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HOW TO DEFINE AND MEASURE SOCIAL CAPITAL: THE POWER OF THE NETWORK APPROACH

Luigi TRONCA¹

Abstract

Social capital is one of the most polysemic concepts used in contemporary social science. The aim of this paper is to identify the different strategies for defining and measuring the concept with reference to the main theoretical approaches in sociology, namely micro-, macro- and meso-sociological theories. The paper will present the main characteristics of the lexical definitions and the operationalisation of concepts of individual social capital, collective social capital and network social capital. When the different study approaches are analysed, it becomes clear that there is common reference to the more general concept of social relation, although it is reduced to an attribute of individuals in individual social capital and an attribute of collectives in collective social capital. Meso theories are the only ones that manage to preserve the intrinsic relationality of the concept of social capital throughout its operationalisation. Finally, the paper claims that it is not feasible to create any form of fusion between different strategies for defining and carrying out empirical studies on the subject of social capital, as the analysis of social context in each strategy is based on different units.

Keywords: Individual social capital; collective social capital; network social capital; definitions; operationalisation; indicators.

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Introduction

Originally introduced by Hanifan (1916), the concept of social capital has, broadly speaking, been an extremely widespread element in sociological, political and economic literature since the first half of the 1990s. It is probably one of the most polysemic concepts in contemporary social sciences. This paper presents some of the most important common analytical strategies adopted to define and consequently measure social capital in an attempt to systematize some of the theoretical work featured in scientific literature. After providing a general overview of the subject, the paper will present the salient features of the main approaches towards a conceptual and operative definition of social capital and show, in particular, that all definitions make reference to the general concept of social relation to some extent. However, the group of strictly relational definitions of the concept will only include definitions that identify social relations as the starting units of analysis for the study of social capital.

General overview of definitions

As a special form of capital, social capital is required in order to achieve an aim. The differences between definitions are therefore largely based on the different solutions adopted to define what is 'social', or what constitutes society (Ostrom and Ahn, 2003; Castiglione, Van Deth and Wolleb, 2008). If this analytical framework is used to analyse definitions of social capital, it is fairly easy to see how the various theoretical approaches differ, with divergences which are well known in sociology: *micro* – society is made up of individuals –, *macro* – society is made up of collective aggregates –, and *meso* – society is made up of social relations (Dumont, 1983; Collins, 1988; Donati, 2010).

In this way three different groups of definitions of social capital can be identified. In the first of these, social capital is a characteristic of individuals, who have a certain stock of it to use to achieve their aims. The second group pools together definitions of social capital as a feature of collective aggregates (countries, regions, professional categories, etc.); if it is present in sufficient quantities, it leads to institutions operating more efficiently, a higher level of wellbeing and an overall improvement in the quality of life of the members of such aggregates. In the third group social capital can be defined, by using a network approach, as a quality of social relations, whereby the latter are a form of capital that subjects – individual or collective – mobilise to achieve their aims.

There is broad agreement in scientific literature about the appropriateness of using the expressions individual social capital and collective social capital to refer respectively to approaches to the study of social capital that define the latter

as a characteristic of individuals and those that instead consider it to be a feature of collective subjects (of different kinds: political-administrative, professional, connected to social stratification, etc.) (Borgatti, 1998; Inkeles, 2000; Lin, 2001; White, 2002; Donati, 2007; Kadushin, 2004; Esser, 2008). Without entering the debate opened by Putnam (in Borgatti, 1998) concerning the quality of social capital as a private or collective good, I would like to stress forthwith that with regard to the third set of so-called “meso” analytical strategies for the study of social capital – those of a largely relational nature – it is essentially impossible to find an adjective to add to the term social capital. Some researchers – such as Lemieux (1999) and Wellman (2007) – have spoken more or less explicitly, for example, about network capital, but it is apparent that this simply involves the replacement of the adjective “social” with another more or less equivalent word.

Individual social capital: social capital as an attribute of individuals

The most influential author with regard to this approach to the definition of social capital is without any doubt Pierre Bourdieu (1980; 1986), according to whom social capital is the only explanatory key for understanding differences in performance obtained from the cultural capital (set of knowledge and expertise) and economic capital (or instrumental capital) available to each individual. Social capital denotes a heterogeneous set of resources that are strictly individual – each individual has his or her own *stock* of social capital – and are created from the network of relations available to the subject: an individual is endowed with social capital in a directly proportional measure to the endowment of other forms of capital (cultural and economic) owned by those to whom he or she is connected.

The analytical branch of individual social capital also encompasses researchers that have developed in an individualistic way the considerations on social capital put forward by Nan Lin (1999; 2001; Lin, Cook and Burt, 2001). Lin claims that the notion of social capital is partly so appealing due to common agreement about the fact that, as a social element, social capital can grasp the essence of many sociological concepts (social integration, social cohesion, values and norms, etc.) and carry out the role of an umbrella concept covering many disciplines. Furthermore, it has certain aspects in common with other forms of capital (especially human capital) and allows sociologists above all to draw out elements and resources embedded in social structures and networks rather than in individuals. Nan Lin offers conceptual and research strategies that are useful for building a theory of social capital. In order to achieve his aim, he starts by assuming that as social capital is “extracted” from resources embedded in social networks, it should be seen as a resource present in networks. The best way to construct a theory about the subject is therefore to analyse the causal mechanisms (or external

factors) that lead to individual differences between endowments and performance levels of social capital.

The theory of social capital developed by Lin is based on the idea that investments are made in social relations with the expectation of gaining benefits through the resources that they can impart. Essentially, when individuals take part in relations and develop networking processes, they aim to obtain gains. Lin claims that four distinct explanations can be provided as to why resources embedded in social networks manage to improve the quality of results achieved through individual actions. Firstly, they facilitate the flow of information: within the market, for example, being inserted into social relations in strategic and/or hierarchical positions can enable the individual to obtain useful information about opportunities and the best choices to make. Secondly, the types of social tie established by an individual can exert an influence on the agents that play an important role in decisions affecting him or her. Thirdly, the acknowledgement of an individual's ability to access means and resources through relations may provide an organisation or his or her agents with evidence of the individual's social credentials and help him or her, for example, to find employment (the individual may supply the organisation with a number of additional resources). Finally, social relations are expected to provide a form of reinforcement to the individual's identity, guaranteeing him or her the right to the relevant resources and greater mental balance.

These four elements (information, influence, social credentials and reinforcement) can be used to explain why the influence of social capital on the actions (instrumental or expressive) of individuals cannot be explained by means of "personal" forms of capital (economic or human capital). In brief, social capital can be defined as the resources, embedded in a social structure, which are found and/or mobilised by individuals when carrying out actions with aims. Overall, this notion of social capital has three characteristic features: (1) the embeddedness of resources in a social structure; (2) the accessibility of these resources to individuals; (3) the use or mobilisation of these resources by individuals when carrying out actions with aims. According to Lin, these three features of social capital make it possible to find intersecting points between the concepts of structure and action. In brief, the aspects of both resources (embedded resources) and relations (in particular conceptualised as network locations) can be referred to the concept of social capital, and suitable conceptual processing must be carried out to formulate theories with regard to possible methodologies for empirical analysis of social capital.

Although the system defined by Lin is essentially structural in nature, some of the researchers that have referred to his contribution as part of studies on social capital have focused on developing the analytical side of embedded resources. They have therefore concentrated on the individual dimension of social capital, refining the techniques and strategies for surveying the resources which an

individual has access to through his or her network of relations and neglecting the purely relational developments (in terms of analysis of the morphology of reticular structures) of Lin's thinking (1999; 2001).

The main authors in this individualistic-based approach to social capital include Van der Gaag (2005) and Snijders (Van der Gaag and Snijders, 2004; 2005), who define individual social capital as the resources, owned by members of an individual's network of relations, which are made available to the individual as a result of the development of these relations. In the late 1990s Snijders (1999) first put forward the theory whereby the value of an individual's social capital coincides with the total expected value of the advantages and benefits that the same individual can derive from his or her links with other individuals.

I will now try to provide some examples of the operationalisation of individualistic-based definitions of social capital. As previously mentioned, from this point of view social capital is a characteristic of individuals and thus an individual attribute. As we have seen, the resource-oriented aspects of Lin's contribution tally with the general framework of this set of definitional strategies. Indeed, in order to analyse social capital empirically Lin developed the position generator technique (Lin, 1999; Lin, Cook and Burt, 2001), which basically consists of collecting data regarding access to resources in personal networks by individuals. The position generator makes it possible to collect information about the highest position in the social stratification achieved by an individual's relations, as well as the range and overall quantity of social positions reached through a personal network of relations. As a result of Lin's path of empirical and theoretical research, which saw him address the issue of the link between individual access to network resources and the ease with which a subject can carry out instrumental expressive actions (Lin 1982; 1983), some researchers involved in the study of social capital have given special importance to individual resources which subjects can access as a result of having a personal network consisting of direct ties with individuals with special attributes. As a result of this emphasis on the part of Lin's thinking closest to Bourdieu's idea of social capital, the dimension of network locations has been pushed into the background.

The contribution made by Van der Gaag and Snijders (2004; 2005; Van der Gaag, Snijders and Flap, 2008) stands out in the field of individualistic-based work related to Lin's thinking on network resources. They have studied a subject's social capital by focusing on potential access to the resources that can be reached through his or her network. In terms of mathematical formalisation, Van der Gaag and Snijders take their cue from a formula inspired by a previous study by Flap and De Graaf (1986):

$$SC = \sum_i \sum_j r_{ij} p_{ij} \quad [1]$$

where SC stands for social capital and expresses the size of ego's individual social capital, i refers to the number of members in the ego network (alters), j to

the types of resources, r_{ij} expresses the number of type j resources that possess alters and p_{ij} is the probability that alter i ensures that ego has access to its own type j resources. However, even Van der Gaag and Snijders admit that this measurement strategy can present problems.

First of all, the formula gives excessive consideration to high numbers of alters. Indeed, in some cases: (1) the help of many alters may not turn out to be good value because of the costs needed to sustain coordination; (2) the help of a wide range of alters may not be necessary and therefore prove to be superfluous; (3) the help of a wide range of alters may be scaled down by behavioural norms or rules (this is especially true for some resources of an emotional nature). Furthermore, this measurement strategy requires the collection of extremely detailed and precise information about each ego's network.

Therefore, starting from Lin's position generator and within the limits of the resources connected to the job prestige of the actors to whom ego is linked, Van der Gaag and Snijders (2004; 2005) put forward an instrument which is able to measure a higher number of resources as social capital. It is called a resource generator and can be formalised as follows:

$$SC = \sum_j s_j \quad [2]$$

where SC stands for social capital, j expresses types of resources and s_j is a measure of the availability of different types of resources to individuals (s_j may be "0", for example, in the event of the absence of a certain type of resource, j , and "1" if the same resource j is recorded as being available at least once).

This strategy for measuring social capital is typical of the individualistic solution to the problem of studying the subject. Supporters of the concept of individual social capital acknowledge that definitional and analytical strategies similar to the ones outlined above have the potential to identify macro phenomena starting from an analysis of the behaviour and choices of individual actors and prevent the loss of conceptual and methodological accuracy that can stem from an excessively broad generalisation of the concept of social capital. In particular, an international research group has now assembled around the figure of Nan Lin, adopting the position generator to study social capital and therefore creating the foundations for a rational comparison of the distribution levels of social capital and the mechanisms that can lead it to emerge or disappear, covering a wide range of different social contexts (Lin and Erickson, 2008a).

There are, however, some problems common to all individualistic strategies in the analysis of social capital. First of all, dyadic relations become an attribute of individuals, which is expressed empirically starting from the resource that could be imparted. Furthermore, these strategies completely overlook the form of the social networks in which the actors are inserted and thereby fail to define the issue of structural morphology as an autonomous dimension of social capital compared to resources.

Collective social capital: social capital as an attribute of collectives

A process of accumulation of social capital is required in order to construct a community, or indeed an economic undertaking. Social capital consists of friendship, good will, mutual understanding, solidarity and social relations between individuals and families, which become able to form a social unit. It can be claimed that the concept of social capital, which was explicitly defined in this way by Lyda J. Hanifan (1916), originated with a special vocation for collective subjects (collective social capital).

Politologist Robert D. Putnam (1993; 2000; 2001) is one of the leading contemporary researchers to have worked on defining social capital in accordance with a similar strategy to the one outlined. Putnam (1993) opened a highly productive thread of analysis of the distribution of social capital in Italy encompassing several subsequent major research projects (Cartocci, 2007; Chiesi, 2007). After studying the performance of ordinary-statute Italian regions, Putnam (1993) concluded that the higher performance of regions in the North and Centre compared to the South can be ascribed to different endowments of social capital within these regions. According to Putnam, social capital is a cultural component that can influence the institutional performance and economic development of certain areas in a country. Putnam (1993) saw social capital as trust, the norms assigned to regulate cohabitation and networks of civic associationism, which improve the efficiency of social organisation by promoting initiatives taken by common agreement. He subsequently refined this definition by claiming that social capital refers to those characteristics of social life – networks, norms and trust – which can place participants in a condition to act more effectively in the pursuit of shared objectives (Putnam, 2000). According to Putnam, social capital is a construct that researchers use to designate a broad series of heterogeneous aspects that refer to collectives (or social aggregates) but not to individuals, who are instead depicted merely as users and beneficiaries of social capital. Indeed, social capital facilitates the resolution of collective problems, allows communities to function by sustaining lower costs, increases individuals' awareness that their destinies are interwoven, helps the information that individuals need to achieve their aims circulate more easily and contributes to the improvement of their biological and psychological lives. The work of Francis Fukuyama (1995) also features a similar perspective to the one outlined above; he shares the idea that social capital is closely connected to problems related to cooperation between people. Social capital is thus seen as a resource created from the prevalence of trust in society or part of it (indeed, it can take root in a family, entire nation and intermediary bodies); it differs from human capital as it is generated – and passed on – through cultural objects and processes such as religion, tradition or habits. For Fukuyama, social capital can be defined as a set of unofficial values or norms, shared by the members of a group, which allows them to help each other in turn;

it is an extra-economic and extra-legal resource, which, however, has definable economic effects as it can reduce the transaction costs related to contracts and the application of formal rules.

A consideration of politologist Roberto Cartocci's (2007) contribution to a lexical and operative definition of the concept leads us directly to the issue of indicators of collective social capital. According to Cartocci, social capital is a collective asset consisting of trust, a sense of obligation and responsibility towards other individuals and institutions, political participation and social solidarity. The amount of social capital present in a given area determines the quality of its civil society. More precisely: (i) social capital is a collective resource that is indivisible and cannot be appropriated, a public good that all individuals can benefit from without reducing its level of availability; (ii) with regard to a given area, the endowment of social capital determines the degree of social cohesion, while the presence of social capital also favours the construction of a social environment that is favourable for economic development. In brief, Cartocci sees social capital as synonymous with "civic spirit". Along the lines of the research conducted in Italy by Putnam and his colleagues (Putnam 1993) and in order to provide an update, Cartocci (2007) suggested conducting ecological analysis with the aim of surveying the endowment of social capital in Italian provinces.

As previously mentioned, the aim of the study conducted in Italy by Putnam was to examine which factors influenced the performance of institutions. The indicators of civic community adopted by Putnam to construct a regional map of social capital in Italy were preference voting (surveyed from 1953 to 1979), the turnout at referenda (1974-1987), the number of readers of newspapers (1975) and the diffusion of sports and cultural associations (1981). Cartocci, on the other hand, takes into account indicators of social capital: the circulation of daily newspapers (years 2000-2001); the level of electoral participation (average turnout percentage at the following elections: 1999 European elections; 1999 referendum to abrogate laws; 2000 referendum to abrogate laws; 2001 political elections; 2001 constitutional referendum); levels of blood donation (data on donors and donations in 2002) and the diffusion of grassroots sports associations (data on the number of sports clubs and members recorded by CONI - the Italian National Olympic Committee, updated in 1999, and Sports Promotion Bodies, updated in the season 2001-02).

It should, however, be noted that the analytical framework used by Putnam for his research work in Italy was subsequently modified in the methodological approach he adopted (Putnam 2000; 2001) to analyse social capital in the United States of America. The units of analysis in this study, once again taking on an ecological and administrative dimension, were the states themselves. Putnam took data from different sources into consideration in order to build an overall index of social capital, which divides the concept into five dimensions and identifies several indicators for each of them:

- (i) the first dimension corresponds to the organisational life of the community, with the following indicators: the percentage of members of committees of local organisations (in the last year), the percentage of officials in clubs or organisations (in the last year), the presence of civic and social organisations for every 1000 inhabitants, the average number of club meetings (in the last year) and the average number of group memberships.
- (ii) Putnam identifies the second dimension of social capital as engagement in public life, with the following indicators: electoral turnout at the 1988 and 1992 presidential elections and the percentage of participants at meetings about school or civic matters (in the last year).
- (iii) The third dimension corresponds to the level of volunteerism in the community, shown by the following indicators: the number of non-profit organisations for every 1000 inhabitants, the average number of times of participation in a community project (in the last year) and the average number of times that voluntary work was carried out (in the last year).
- (iv) The fourth dimension of social capital consists of the presence of informal sociability, with the following indicators established by Putnam: the time spent at friends' houses and the average number of times that guests were entertained at home (in the last year).
- (v) The fifth dimension identified is social trust, which is represented by the following indicators of generalised interpersonal trust: degree of trust in most people and degree of conviction that most people are honest.

The estimates of group membership (available for forty states) were obtained from the General Social Survey, while data regarding public meetings and leadership in local organisations was taken from the Roper archive (available for forty-three states). The DDB Needham Life Style Survey instead provided the figures (available for forty-six states) for club meetings, community projects and voluntary work. The variables regarding time spent at friends' houses, the frequency of entertaining guests at home and opinions about the honesty of the majority of people (available for forty-eight states) were obtained from the "Life Style" surveys carried out by DDB Needham. The variable regarding the level of agreement with the sentence "Most people can be trusted" was instead taken from the General Social Survey (in this case data was available for forty-one states). The data on electoral turnout (available for all states) was taken from the 1994 U.S. Statistical Abstract, while data about civic engagement and the presence of non-profit organisations was generated by reworking the information in the Nonprofit Almanac supplied by the Department of Commerce (with data again available for all states). After obtaining all the information available for each indicator, Putnam summarised it by creating a social capital index, which he also used in an ordinal version consisting of an eight-level scale ranging from (1) = "very low social capital" to (8) = "very high social capital".

Many doubts have been raised regarding the validity of indicators of collective social capital (Lin, 2001; Landry, Amara and Lamari, 2001; White, 2002). Some of their limits are similar to those for strategies for defining and measuring individual social capital, while others are specific to this strategy. The former include limits regarding the inability to read the map of social relations, which is a characteristic of all non-relational definitions of social capital. The identification of certain characteristics of the social life of individuals inhabiting ecological units of analysis is also problematic, as the data obtained consists of values (absolute, percentages, etc.) that refer to collective subjects and is processed as an attribute of the latter.

The problems that are specific to these strategies for measuring social capital include a reliance on qualitative notions (such as social trust), which are difficult to measure except through scaling techniques. There is also the problem of the absolute arbitrary nature of the choice of collective subjects to be used as units of analysis of social capital (countries, regions, municipalities, professional categories, social classes, groups of individuals with a certain level of education, etc.). With regard to the last issue, it should be stressed that scientific literature provides examples of highly diversified allocations of social capital for collective subjects (Putnam, 1993; Putnam, 2000; Cohen and Fields, 1998; Forsé, 2004).

Network (social) capital: social capital as an attribute of social relations

James S. Coleman was the first researcher that made explicit observations on social capital as a characteristic of social relations and networks (1988; 1990). According to Coleman, social capital is defined by its function and consists of a variety of different entities, all connected to different aspects of the social structure. These characteristics make it easier for certain actions to be carried out within the same structure. Social capital is productive in the same way as other forms of capital (physical and human), because it enables the achievement of aims that could not otherwise be reached. However, unlike other forms of capital, social capital refers to the structure of relations between two or more people: instead of residing in individuals (human capital) or the physical components of production (physical capital), social capital is found in relations and constitutes a collective rather than an individual property. The distinctive nature of Coleman's rational choice approach is compatible with his more general switch from the problem of the aggregation of individual actions to that of the interdependence of positions occupied by individuals and collective subjects before forging a tie. This system of interdependence becomes the structure of society and influences the course of actions.

Coleman's research project (1988) offers the following examples of indicators of social capital: (i) at family level: having both parents present; parents' expectations for the education of their children; number of children (an indicator negatively connected to social capital); the amount of time that children dedicate to talking to their parents about their personal experiences. (ii) At community level (with particular reference to school-related circles): relations between parents; relations between parents and institutions; intergenerational closure – the presence of multiple ties between parents and children.

The contribution that some structural analysts have made to the definition and measurement of social capital is in keeping with certain aspects of Coleman's approach. By using a network approach, the social network – the network of social relations that emerges from the interactive paths that individuals take and contributes to forming the structure of their preferences – has now become the unit of analysis for the study of social capital in an even more explicit way.

According to structural analysis, social networks are formed through the actions of individuals, but also condition them at the same time: as a social structure, social networks are both a constraint on and an emerging effect of individual actions (Burt, 1982; Ferrand, 1997; Di Nicola, 1998; Degenne and Forsé, 2004; Freeman, 2004). There is an extremely strong connection between the concepts of social network and social capital. In a recent survey of the main issues in social network analysis, Wellman (2007) included the study of the way in which social support emerges from personal networks, which are thus a highly important form of (social) capital for individuals. Therefore, in certain conditions social networks can be a form a capital for social actors, as they constitute a resource that can be mobilised effectively to achieve objectives.

One of the most thorough explorations of the nexus between social network and social capital was conducted by Nan Lin. Indeed, Lin (1982; 1983; 1995; 1999; Lin, Cook and Burt, 2001; Lin and Erickson 2008b) made use of the concept of social resource and linked it to the concept of social capital, claiming that a resource is only *social* if it is embedded within a social network. It follows that social resources can never constitute a good owned by individuals; instead, they are resources that are only accessible through direct or indirect social ties, in other words through social networks. Unlike the mechanism for individual resources, which social actors can use freely and which can be accumulated additively, social resources are only accessible through relations and can only be used or even accessed on a purely temporary basis, which is in any case conditional on the existence of social ties. Furthermore, social resources are acquired in a multiplicative way, as every additional social tie established by an individual can potentially enable access not only to the resources directly allocated to the new contact but also to those which the latter has access to through his or her personal network of social ties. Social resources are therefore one of the central elements

of the structural reading of social capital. Lin calls them “network resources”, embedded in the social structure (seen as a network of social relations), when they are simply accessible, while they are termed “contact resources” as soon as the social actor mobilises them to achieve one of his or her objectives.

As I have already shown, it is possible to use these features of Lin’s thinking on the subject of social capital to define measurement strategies that focus on gathering information about the opportunities that individuals have to obtain social resources from their proximity networks. Nevertheless, the contribution of structural analysis is not limited to making instruments available to study social resources (which, unless suitably integrated, basically reduce social capital to an individual attribute). Another major issue is the form or morphology of social support networks – networks of relations that manage to transmit social resources to the individual (ego). The work of Ronald S. Burt (1992; 2000; 2005; 2009) is especially relevant with regard to this issue. Burt claims that there are two different primary mechanisms on the basis of which social networks can act as social capital for their constituent members. The first mechanism that Burt identifies is called brokerage, which involves the building of connections between reciprocally disconnected groups. In this case there is a competitive advantage for those that are able to operate as intermediaries between disconnected parts of the social network, namely the areas surrounding structural holes. A broker can benefit from his or her position, as all resources that circulate between separate social groups within the network pass through him or her. The social mechanisms of brokerage are generally associated with dynamics of growth and innovation for the entire network (Lemieux, 1999; Täube, 2004; Dekker, 2006). The second mechanism identified by Burt is closure (also a major element in Coleman’s thinking), which consists of the construction of strong exclusive relationships within groups of individuals. Closure guarantees the strengthening of intra-group ties and, at the same time, makes contact with subjects outside the same group less probable: it therefore ensures the growth of trust and sense of belonging among those that make up the network (on the subject of closure see also: Lin, 1982; 1983; Walker, Wasserman and Wellman, 1994). The circulation of social resources can therefore occur within networks that have a certain amount of closure and which may contain individuals able to carry out the role of broker on structural holes – between sectors not directly connected to the social network established by the circulation of resources. Form thus emerges as a specific dimension of social capital, analytically distinct from that of content (which is defined in operative terms by social resource indicators). I feel that it is also useful in this case to provide a brief presentation of some of the measures used in the study of the morphology of social networks that are able to transmit social resources (Borgatti, Jones and Everett, 1998). In order to be applied, the measures presented below require relational data – attributes regarding social ties – to be collected and systematised; it is for this reason that they have been developed in the field of

social network analysis, which forms the methodological basis (made up of specific techniques for collecting, systematising and analysing data) of structural analysis.

Indicators of the presence of brokerage and structural holes include the measure of global centrality based on betweenness – providing a measure of each ego’s ability to operate as an intermediary between the other members of his or her network – the measure of effective size – accounting for the number of non-redundant ties that each ego has – and the measure of efficiency – calculated for each ego from the relationship between effective size and the dimension of his or her personal support network. Let us now look at these measures in brief.

I will first present the measure of global centrality based on betweenness (Freeman, 1977). Here, g_{jk} is the number of geodesics (or shorter paths) that connect any two actors j and k . Assuming that all geodesics have the same probability of being selected for the creation of a path between j and k , the probability that each geodesic has of being used (by a resource, a piece of information, etc.) is theoretically equivalent to $1/g_{jk}$. If we use $g_{jk}(n_i)$ to identify the number of geodesics between j and k that contain actor i , we can use $g_{jk}(n_i)/g_{jk}$ to estimate the probability that i is involved in the tie between j and k . For any subject, $i(n_i)$, the measure of global centrality based on betweenness is obtained from the sum of the probability that he or she has of being involved in ties between all pairs of nodes present in the network (omitting pairs in which i is present) (Wasserman and Faust, 1994, 190):

$$C_B(n_i) = \sum_{j < k} g_{jk}(n_i)/g_{jk} \quad [3]$$

with $i \neq j, k$. This measure can assume values ranging from 0 (there is no probability for any pair of nodes that i is positioned among the shortest paths linking members of the network) to the overall number of pairs of actors that do not contain i , namely $(g-1)(g-2)/2$, where g refers to the number of nodes in the network. Therefore, the standardised version of the measure of global centrality based on betweenness for any subject, i , can be expressed in the following way (Wasserman and Faust, 1994, 190):

$$C'_B(n_i) = C_B(n_i) / [(g-1)(g-2)/2] \quad [4]$$

We shall now turn to the measure of effective size. Starting from the Z matrix values (Burt, 1982, chap. 2), the effective size (non-redundant ties) of the network of a subject, i , is calculated as follows (Burt, 1992, chap. 2; Degenne and Forsé, 2004, 145):

$$NR_i = \sum_j (1 - \sum_q p_{iq} m_{jq}) \quad [5]$$

with $q \neq i, j$ and where:

$$p_{iq} = (z_{iq} + z_{qi}) / \sum_j (z_{ij} + z_{ji}) \quad [6]$$

with $i \neq j$ and:

$$m_{jq} = (z_{jq} + z_{qj}) / \max(z_{jk} + z_{kj}) \quad [7]$$

with $j \neq k$ and where type z_{ij} values are obtained from a Z matrix (formed from the matrix of adjacencies between nodes in the network and whose values indicate the strength of the relationship between nodes i and j , considered in this order: see Burt, 1982, chap. 2).

If the value of NR_i is 1, each of i 's contacts is strongly linked to the other contacts, while if the effective size coincides with the size of i 's network, there is no relationship between the members of his or her network. The greater the level of effective size recorded for an individual, the greater his ability to carry out the role of broker will be.

The measure of the efficiency of an ego network is closely linked to effective size; it can be calculated for a subject i , using the following formula (Burt, 1992, chap. 2; Degenne and Forsé, 2004, 145):

$$ER_i = NR_i / N_i \quad [8]$$

where NR_i is the effective size of i 's network and where N_i is the number of his or her ties. This measure is also positively connected to the presence of structural holes within social networks.

Positive indicators of closure include the measure of graph density (social network) and measures of aggregate constraint. The density of a graph (Harary 1969) consists of the relationship between the ties (in this case supportive) that can be activated within the network and those that could potentially be activated. Density is calculated in the following way in directed graphs (Wasserman and Faust, 1994, 129):

$$\Delta = L/g(g - 1) \quad [9]$$

where L = number of arcs (directed ties) and g = number of nodes (members of the network). Density varies between 0 (completely disconnected graph) and 1 (completely connected graph) and establishes a directly proportional relationship with closure.

Measures of aggregate constraint express each ego's degree of involvement in ties with alters (other members of the network) that are directly interconnected (Burt 1992; 2000). Aggregate constraints basically offer a measure of the level of closure of ego within its support network. The aggregate constraint (C_i) that influences a subject, i , is (Burt, 1992, chap. 2; Degenne and Forsé, 2004, 146):

$$C_i = \sum_j c_{ij} \quad [10]$$

where c_{ij} expresses the amount of constraint exerted on i by j and is:

$$c_{ij} = (p_{ij} + \sum_{q \neq i, j} p_{iq} p_{jq})^2 \quad [11]$$

with $q \neq i, j$.

If the value of C_i is 0, i has many contacts isolated from each other, whereas if the value of C_i is 1, i instead has just one contact. The subjects with a higher aggregate constraint are those that are easier to control within the network, those on which the network exerts greater closure. It stands to reason that closure increases when the average level of aggregate constraint within a network grows.

Van der Gaag, Snijders and Flap (2008) have shown that strictly morphological measures (generally obtained using name generator and name interpreter survey instruments) are indicators of social capital that are not only semantically but also syntactically different from those obtained using a position generator, adding further proof that such measures cannot be superimposed on those obtained from a simple analysis of the circulation of social resources among different social positions.

The issue of the relationship between social stratification and distribution of social capital is central to Nan Lin's thinking. Specifically, on one hand Lin claims that there is a very strong connection between the presence of homophilous relations (which are coherent in terms of the principles of cognitive congruence and individuals' structural expectations) and expressive actions (actions in which means cannot be distinguished from ends in analytical terms, which are needed to maintain accessibility to social resources rather than procure new ones). On the other hand, there is an equally strong link between heterophilous relations (which lead to tension more easily) and instrumental actions (actions in which one or more means is used to achieve specific objectives and through which attempts are made to access new resources).

Independently from the position adopted by Nan Lin, structural analysts studying social capital have thoroughly analysed the socio-economic context in which individuals act. Indeed, the influence of social context on relational models (especially in terms of the content and form of social relations) has long been the subject of structurally based sociological studies (see among others Laumann, 1966; Blau, 1977; Fischer, 1982; Marsden, 1990; McPherson and Ranger-Moore, 1991; Kalmijn, 1998; Webster, Freeman and Aufdemberg, 2001; Mollenhorst, Völker and Flap, 2008). The concept of Blau space (McPherson and Ranger-Moore, 1991), for example, is also particularly important in the study of social capital; each individual occupies a point inside a system of multidimensional coordinates, each of which is defined by a variable that is generally of a socio-demographic nature (gender, age, level of education, profession, etc.). The

distribution of points in Blau space determines the degree of correlation between different dimensions at a systemic level and the probability that two individuals come into contact decreases as the distance between them in Blau space grows. Social networks tend to be homophilous, as the probability that two subjects are connected by one or more social ties depends positively on their similarity, and the likeness between two individuals is an inverse function of their distance with regard to each Blau space dimension.

Together with the concepts of social resource and the morphology of the social support network, the principle of homophily is fundamental to the structural analysis of social capital, as it reduces the complexity of the personal networks of each actor and is a decisive factor in explaining the composition of the social circles which each network can be partitioned into (circle of kinship, work colleagues, friends, etc.). Furthermore, if certain socio-demographic variables are positively correlated with each other (for example level of education and job prestige), there is a reduction in the relevant Blau space dimensions. In situations of this type, the action of the principle of homophily can significantly strengthen existing ties in individuals' relational strategies and at the same time help subjects in the creation of stronger relationships (activated more frequently and in different social contexts, intimate and intense in emotional terms and with a strong sense of mutuality and reciprocity in the transmission of forms of support) (Lin, 1982; Walker, Wasserman and Wellman, 1994). Contrastingly, if there is little correlation between dimensions, subjects are more likely to establish weak relationships.

In conclusion, we can summarise the different contributions that structural analysis has made to the definition and measurement of social capital by using a definition provided by Michel Forsé: «social capital, which is based on an individual's personal relationships, depends on the structure of the same individual's network and corresponds to the opportunities to access what the latter conveys» (Forsé 1997, 145). Some applications of this strategy as part of empirical studies can be found in Di Nicola, Stanzani and Tronca (2011a; 2011b).

The relational survey strategy seems potentially able to collect the most sophisticated data on the concept of social capital. However, this attribute is also the limit of these somewhat complex measurement strategies, especially in terms of constructing and administrating data collection instruments.

Conclusions

The preceding overview of some of the strategies for defining and measuring social capital omitted a good number of research projects conducted on the basis of indicators different from those presented herein.

I clearly never intended to provide an exhaustive account of definitions and indicators of social capital used in the social sciences; instead, my aim was to put forward a strategy to present study approaches in order to grasp the most drastic differences between them. Furthermore, nothing has been said about the degree of integrability between strategies from the three different groups considered, with one exception in the case of the strategy put forward by Nan Lin, which has, however, inspired different solutions to the problem of an operative definition of social capital. Indeed, it seems that the line of research based on dialogue and interplay between measurement strategies will be difficult to follow, as the latter feature such different ideas of the unit of analysis to take into account and which the concept of social capital can be referred to.

Every different approach to social capital that I have considered tries to identify the most effective strategies for providing a definition, starting from the more general concept of social relation. For individualistic-based (or micro-based) approaches, the relation becomes a subjective attribute and is identified by a single resource, losing sight of the complexity that is intrinsic to dyadic relations and ignoring the morphological dimension of social networks. According to collectivist (or macro) approaches, the relation becomes an attribute of undifferentiated social aggregates of a mainly administrative nature; here too, there is therefore no operative definition of the size of relations and social networks, whose characteristics are referred to collectives after having been gathered from studies of an ecological nature or from the aggregation of cases present in sample surveys. Finally and somewhat paradoxically, social capital is generally unrelated to the concept of relation both at individual and collective levels.

Contrastingly, analytical strategies of a relational (or meso) nature acknowledge the validity of studies based on gathering and processing relational data, which is collected in reference to relational units of analysis. They attribute equal importance to the autonomous dimensions of the content and form of networks as components of social capital and promote analysis of the influence of social capital on individuals' actions, carried out by checking the distribution of the latter compared to the socio-demographic characteristics of the social actors.

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