretical premises to real applications, a critical perspective and a systematic evaluation of the financed initiatives are required.

The present study will contribute to the relevant literature on the evaluation of rural development with specific reference to the EU-funded LEADER projects, proposing an evaluation approach based on classical and new indexes of Social Network Analysis (SNA), applied to the transnational cooperation (TNC) projects promoted and implemented by the Local Action Groups (LAGs). The results, referred to the Veneto Region and evidencing the evolution of the networks in different programming periods (LEADER II, LEADER + and LEADER Axis), could be used by the Managing Authority to assess the LAGs performance in implementing these initiatives.

The paper opens with a brief theoretical overview of the major changes in rural development approaches, and consequently focuses on the innovative features of the LEADER projects. Despite the institutional innovation, critical elements have appeared in the implementation, evidencing the necessity of a detailed monitoring and evaluation process, currently lacking in the case of transnational cooperation projects despite the importance of the cooperation activity. In the subsequent part the evaluation method – SNA approach – is briefly presented. It must be noted that SNA has already been applied to the investigation of the internal network structures and network dynamics of LAGs (Marquardt *et al*., 2012; Nardone *et al*. 2010; Franceschetti, 2009), but not yet to the detailed examination of the transnational networks promoted by the LAGs. The proposed methodology, here applied to the case study of TNC project of Venetian LAGs for different LEADER programming periods, conducts to specific measures and results. These show a reduction of the size and density of the network that, at first sight, could be interpreted as a worsening in the performance of TNC projects. In practice, the data attest a reshape of the transnational, national and regional compositions, suggesting an increased effectiveness and better selection of cooperating LAGs. To conclude, an overview of the case study results and some suggestions for possible future researches are remarked, evidencing the opportunity to apply the method on different regional situations.

2. LITERATURE REVIEW

The present state of discussion on rurality embodies the result of the evolution in the approaches to rural development, passing from an 'exogenous' to an 'endogenous' approach, till reaching the contemporary 'neo-endogenous approach' (Shucksmith, 2009). The first was influenced by Keynesian and neo-liberal economic theories that, even standing from different viewpoints, induced the application of the sectorial top-down approach, and conceived the development of rural areas as a consequence of the development process initiated in urban areas (Gkartzios and Scott, 2013; Lowe, 2006; Lowe *et al*., 1995). The endogenous perspective has

valorized the local human and environmental differences, and has balanced the economic, social and environmental factors using a combined approach (Gkartzois and Scott, 2013). This locally-based approach has been progressively integrated in a new mode of governance to coordinate different actors at different levels. As a consequence, various local actors have to promote local development, embedded in a network composed not only by horizontal but also by vertical relations (Shucksmith, 2009). From the previous endogenous perspective the locally-based approach kept the consideration of rural areas as places with unique characteristics and resources that necessitate flexible and specific paths for development (Saraceno, 2013; Lysgard and Cruickshank, 2013); and in a certain way it also gives continuity to some elements of the exogenous approach, as it draws the attention to connection with extra-local territories (Shucksmith, 2009; Vitale, 2006; Leon, 2005). The post-modern economy is 'informational, global and networked' (Castells, 2011), therefore local and supra-local actors are also interconnected in a complex global network that correlates horizontal and vertical ties. These relations are developed in a bi-dimensional way (vertical and horizontal) within an economic sector and intrasectorially to gain access to new economic opportunities (Murdoch, 2000; Ray, 1998). The rural interconnections can be graphically represented by a 'rural web'; this continuously reshapes its power relations and development opportunities (Esparcia, 2014; Shucksmith, 2009; Ploeg, 2006). Moreover the capacity to develop relations represents for rural areas one of the possibilities to renew their image and to become more attractive and, consequently, to stimulate the urban demand of rural products and services, thus increasing their economic performances (Ploeg, 2006; Vitale, 2006).

The increased importance of rural development is acknowledged within the EU Common Agricultural Policy (CAP)[1] (European Commission, 2011; Oostindie *et al*., 2010). In particular, the LEADER Approach became the opportunity for the European institutions to implement a neo-endogenous approach that could deal with rural areas standing from a multi-dimensional

[1] The contribution of CAP to market support decreased from 74% in 1992 to 10% 2009. Contemporary, the expenditure for Rural Development rose from 8% to 20% and the contribution to direct payments rose from 18% to 70% (EC, 2011).

perspective (Shucksmith, 2009; Vitale, 2006; Murdoch, 2000; Storey, 1999). The LEADER Approach considers the diversities of the territories as the starting point for development programs, in such a way that the specific economic, social, environmental, institutional conditions become the basis for a territorial path of integrated economic development (Saraceno, 2013; Wellbrock *et al*., 2013; Franceschetti, 2009). Thus, the capacity of any territory to be integrated in the globalized economy, only partly rests on sub-national social, cultural and institutional forms of support; it is through the enhancement of a local network in parallel to the supra-local network that multi-level governance is strengthened (Tola, 2010; Depoele and Ebru, 2006).

Local Action Groups, the local public-private partnership implementing the LEADER Approach, are characterized by the following elements: empowerment and social capital (Macken-Walsh and Curtis, 2013; Casieri *et al*., 2010; Nardone *et al*., 2010; Shucksmith, 2009; Storey, 1999), local governance (Macken-Walsh and Curtin, 2013, Nardone *et al*., 2010; Secco *et al*., 2010; Shucksmith, 2009) and local service provision (Lukesh, 2007; Gaudio and Zumpano, 2006). Helling, Serrano and Warren (2005) identify these elements as necessary for the realization of a sustainable local development process, increasing local access to public infrastructures, services, and economic opportunities. Furthermore, these elements are characterized by a specific structure – the LAG network – and by precise dynamics that represents the opportunity for the LAGs to acquire resources and innovate (Esparcia, 2014; Dwyer, 2013). As for the 'rural web', the network is formed by relations developed on horizontal and vertical levels and, referring to the horizontal relations, it is possible to distinguish between local horizontal ties, among local partners who form the LAG, and extra-local horizontal ties, among the LAGs which cooperate to plan and implement interterritorial or transnational projects. According to Ray (2006), the transnational perspective to European rural development allows to acknowledge the 'big transformation' of the last 30 years. In fact, transnational cooperation has the potential to upsurge the knowledge exchange and to expand the pooling of expertise of individual and collective actors that are fundamental to gain new viewpoints in the solution of problems and, consequently, for innovation (Dwyer, 2013). Local

territories have some specific knowledge and information that are part of their competitive advantage (Saraceno, 2013) and transnational cooperation can contribute to the knowledge sharing among different European territories (Esparcia, 2014; Saxena *et al*., 2007; Ray, 2001). Moreover, Ray (2001) specifies three rationales that motivate LAGs participation to TNC projects. The first is 'to take advantage of similarity', as the project stems from commonalities, related to natural resources, cultural heritage or services delivered. The second one is 'to take advantage of complementarity', combining different resources or places for a continuous action, according to a strategic alliance of co-opetition where conflicting and shared interests are combined for the creation of a fruitful relation (Pasquinelli, 2013; Bengtsson and Kock, 2000). The final one is 'to reach critical mass', for example using the international contacts to increase the size of local markets or of number of the end consumers and also beneficiaries (Ray, 2001). TNC projects of LAGs realize the possibility to be integrated in the global system, keeping pace with international economic structures. Thus, LAGs can be compared to network organizations, which are characterized by 'repetitive exchanges among semi-autonomous organizations that rely on trust and embedded social relationships to protect transactions and reduce their costs' (Borgatti and Foster, 2003: 995), the transnational and interterritorial cooperation is a way to enlarge LAGs network in order to be integrated in the supra-local system, and to take advantage of the creation of a shared capital for some common actions. Indeed, LAGs have a public-private nature and they should act trying to realize economic and social benefits for their territory (Council Regulation (EC) No 1698/2005, Art. 61, 62; Regulation (EU) No 1305/2013). The network activity is a fundamental instrument to produce these impacts as different authors have pointed out (Aral and Alstyne, 2007; Borgatti and Foster 2003; Burt, 2002; Granovetter, 1973) and consequently Social Network Analysis can represent a useful instrument for the structural evaluation of this activity.

3. METHODOLOGY

Transnational cooperation projects can be regarded as a remarkable opportunity for LAGs to exchange fruitful information, contextual expertise and local knowledge, thus enhancing the opportunities of innovation and of economic benefits. These projects create a grid composed by direct and indirect relations and, for this reason, SNA is the most appropriate tool to quantitatively and graphically describe the network structure and the power distribution within it (Hanneman and Riddle, 2005; Borgatti and Foster, 2003; Wellman, 1988). Different authors have applied the SNA to the analysis of LAGs structures and relations, but the focus have been mainly on the network composing the LAG, while the perspective here adopted is on the network created by the LAGs in realizing TNC projects. Some classical indexes of SNA have been employed and are summarized in table 1.

Table 1. Some Classical Social Network Analysis indexes.

Size (N)	Number of nodes of the network.
Degree (d(n))	Number of relations that involve the specific node.
Density (D_n)	Proportion of all ties that are present in the network compared to those that could be present. It correspond to: $\frac{tot(n)}{\left[\frac{N(N-1)}{2}\right]}$ $\frac{\text{tot(n)}}{\left[\frac{\text{N(N-1)}}{2}\right]}$, where tot(n) is the total number of ties present in the network.
Geodesic Distance	Number of ties of the shortest path linking two nodes.
Diameter	The larger geodesic distance of a network.
Clustering Coefficient	Density of the nodes with whom a specific node is connected.
Degree Centrality	Normalized number of edges incident upon a node, corresponding to: $\frac{d\,(n)}{N-1}$.
Closeness Centrality	Normalized geodesic distance of a node from all the other nodes in the network.
Betweenness Centrality	Number of geodetic paths that pass through a given node, indicating the role of connector of one actor for the others.
Centralization	Normalized distribution of degree centrality among all the nodes of the network.
Eigenvector Centrality	Weighted degree measure in which the centrality of a node is proportional to the sum of centralities of the nodes it is adjacent to. Intended as a measure of node importance in a network based on its connections.

Source: Borgatti and Everett (1997).

In the proposed evaluation approach of the TNC projects, it is also important to identify specific indexes able to capture the peculiar features of the transnational cooperation. Analyzing the network of TNC projects implemented by the LAG (which is a regional ego-network), different kinds of

nodes have to be considered: transnational, national, and regional. These are related according to the squared matrix represented in table 2.

Table 2. Classification of nodes and their relations in a TNC project.

	Regional LAGs	National LAGs	Transnational LAGs
Regional LAGs			
National LAGs			
Transnational LAGs			

Source: own elaboration. Only one-dimensional relations are considered.

In order to assess the peculiarities referred to networks composed by TNC projects, the densities of each type of relation are synthetically exposed in table 3. These decomposed indexes are based on the classical idea of density (ranging between 0 and 1) as a proportion of all ties which are actually present in the network compared to those that potentially could be (Borgatti and Everett, 1997), but the formula is here applied on specific typologies of relations. It is now possible to analyze how much the projects invest in the activation of transnational, interterritorial or regional ties according to the potential opportunities they have. These indexes indicate the composition of the network density according to the equation (1).

$$D_N = \frac{tot(n)}{\left\lfloor \frac{N(N-1)}{2} \right\rfloor} = \frac{D_{rr}*P_{rr}+D_{nn}*P_{nn}+D_{tt}*P_{tt}+D_{rn}*P_{rn}+D_{rt}*P_{rt}+D_{nt}*P_{nt}}{\left\lfloor \frac{N(N-1)}{2} \right\rfloor} \quad (1)$$

where $tot(n)$ is the total number of ties present in the network and N is the total of nodes of the network, D_{rr} is the regional density, P_{rr} represents all the ties among regional nodes that could be present, D_{nn} is the national density, P_{nn} represents all the ties among national nodes that could be present, D_{tt} is the density among transnational ties, P_{tt} represents all the ties among transnational nodes that could be present, D_{rn} is the regional-national density, P_{rn} represents all the ties among regional and other national nodes that could be present, D_{nt} is the national-transnational density, P_{nt} represents all the potential ties among national and transnational nodes that could be present, D_{rt} is the regional-transnational density, P_{rt} represents all the ties among regional and transnational nodes that could be present in the network. To have a more clear idea of the composition of the network ties and to facilitate the comparison over time, also a calculation of the proportion of

effective types of ties over all the effective ties of the network are calculated, according to the formula presented in table 4. This calculation enables to understand the percentage of the different typologies of relations within the network.

Table 3. Density for specific types of relations.

Regional density (D_{rr})	Proportion of the ties among regional nodes that are present in the network (rr(n)) compared to all the ties that could be present among regional nodes (P_{rr}). Where $P_{rr} = \frac{R(R-1)}{2}$ and R is the number of regional nodes of the network.	$\frac{rr(n)}{P_{rr}}$
National density (D_{nn})	Proportion of the ties among other national nodes that are present in the network compared to all the ties that could be present among other national nodes (P_{nn}). Where $P_{nn} = \frac{Na(Na-1)}{2}$ and Na is the number of national nodes of the network.	$\frac{nn(n)}{P_{nn}}$
Transnational density (D_{tt})	Proportion of the ties among transnational nodes that are present in the network compared to all the ties that could be present among transnational nodes (P_{tt}). Where $P_{tt} = \frac{T(T-1)}{2}$ and T is the number of transnational nodes of the network.	$\frac{tt(n)}{P_{tt}}$
Regional-national density (D_{rn})	Proportion of the ties among regional nodes and national nodes that are present in the network compared to all the ties that could be present among regional and national nodes (P_{rn}). Where $P_{rn} = R * Na$.	$\frac{rn(n)}{P_{rn}}$
National-transnational density (D_{nt})	Proportion of the ties among national nodes and transnational nodes that are present in the network compared to all the ties that could be present among national and transnational nodes (P_{nt}). Where $P_{nt} = Na * T$.	$\frac{nt(n)}{P_{nt}}$
Regional-transnational density (D_{rt})	Proportion of the ties among regional nodes and transnational nodes that are present in the network compared to all the ties that could be present among regional and transnational nodes (P_{rt}). Where $P_{rt} = R * T$.	$\frac{rt(n)}{P_{rt}}$

Source: own elaboration.

Table 4. Proportion of specific types of relations.

Regional/total	Proportion of the ties among regional nodes that are present in the network and all the ties present in the network.	$\frac{rr(n)}{tot\ (n)}$
National/total	Proportion of the ties among other national nodes that are present in the network and all the ties present in the network.	$\frac{nn(n)}{tot\ (n)}$
Transnational/total	Proportion of the ties among transnational nodes that are present in the network and all the ties present in the network.	$\frac{tt(n)}{tot\ (n)}$
Regional–national/total	Proportion of the ties among regional nodes and national nodes that are present in the network and all the ties present in the network.	$\frac{rn(n)}{tot\ (n)}$
National-transnational/total	Proportion of the ties among national nodes and transnational nodes that are present in the network and all the ties present in the network.	$\frac{nt(n)}{tot\ (n)}$
Regional-transnational/total	Proportion of the ties among regional nodes and transnational nodes that are present in the network and all the ties present in the network.	$\frac{rt(n)}{tot\ (n)}$

Source: own elaboration.

The transnational dimension can be analyzed also through transnational centrality (t_c) in relation to the Veneto LAGs, which traces the formula of degree centrality, defined as the normalized number

of ties of a node (Borgatti and Everett, 1997), but is based on transnational edges, calculating the total number of transnational relations of the specific node:

$$t_c = \frac{t\,(n)}{N-1} \quad (2)$$

where *t(n)* is the number of transnational relations of the node and *N* is the number of nodes of the network.

The exposed indexes can be useful to understand the transnational structure of the network. In particular, through the decomposed indexes of density and the proportion of the different types of relations over the effective edges it is possible to measure the composition and the transnational component of a network. On the other side transnational centrality helps to understand the relevance given by a node to transnational relations, especially if compared to degree centrality.

4. EMPIRICAL APPLICATION

The SNA and the new indexes presented were applied in a specific case study: the TNC projects implemented by the LAGs of the Veneto region in different programming periods. To elaborate the network data the Gephi[2] open source software has been used.

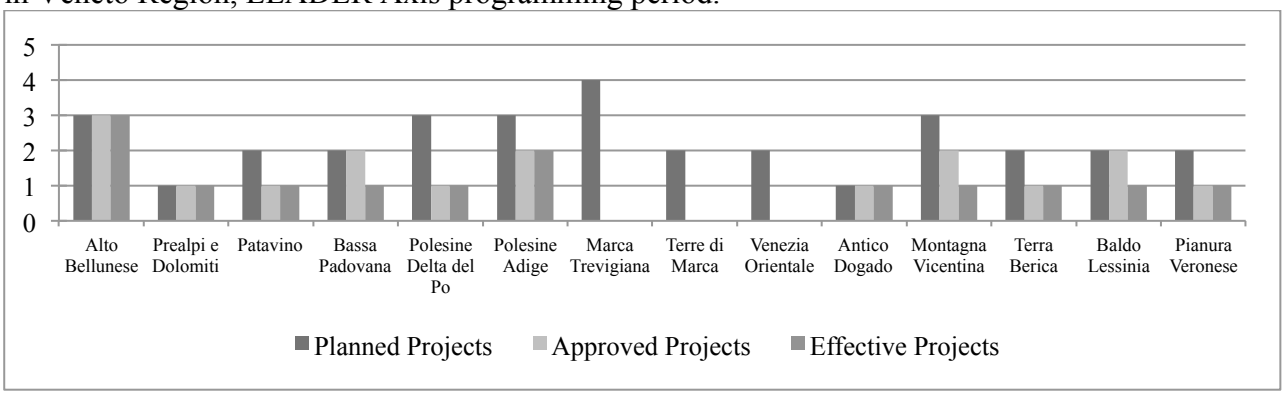
4.1. Case Study

In Veneto, Local Action Groups cover 65% of the regional municipalities and 38% of the population (Veneto Region, 2010). For the period 2007-2013, Venetians LAGs has implemented the highest number of TNC projects in Italy. Compared to the national level, Veneto is also the region where there is the highest public and private financial contribution to the TNC projects implemented during LEADER Axis period[3]. Despite these positive results, the regional data present numerous discrepancies among planned, approved and effectively implemented projects (see figure 1), probably due to procedural and administrative difficulties (Veneto Region, 2010). The number of projects realized passed from 7 projects in LEADER II to 8 projects in LEADER +, to 7 projects

[2] https://gephi.org/.
[3] Italian Rural Network database: http://89.119.249.9:8080/birt/ProCoopLeader/Index.jsp. Accessed 4 April 2014.

in LEADER Axis, besides it was interesting to analyze the evolution of the network of projects over time.

Figure 1. Comparison between planned, approved and effectively realized TNC projects, by LAG in Veneto Region, LEADER Axis programming period.



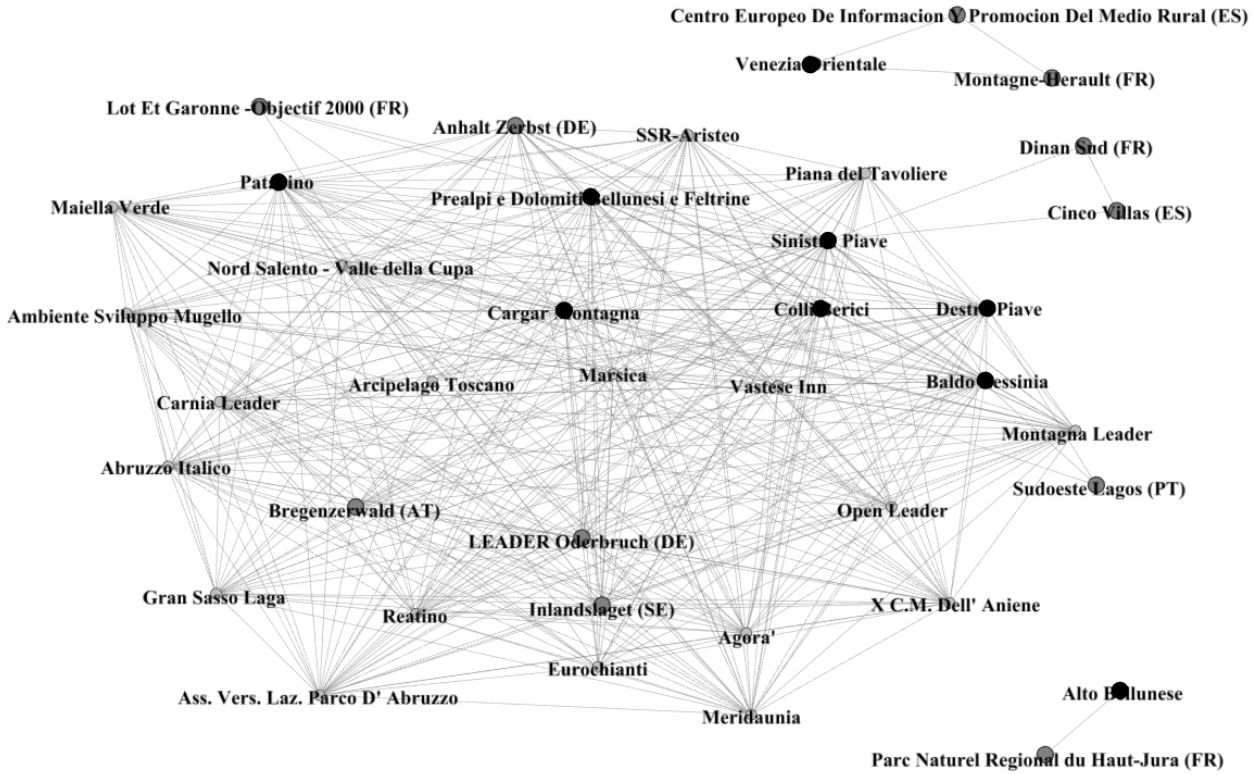
Source: own elaboration based on projects data from Italian Rural Network at http://89.119.249.9:8080/birt/ProCoopLeader/Index.jsp (accessed 2014), www.gal.veneto.it (accessed 2013), Veneto Region (2010).

4.2. Analysis of the structure of TNC projects network in Veneto, LEADER II, LEADER + and LEADER Axis programming period

The analysis considers the network of the Venetian LAGs involved in TNC projects as a whole, in order to understand which are the potential and real possibilities of information and knowledge exchange and the power distribution within the network. The network referring to the LEADER II period is presented in figure 2. In table 5 the values of the most interesting SNA indexes are presented, with reference to the LEADER II period.

During LEADER II the network is composed of 39 nodes clustered in 3 components. One of them is formed by two nodes, another by three nodes, while the third is composed by the majority of the nodes (34), including the other nationals. The density of the network is 53.3% and this is related to the high number of relations that are effectively taking place compared to the theoretical ones. The disaggregated indexes attest the highest values for the density of ties among national nodes (83.6%) and among regional and other national nodes (75.4%). The proportion between the various types of relations and the total possible, see a prevalence of ties among national and regional-national nodes (32.7%), only 5.3% of the relations are realized among regional nodes.

Figure 2. Transnational cooperation network of Venetian LAGs, LEADER II.



Source: own elaboration based on projects data from Zumpano (2001). To facilitate the visual representation, the black color is used to indicate Venetian LAGs, dark grey to indicate transnational partners and light grey to refer to other Italian partners.

Table 5. Indexes of the transnational cooperation network of Venetian LAGs, LEADER II.

SNA Index	*Value*	*SNA Index*	*Value*	*SNA Index*	*%*
Size	39	*Regional density*	0.583	*Regional/total*	5.3
Connected Components	3	*National density*	0.836	*National/total*	36.2
Average Clustering Coefficient	0.949	*Transnational density*	0.073	*Transnational/total*	1.0
Average Degree	20.256	*Regional-national density*	0.754	*Regional–national/ total*	32.7
Centralization	0.009	*National-transnational density*	0.282	*National-transnational/total*	14.9
Density	0.533	*Regional-transnational density*	0.394	*Regional-transnational/total*	9.9

Source: own elaboration based on projects data from Zumpano (2001).

Table 6 evidences that the LAG with the highest degree centrality is "Sinistra Piave" (0.868)[4], while LAG "Alto Bellunese" attests the lowest degree centrality (0.026). The values of the transnational centrality confirm these first findings: the LAG "Sinistra Piave" appears the most active in terms of capacity to acquire new information and knowledge from transnational partners (0.211). Also

[4] The LAG "Sinistra Piave" is now part of LAG "Alta Marca Trevigiana"

considering the betweenness centrality, the "Sinistra Piave" presents the highest value (90.222), meaning that this node functions as a relevant connector for many others LAGs and it can share information, expertise and knowledge with many other partners.

The network of TNC projects evolves during LEADER + programming period and it is presented in figure 3 and the overall values of the network are exposed in table 7.

Table 6. Indexes of the transnational cooperation network of Venetian LAGs, by node, LEADER II.

GAL	*Degree*	*Transnational Degree*	*Degree Centrality*	*Closeness Centrality*	*Betweenness Centrality*	*Transnational centrality*	*Clustering Coefficient*	*Eigenvector Centrality*
Alto Bellunese	1	1	0.026	1.000	0.000	0.026	0.778	0.000
Prealpi e Dolomiti Bellunesi e Feltrine	28	4	0.737	1.152	1.556	0.105	0.926	0.982
Cargar Montagna	31	6	0.816	1.061	28.222	0.158	0.768	0.996
Sinistra Piave	33	8	0.868	1.000	90.222	0.211	0.678	1.000
Destra Piave	31	6	0.816	1.061	28.222	0.158	0.768	0.996
Baldo Lessinia	28	4	0.737	1.152	1.556	0.105	0.926	0.982
Colli Berici	28	4	0.737	1.152	1.556	0.105	0.926	0982
Patavino	28	4	0.737	1.152	1.556	0.105	0.926	0.982
Venezia Orientale	2	2	0.053	1.000	0.000	0.053	1.000	0.001

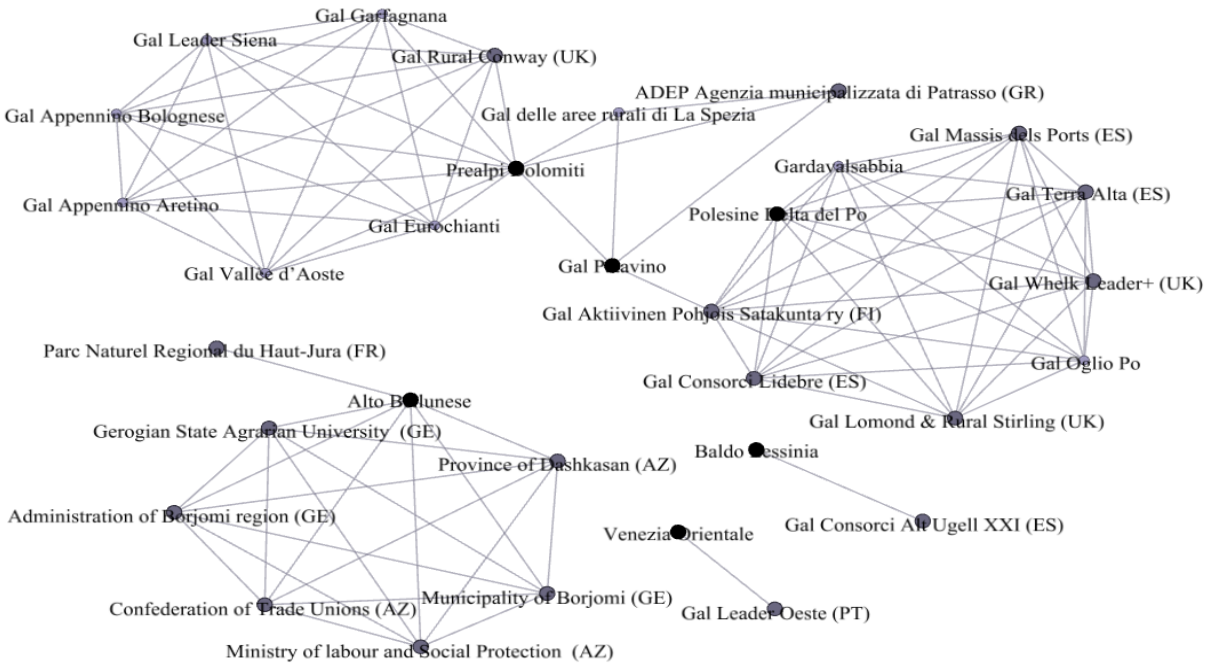
Source: own elaboration based on projects data from Zumpano (2001).

Table 7. Indexes of the transnational cooperation network of Venetian LAGs, LEADER +.

SNA Index	***Value***	***SNA Index***	***Value***	***SNA Index***	***%***
Size	32	*Regional density*	0.067	*Regional/total*	1.1
Connected Components	4	*National density*	0.444	*National/total*	16.8
Average Clustering Coefficient	0.945	*Transnational density*	0.221	*Transnational/total*	31.6
Average Degree	5.938	*Regional-national density*	0.185	*Regional–national/total*	10.5
Centralization	0.005	*National-transnational density*	0.124	*National-transnational/total*	20.0
Density	0.192	*Regional-transnational density*	0.186	*Regional-transnational/total*	20.0

Source: own elaboration based on projects data from Zanetti (2009).

Figure 3. Transnational cooperation network of Venetian LAGs, LEADER +.



Source: own elaboration based on projects data from Zanetti (2009).

During LEADER + the size of the network partially decreases to 32 nodes (from the 39 of the previous programming period), grouped in 4 components (two of them are made of only two nodes, one of them is composed of 8 nodes and one of 20 nodes). The density strongly decreases to 19.2% (while in the previous period the value was 53.3%). The disaggregated densities decrease too, but the density of ties among national nodes is the highest again. During this period, the majority of the relations are among transnational nodes (31.6%) and only 1% of the effective ties are among regional nodes. Thus, it seems that in this period the Venetian LAGs are mainly inserted in a network of transnational projects, mainly implemented by transnational nodes and the opportunity of new knowledge exchange and cooperation among regional LAGs is strongly reduced.

The LAGs with the highest degree centrality is "Polesine Delta del Po" (0.258), but in this case the LAG with highest degree centrality and the highest betweenness centrality does not correspond to the LAG with highest transnational centrality, attested by LAG "Alto Bellunese" (0.226). At the same way, the role of connectors and mediators of information in the network is realized by LAG

"Prealpi e Dolomiti" and LAG "Patavino", since their betweenness centrality values are the highest (84 and 90) and they are part of the largest component.

Table 8. Indexes of the transnational cooperation network of Venetian LAGs, by node, LEADER +.

GAL	*Degree*	*Transnational degree*	*Degree Centrality*	*Closeness Centrality*	*Betweenness Centrality*	*Transnational Centrality*	*Clustering Coefficient*	*Eigenvector Centrality*
Alto Bellunese	7	7	0.226	1.000	6	0.226	0.714	0.259
Baldo Lessinia	1	1	0.032	1.000	0	0.032	0.000	0.002
Polesine Delta del Po	8	6	0.258	2.474	0	0.194	1.000	0.968
Prealpi Dolomiti	10	2	0.323	1.895	84	0.065	0533	0.612
Gal delle aree rurali di La Spezia	3	1	0.097	2.263	0	0.032	1.000	0.146
Gal Patavino	4	2	0.129	1.789	90	0.065	0.500	0.257
Venezia Orientale	1	1	0.032	1.000	0	0.032	0.000	0.002

Source: own elaboration based on projects data from Zanetti (2009).

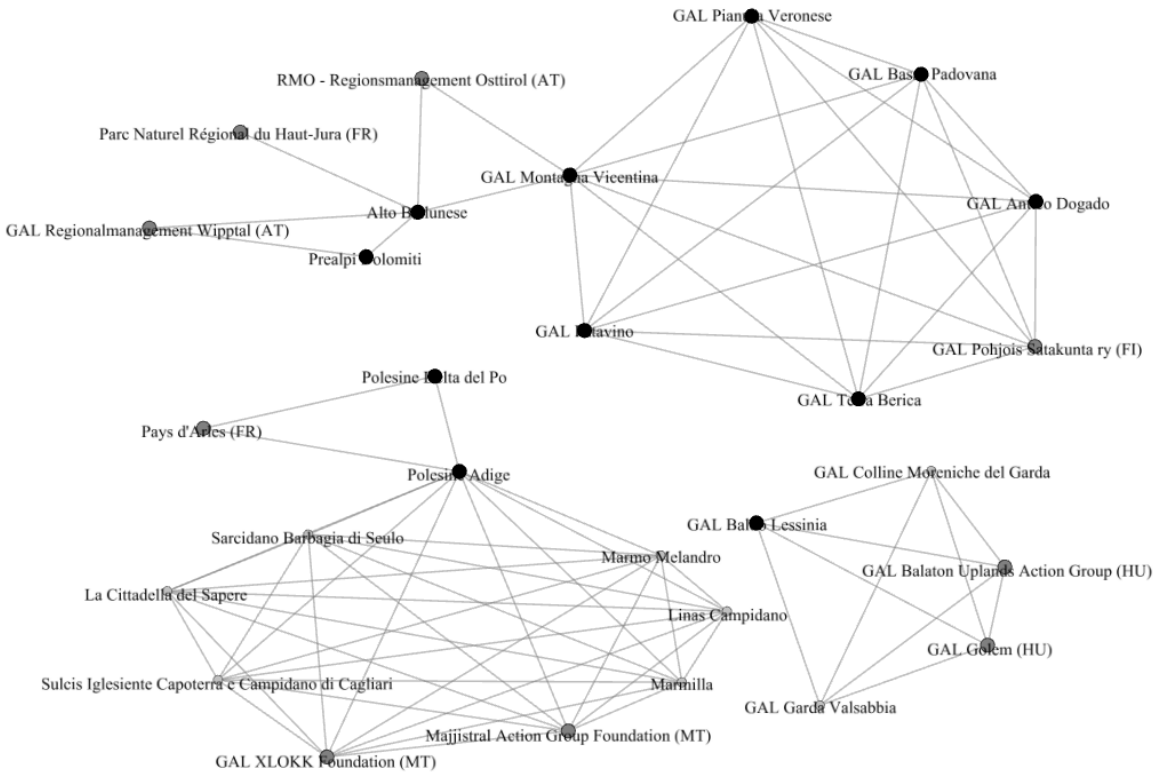
To complete the analysis, the whole network referring to LEADER Axis period is presented in figure 4. As for the others programming period, a resume of the most significant indexes is presented in table 9.

Table 9. Indexes of the transnational cooperation network of Venetian LAGs, LEADER Axis.

SNA Index	***Value***	***SNA Index***	***Value***	***SNA Index***	***%***
Size	28	*Regional density*	0.327	*Regional/total*	23.4
Connected Components	3	*National density*	0.571	*National/total*	20.8
Average Clustering Coefficient	0.941	*Transnational density*	0.056	*Transnational/ total*	2.6
Average Degree	5.5	*Regional -national density*	0.091	*Regional–national/ total*	10.4
Centralization	0.007	*National-transnational density*	0.222	*National-transnational/ total*	20.8
Density	0.204	*Regional-transnational density*	0.172	*Regional-transnational/ total*	22.1

Source: own elaboration based on projects data from Italian Rural Network at http://89.119.249.9:8080/birt/ProCoopLeader/Index.jsp (Accessed 4 April 2014).

Figure 4. Transnational cooperation network of Venetian LAGs, LEADER Axis.



Source: own elaboration based on projects data from Italian Rural Network at http://89.119.249.9:8080/birt/ProCoopLeader/Index.jsp (Accessed 4 April 2014).

During LEADER Axis the size of the network further decreased to 28 nodes, grouped in 3 components, one including 5 actors, another involving 11 actors and the third composed of 12 actors. The density however slightly increased (20.4%) with a reshape of disaggregated densities. The national density attests again the highest value (57.4%), while the lowest value refers to transnational density. Considering the proportion of the effective types of relations over the effective relations of the network, the regional/total proportion is the highest (22.1%).

As table 10 illustrates, the node with the highest degree centrality is “Polesine Adige” (0.370) and that with the highest betweenness centrality is “Montagna Vicentina” (30). The nodes with the highest transnational centrality are “Alto Bellunese” (0.111) and “Polesine Adige” (0.111). Considering together transnational centrality and betweenness centrality, LAG “Alto Bellunese” represents a key actor and information broker for the whole network, thanks to its international ties, resulted from the involvement in three different TNC projects, and its betweenness power.

Furthermore, it shows a certain evolution and stability in its transnational relations, with an increasing number of projects and partners over time.

Table 10. Indexes of the transnational cooperation network of Venetian LAGs, by node, LEADER Axis.

LAG	*Degree*	*Transnational degree*	*Degree Centrality*	*Closeness Centrality*	*Betweenness Centrality*	*Transnational Centrality*	*Clustering Coefficient*	*Eigenvector Centrality*
Alto Bellunese	5	3	0.185	1.545	26.000	0.111	0.200	0.078
Prealpi Dolomiti	2	1	0.074	2.364	0.000	0.037	1.000	0.023
GAL Montagna Vicentina	8	2	0.296	1.273	30.000	0.074	0.571	0.287
GAL Patavino	6	1	0.222	1.727	0.000	0.037	1.000	0.263
GAL Bassa Padovana	6	1	0.222	1.727	0.000	0.037	1.000	0.263
GAL Terra Berica	6	1	0.222	1.727	0.000	0.037	1.000	0.263
GAL Antico Dogado	6	1	0.222	1.727	0.000	0.037	1.000	0.263
GAL Pianura Veronese	6	1	0.222	1.727	0.000	0.037	1.000	0.263
GAL Baldo Lessinia	4	2	0.148	1.000	0.000	0.074	1.000	0.053
Polesine Delta del Po	2	1	0.074	1.800	0.000	0.037	1.000	0.145
Polesine Adige	10	3	0.370	1.000	16.000	0.111	0.644	1.000

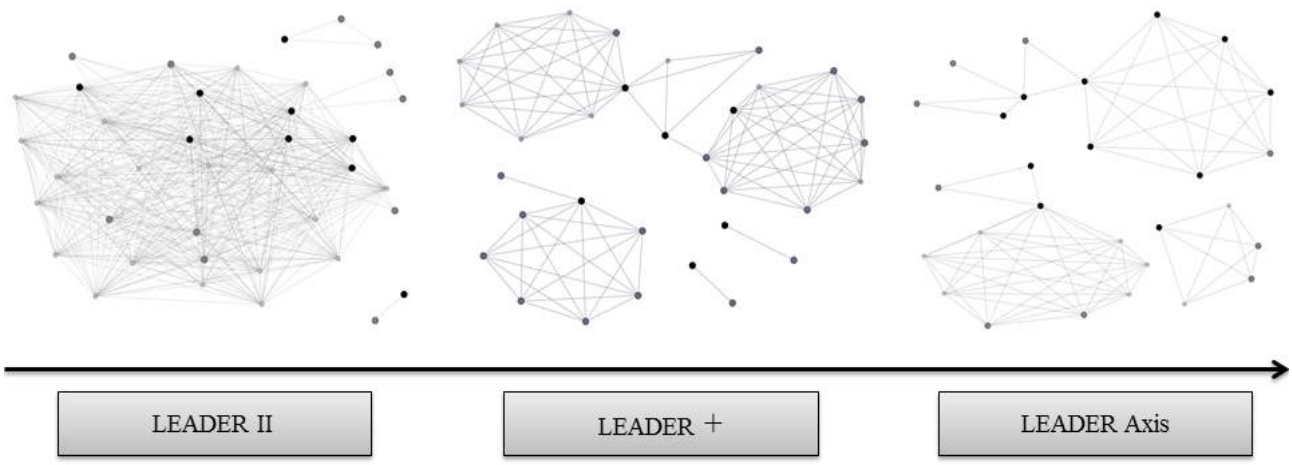
Source: own elaboration based on projects data from Italian Rural Network at http://89.119.249.9:8080/birt/ProCoopLeader/Index.jsp (Accessed 4 April 2014).

4.3. Analysis of the dynamics of TNC projects network in Veneto, LEADER II, LEADER + and LEADER Axis programming period

The size and the density of the networks evolved over time, as it is immediately possible to see by the graphs presented in figure 5. The network size decreased over time from 39 during LEADER II, to 32 during LEADER + to 28 nodes during LEADER Axis. This could signify a progressive decreasing interest in the realization of transnational projects, possibly due to bureaucratic limits, but it could also mean that there is a more effective selection of LAGs, implementing only projects that are able to respect the complex administrative procedures established for transnational cooperation. Also the network density decreased over time with a negative peak during the LEADER + (0.533; 0.192; 0.204) According to Burt's theory of structural holes, a dense networks can have limited efficiency, because the cost of connection is not compensated by the value of the information shared, which could be known indirectly through another tie (Burt, 1992). This would mean that the case studied attests a positive trend in relation to the efficiency of the information

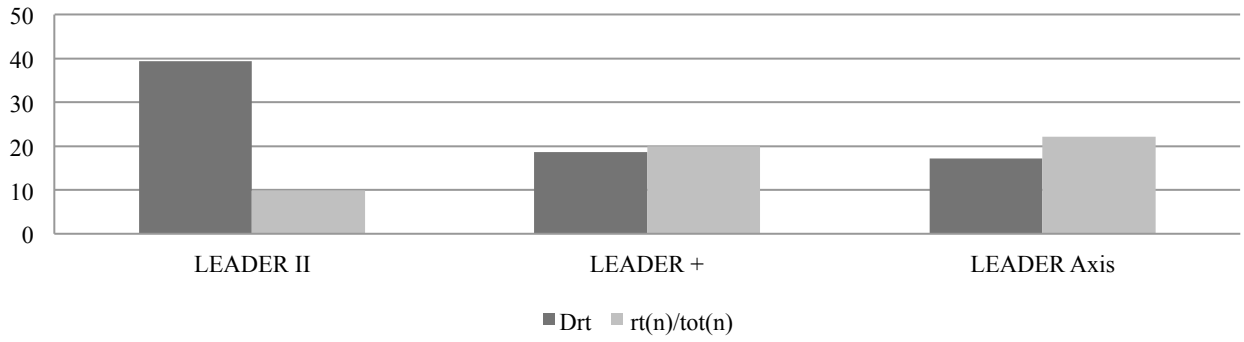
flow, since the density decreased over time. This trend is also confirmed by the regional-transnational density and by the proportion of effective regional-transnational ties over all the ties of the network. As it is possible to see in figure 6, the density of regional-transnational ties decreased over time, this means that each Venetian LAG chose to cooperate with differentiated transnational partners. This, according to Burt, is an optimization of the access to information and knowledge that will be more diversified and less redundant. Furthermore, the proportion of the transnational ties over all the ties of the network increased, meaning that the investment in transnational relations increased, despite the reduction of their density.

Figure 5. Evolution of TNC LEADER network in Veneto.



Source: own elaboration.

Figure 6. Comparison between the trend of regional-transnational density and trend of the proportion of regional-transnational ties over all the ties of the network.



Source: own elaboration.

The analysis of the evolution of disaggregated density shows also that most of the potential relations are realized by national nodes among themselves. At the same time, the trend of regional-regional density is negative, with a strongly negative peak during LEADER + (0.583, 0.067, 0.327), this data however cannot have a clear interpretation, because it can be supposed that other forms of LAGs cooperation are taking place within the regional territory being easier opportunities compared to transnational projects . Furthermore, the proportion of relations among regional nodes over the total, increased during the different programming periods. The relations among national nodes are prevalent during LEADER II and LEADER Axis periods while during LEADER + most of the relations were among transnational nodes.

In the different periods the actors more central in terms of transnational ties changed. During LEADER II "Sinistra Piave" registers the highest transnational centrality and contemporary LAG "Alto Bellunese" has the lowest value. Nevertheless, during LEADER + "Alto Bellunese" shows the highest value for the same index, confirming a positive trend during LEADER Axis. This attests its positive evolution in terms of number of projects presented and implemented and in partners' continuity, that probably indicates a good experience and stability. Even if during LEADER II it was possible to identify a correspondence between the values of degree centrality and those of transnational centrality, the following periods do not show a clear correspondence. Thus, the nodes with more connections within the network, do not necessarily realize the highest number of transnational relations.

5. CONCLUSIONS

The discussion presented in this paper proposes an innovative approach for the evaluation of transnational projects implemented by Local Action Groups. In order to clarify the importance that these projects can have for LAGs, an initial explanation of the advantages of cooperation have been exposed: the improvement of competitiveness, the pooling of expertise and know-how, the

promotion of innovation by sharing best practices and new ideas, and the enhancement of territorial identity (Esparcia, 2014; Dwyer, 2013; Ray, 2006, 2001; Pasquinelli, 2013). Transnational cooperation projects can increase the opportunities of their partners to take advantage of 'similarity' and 'complementarity', thus of co-opetition (Pasquinelli, 2013; Ray, 2001). During the implementation of these projects, LAGs compose a network that facilitates the sharing of knowledge and information, not only at local but also at extra-local level. The TNC network has been analysed in the present study through Social Network Analysis, in order to have a complete overview of the projects not only in terms of quantitative data, but also considering the relations, direct and indirect, that they can produce; to visualize the evolution of the network the analysis was realized also on past programming periods. The proposed SNA indicators are useful instruments to evaluate the structure and performance of transnational cooperation networks and can be used by the single LAG as a monitoring instrument or by the Managing Authority at regional level in order to understand the efficiency and effectiveness of the financed initiative. The case study presented shows a very dynamic network, which evolved not only in terms of size and density, but also with respect to the internal composition of the actors and their relations. This is reflected in new possibilities for the information flow and for the access to new knowledge. In Veneto, the analysis of the structure and of the dynamics of the TNC projects network, suggests a positive evolution of the efficiency of information transmission, since the proportion of transnational partners increased but the regional-transnational density decreased. These elements attest the importance of the new indexes proposed, capturing critical features that the classical indexes of SNA are not able to assess. The analysis focused only on the case study of transnational cooperation projects implemented by LAGs within the LEADER measure "cooperation". A deeper analysis could consider also other forms of territorial cooperation implemented by LAGs (such as cross-border cooperation or the interterritorial cooperation), because other forms of cooperation could give the same advantages highlighted for TNC in LEADER.

The use of SNA indicators for the evaluation of transnational cooperation is a relative simple system based on secondary data that could be applied in all Italian and European LAGs in order to understand different trends and changes in transnational cooperation in diverse regions and countries. A deeper analysis could be useful, in association to a qualitative study, necessary to better interpret the results of the evaluation. Furthermore, the investigation could be useful to identify which could be the best network characteristics to have a long-impact cooperation, considering the fact that cooperation will acquire more and more importance in the next programming period.

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