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Postelnicu, Lumimnita; Hermes, Niels

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Luminita Postelnicu
Niels Hermes

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Research Institute SOM
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Visiting address:
Nettelbosje 2
9747 AE Groningen
The Netherlands

Postal address:
P.O. Box 800
9700 AV Groningen
The Netherlands

T +31 50 363 9090/3815

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The Economic Value of Social Capital

Luminita Postelnicu
Solvay Brussels School of Economics and Management (SBS-EM), Université Libre de Bruxelles

Niels Hermes
University of Groningen, Faculty of Economics and Business, Department of Economics, Econometrics and Finance, The Netherlands
c.l.m.hermes@rug.nl

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Luminita Postelnicu

Solvay Brussels School of Economics and Management (SBS-EM), Université Libre de Bruxelles

Niels Hermes

Faculty of Economics and Business, University of Groningen

Solvay Brussels School of Economics and Management (SBS-EM), Université Libre de Bruxelles

Abstract

Empirical studies on the importance of social capital for poor households show divergent outcomes. This divergence may stem from the lack of a conceptual framework for capturing the social capital dimensions that deliver economic value to individuals. This paper defines individual social capital from an economic perspective and proposes a measurement based on the two dimensions of individual social capital that bring economic value to individuals, i.e. informal risk insurance arrangements and information advantages arising from personal social networks. Using this measurement, we present a numerical application to argue that differing network configurations drive asymmetry of social interactions among individuals. (*102 words*)

Key words: Social capital; socio-economics; networks, economic development
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Corresponding author: Niels Hermes, Faculty of Economics and Business, University of Groningen, Nettelbosje 2, 9747 AE Groningen, the Netherlands; P: +31-50-3634863; E: c.l.m.hermes@rug.nl

1. Introduction

The term social capital refers to the resources embedded in social ties between individuals. It facilitates economic transactions, especially in environments characterized by imperfect information and limited contract enforcement. According to Bourdieu (1986) individuals can build social capital through purposeful action and transform it into economic gain. A large body of the sociological literature defines social capital and explains its interaction with other forms of capital.[1] Yet, economists have only recently considered social capital in their investigations of processes explaining (microeconomic) exchange and (macroeconomic) growth.[2] Moreover, because researchers lack a suitable definition of the concept to carry out empirical economic investigations, they have used various proxies as measures. The multidimensionality of social capital (Nahapiet and Ghoshal, 1998)[3] has resulted in divergent views of its role in economic research. A conceptual framework is necessary to identify the dimensions of social capital from an economic perspective.

To determine the dimensions of social capital that shape the economic behavior of individuals, the concept of individual social capital (as developed in the sociological literature) must be linked to theoretical and empirical evidence of the economic value of social interaction for individuals. Such a link may allow future empirical researchers to include relevant individual social capital dimensions in their analyses and enhance understanding of the economic role of individual social capital. This can help individuals and organizations leverage the economic outcomes of social interactions. By identifying the dimensions of social interaction that make such connections valuable to individuals, organizations can develop more focused human resource services for their employees and stimulate the accumulation of social capital—thereby improving cooperation between employees. Furthermore, when individuals understand the incentives associated with social interaction, they can take a more focused approach to establishing social ties.

One potentially interesting application of our approach relates to improving our understanding of the persistence of poverty and inequality in developing societies. These societies are characterized by environments in which imperfect information, underdeveloped or non-existent formal institutions and limited contract enforcement play an important role. Consequently, social capital may be important to facilitate economic transactions in these societies. If we understand how personal social networks create economic value, we can explain economic disparities between individuals as being partly driven by the differences in the use and mobilization of their individual stocks of social capital. Insights into how social capital brings economic value to individuals can help people thrive and inform policies that are focused on achieving bottom-up poverty alleviation.

The aim of this paper is to fill the gap with respect to our understanding the economic value of social capital that currently exists in the literature. We begin by providing a concrete definition of individual social capital and identifying social capital dimensions that are important from an economic perspective (i.e., dimensions that bring economic value to the individual). Next, we develop a new conceptual framework around this definition and propose a social capital measurement. Finally, we apply this measurement numerically to demonstrate that differences in the network configurations between individuals lead to asymmetry of social interactions between these individuals.

The setting in which we discuss our conceptual framework and develop our numerical example is primarily focusing on the poor in emerging societies, as the role of social capital in creating economic value is arguably most important in societies where imperfect information, un(der)developed formal institutions and limited contract enforcement abound. At the same time, however, we stress that our findings can be applied more generally to other institutional contexts as well.

We make two contributions to the existing literature on social capital. First, we bring together three different strands of literature to conceptualize individual social capital from an economic perspective. Specifically, we propose a measurement of resources embedded in social ties along the two social capital dimensions that bring economic value to individuals. The second contribution is the finding that the exchange of resources between two individuals is affected by their individual network configurations.

The remainder of this paper is organized as follows. Section 2 discusses three strands of literature to define individual social capital from an economic perspective. Section 3 proposes a measurement for the individual social capital. Section 4 provides an application of this measurement through a numerical example, which reveals that various network configurations drive asymmetrical social interactions. Section 5 presents conclusions.

2. Conceptualization of Social Capital

In this section, we conceptualize social capital by reviewing three strands of literature. We begin by defining the concept of social capital according to the mainstream sociological literature. Next, we introduce two theories on how social capital brings economic value to individuals. The first theory pertains to how social ties are used as informal risk insurance devices and the second explains the role of social ties in information diffusion. Finally, we provide a concrete definition for social capital from an economic perspective.

2.1. Social Capital: Concepts and Definitions

The concept of social capital has been defined in the mainstream sociological literature from a network-based perspective. That is, it refers to the resources embedded in social networks.[4] Social networks are patterns of social exchange and interaction that persist over time (Uphoff, 2000). The links between network members are known as social ties. Social ties have

differing strengths, varying from *weak ties* (e.g., acquaintances) to *strong ties* (e.g., family members or very close friends). Granovetter (1973) defines the strength of a tie as a combination of the amount of time, emotional intensity, intimacy (mutual confidence), and reciprocal services between two individuals.

In investigating social ties within a community, Granovetter (1973, 1983) finds that strong social ties are not spread among social networks at the community level but are organized into tightly knit clusters. Lin (1986) extends this finding by identifying patterns in which social ties of different strengths are grouped or clustered within networks. He identifies three network layers. The first (inner) layer is formed by densely knit, strong ties. Individuals linked by these ties (usually kin members or close friends) have intense interactions and feel obligated to reciprocate and provide mutual support. The social capital embedded in this network layer is known as *binding* social capital.

A second (intermediary) layer consists of a mixture of strong and weak ties and is wrapped around this tightly knit cluster of strong ties. Some members of the first network layer have strong ties with other individuals beyond their tightly knit cluster of strong ties; others do not. However, individuals who limit their strong ties to the first network layer are linked via weak ties to the individuals to whom their first network layer peers are connected via strong ties. In other words, individuals from the first layer do not maintain equally strong and reciprocal relations with the individuals from the second layer. The social capital embedded in the ties from the second network layer is known in sociology as *bonding* social capital. Although the second-network-layer individuals are not bound to equally reciprocate and provide support to the first-network-layer members, they all belong to the same network segment (in which all individuals know each other).

The third (outer) layer refers to the entire community, which provides members with a sense of belonging, even though they may not interact directly. When ties with the third

network layer exist, they are always weak. However, they offer the possibility of diversifying social capital through access to other network segments. Diversity of social capital reflects the variety of resources that individuals can access. Such diversity is important because it increases the range of opportunities for individuals. Because these ties link individuals from different network segments, the social capital they embed is called *bridging* social capital.

We restructure these concepts to present the three network layers from the perspective of the individual, rather than from tie clusters within the community. Figure 1a illustrates the example of the social network of individual "*a*". In this figure, we portray a community, *N*, made up of seven individuals $N = \{a, b, c, d, e, f, g\}$. To facilitate the explanation, let us consider the ties represented in this figure either as strong (represented by a full line) or weak (represented by a dotted line). Individuals *b* and *c* form the first social capital layer of *a*, because they are *a*'s strong ties.

Note that when observing another individual from community *N*, the structures of individuals' social networks and, thus, the distribution of the three network layers, may be different. Taking individual *b* for example (see Figure 1b), *b*'s first layer is formed by ties with *a*, *c*, and *d*; those ties are *b*'s strong ties. We can imagine that in Figure 1b, *a*, *b*, and *c* are members of the same family, and *b* also has a close friend *d*, who is also a close friend of *c*, but not *a*. Note that the tie between *a* and *d* is weak.

We return to the structure of the network from the perspective of individual *a* shown in Figure 1a. To maintain simplicity, in the second layer of this figure we consider a single individual *d*. The individual *d* is positioned on the second layer of *a* because *d* is part of the same network segment as *a* (whose social network we are examining), and *a* and *d* are linked by a weak tie. Individuals from the first layer may be linked by strong or weak ties to individuals from the second layer (in our example, *b* and *c* are linked by strong ties with *d*). As Lin (1986) argues, this leads to a mixture of strong and weak ties between individuals

from the first network layer and the second network layer. In other words, from an individual's perspective, the second network layer is determined by the weak ties of the individual whose network we are examining with individuals from the same network segment.

The third layer is formed by individuals *e*, *f*, and *g*. Individuals from the first and second network layer may or may not be linked to individuals from the third network layer. When these links are present, they are weak. These individuals are not linked with *a, c*, and *d*. The social capital of *a*, *c* and *d* is limited to social ties with individuals from the same network segment. However, there is a bridge (i.e., a weak tie between individuals from different network segments) between *b* and *e*.

2.2. The Economic Value of Social Capital

Two strands of literature investigate the use of social ties in economic actions. The first argues that individuals use their social ties as informal risk insurance devices. The second assumes that social ties are used for information diffusion purposes. An individual's decision-making process is likely to be affected by the availability and accuracy of information and by the individual's exposure to risk. Thus, information availability and risk insurance shape the economic performance of individuals.

Poor individuals live in soft-information-based environments.[5] To collect soft information and thus make informed decisions, they rely heavily on their social ties. Moreover, missing or unreliable formal institutions (e.g., formal social security systems) and lack of access to resources compel these individuals to turn to their social networks to insure against risks. For poor individuals, these informal risk insurance arrangements play a critical role in coping with risk (Townsend, 1994; Ligon et al., 2001).

2.2.1 Social Capital as an Informal Risk Insurance Device

A large part of the literature focuses on informal insurance in social networks. Informal insurance is regarded as a social activity in which transfers are based mainly on social norms of reciprocity (Platteau, 2000). Enforcement is a critical aspect of informal risk insurance arrangements. There are two perspectives on enforcement. First, a self-enforcing element is embedded in these arrangements. Individuals willingly make transfers toward members of their informal risk insurance arrangements to maintain the arrangements because they may need them in cases of future shocks. Second, there is third-party enforcement for deviating members (i.e. members who decide not to make transfers toward an affected peer). Other members of the informal risk insurance arrangement may punish deviating members by excluding them from the arrangement.

The main findings of research on informal risk insurance indicate that these informal arrangements do not take place at the community or village level. Instead, they occur within smaller network segments involving individuals linked by strong ties, i.e. individuals in the first network layer (see, e.g., Fafchamps, 1992, Grimmard, 1997, Murgai et al., 2002, Fafchamps and Lund, 2003, De Weerdt and Dercon, 2006, Angelucci et al., 2015). The strength of ties reflects the willingness of individuals to step in and help each other in cases of need. As Figure 2 illustrates, first-network-layer ties are links with individuals who are willing to redirect their resources to the affected individual, thus providing an informal risk insurance arrangement.

The extent to which binding ties are able to help an individual overcoming an idiosyncratic shock depends on the capacity of the ties to produce and provide resources. Individuals who live in resource-scarce environments are usually more exposed to shocks. This exposure incentivizes them to exchange resources in non-crisis conditions to establish and maintain informal risk insurance arrangements that will support them in cases of

idiosyncratic shocks. The extent to which two individuals are able to provide resources to each other in non-crisis conditions may affect their decisions to maintain or adjust the current strength of their dyadic tie. The decision to exchange resources with an individual who has a greater ability to reciprocate may improve the payoff of one's network.

Several studies examine the formation of informal risk insurance arrangements and show individuals make independent decisions on forming and reshaping their informal risk insurance arrangements (see, e.g., Rosenzweig and Stark, 1989; Grimmard, 1997; Comola, 2007). Usually, they do not create risk-sharing groups. Instead, individuals form bilateral risk-sharing relationships (Bramoullé and Kranton, 2007).

The functioning of informal risk insurance arrangements and potential decisions to reshape them are contingent on the availability of information. Information may help individuals to verify whether an idiosyncratic shock has happened to a member of one's informal risk insurance arrangement and allow them to monitor the use of resources provided by the arrangement. Conversely, affected individuals may verify whether members of their informal risk insurance arrangements have provided resources according to their ability to contribute. Moreover, other contributing members from the arrangement may collect information to check whether all expected contributors have provided their support. Further network-reshaping decisions are taken based on availability and accuracy of information.

2.2.2. Social Ties for Information Diffusion Purposes

Individuals communicate during their social interactions to exchange information. Information *diffusion* is a special type of communication, in which messages are associated with new information (Rogers, 2003). This new information results in broadening of knowledge and opportunities (Granovetter, 1983). The ability of personal networks to diffuse information is essential for individuals to have access to new opportunities; it enables them to

make informed decisions. A wide range of economic studies acknowledges the importance of access to new information. Jackson and Yariv (2010) provide an overview of how information diffusion influences individuals' behaviors. The extent to which individuals get access to new information depends on the diffusion capacity of their dyadic ties. Although strong ties determine the extent to which asset-poor individuals may be able to deal with idiosyncratic shocks, they have little effect from an information diffusion perspective. Strong ties provide access to limited and redundant information (Granovetter, 1983; Lin, 1986). Figure 2 shows that information exchanged by individuals *a*, *b*, and *c* is highly redundant because as explained by Granovetter they spend a great amount of time together in the same environment, sharing the same experiences.

We find that an individual's ties with the second network layer (i.e., the tie between *a* and *d*) give access to limited and largely redundant information. This occurs because *a* and *d* are part of the same network segment. Information available to *d* is likely to be have been already transmitted to *a* through other channels (e.g., through *b* and *c*). Only bridging ties (i.e., weak ties linking individuals from different network segments) facilitate access to new and non-redundant information (Granovetter, 1973, 1983; Lin, 1986). In our example, *b* is the only individual in the network segment with a bridging tie (with individual *e*). This gives *b* an information advantage within *b*'s network segment because *b* can access new information that is otherwise unavailable. Figure 2 illustrates the way information is diffused across the three network layers.

2.3. Social Capital: A New Definition

Building on the previous discussion, we define individual social capital as follows:

> Individual social capital refers to *whom you know*, what *information advantage* those you know can provide, and the extent to which they are *willing* and *able* to help you in cases of need.

This definition encompasses the two dimensions in which social capital shapes the economic behavior of individuals: (1) the information advantage that members of an individual's social network can bring and (2) the individual's informal risk insurance arrangement (i.e., to what extent social network members are both *willing* and *able* to help one in cases of need). The aim of the next section is to provide an individual social capital measurement by building on this definition.

3. Social Capital Measurement

Using the definition discussed in section 2.3 we examine individual social capital from the perspective of (1) informal risk insurance arrangements and (2) information advantages. In particular, we provide a way to measure the individual social capital along these two dimensions.

3.1. Informal Risk Insurance Arrangement

As noted, we can identify the capacity of a dyadic tie to act as an informal risk insurance device by examining the extent to which the two individuals are *willing* to help each other (i.e., the *strength* of their dyadic tie) and the extent to which they are *able* to provide help or resources in cases of need (i.e., the *content* of the dyadic tie). These two aspects of social ties are complementary: the content of a tie shows the total amount of resources the tie could possibly provide at a certain moment, and its strength shows the extent to which one individual allows the other to transform these resources into personal assets.

Let us consider a community, *N*, where g_{ij} denotes the *strength* of the dyadic tie between individuals *i* and *j*, ranging between 0 (no tie) and 1 (very strong tie); that is, $0 \leq g_{ij} \leq 1$. Although g_{ij} shows the current *willingness* of *i* to help *j* if an idiosyncratic shock happens to *j*, this willingness is the result of multiple social interactions over time. In line with Granovetter's definition, the strength of *i*'s dyadic tie with *j* is a function of the amount of time they have spent together, the emotional intensity and intimacy (mutual confidence) that *i* assigns to the relationship with *j*, and the services they have exchanged in the past. Although the amount of time the two individuals have spent together is implicitly symmetrical, they may not perceive their relationship with the same emotional intensity and intimacy. Moreover, the value the two individuals assign to past exchanges of pecuniary resources may differ. Thus, in reality, the strength of a dyadic tie may not be symmetrical. For the sake of simplicity, however, we will assume that the strength of dyadic ties is symmetrical (see section 4).[6]

With regard to the content of dyadic ties, let w_i denote the redistributable monetized resources that individual *i* is currently able to share with *i*'s network. Redistributable resources pertain to the pecuniary and non-pecuniary resources that *i* is able to share with other network members after satisfying his/her personal needs (in terms of pecuniary and non-pecuniary consumption as well as any desired savings). The individual *i* thus retains a share of personal resources and distributes the remainder within the network.

The strength of a tie is a matter of personal perception that the individual has developed from past social interactions. The content of a tie refers to the resources the individual is able to redistribute between the members of the individual's network. Developing and maintaining strong social ties is time-consuming and costly. To maintain binding ties that can be used as risk-coping devices in case of idiosyncratic shock, network members exchange resources during non-crisis situations. This prevents waste of perishable

resources (e.g., food), helps smoothing consumption, and provides social support (e.g., time spent together, advice, moral support). Thus, we assume that in non-crisis situations, each individual distributes personal redistributable resources to other network members according to the strengths of the individual's dyadic ties. Thus, the resources that *i* gives to *j* in *non-crisis situations*, r_{ij}, are:

$$r_{ij} = \frac{g_{ij}}{\sum_{\substack{k=1 \\ k \neq i}}^{n} g_{ik}} * w_i. \quad (1)$$

Equation (1) shows the resources that *i* gives to *j* in *non-crisis situations* are directly proportional to the strength of their dyadic tie and to *i*'s current stock of redistributable resources, and inversely proportional to the sum of the strengths of all *i*'s dyadic ties. This implies that the resources *j* receives from *i* in non-crisis conditions depend not only on g_{ij} and the resources that remain available to *i* after satisfying personal needs, but also on the configuration of *i*'s network (in terms of the number and strengths of *i*'s dyadic ties). Therefore, there is asymmetry in terms of resources exchanged by the two individuals due to three factors. First, as Granovetter's definition indicates, the strength of dyadic ties is asymmetrical. That is, individuals do not invest identical emotional intensity and intimacy in their dyadic tie and may not assign identical value to their past pecuniary exchanges. Second, at any moment in time, individuals may not have identical stocks of redistributable resources. Third, the resources one individual gives to the other in non-crisis situations depend on the first individual's network configuration (in terms of the number and strength of dyadic ties). As Figures 1a and 1b in Section 2 illustrate, individuals may have different network configurations.

Although literature has addressed the asymmetry of dyadic ties, scant research has examined how the network configuration of individuals in a community affects the payoff that

results from an individual's personal dyadic ties. To this end, in Section 4, we numerically apply the measurement proposed in Section 3 to explain how the various network configurations of individuals from community *N* determine their asymmetrical social interactions.

Building on Equation (1), the resources made available (AR) by the community to individual *j*, are:

$$AR(j) = \sum_{\substack{i=1 \\ i \neq j}}^{n} r_{ij}. \quad (2)$$

In other words, *j* receives—from the community—the resources the community members can provide to *j*. As Equation (1) indicates, these resources depend on the community members' personal stocks of redistributable resources, the strengths of their dyadic ties with *j*, and their personal network configurations (in terms of number and strength of dyadic ties).

However, in a *crisis situation* (i.e., *idiosyncratic shock*), the informal risk insurance arrangement is fully enabled. If a major shock occurs, the affected individual may need the entire stock of redistributable network resources available to overcome the shock. The members of the individual's informal risk insurance arrangement are those willing to redirect their stocks of redistributable resources to the individual. Each member of the informal risk insurance arrangement is driven to maintain the current strength of the tie with the affected individual, because the tie has been costly to establish. Furthermore, members are motivated by reciprocity: they may themselves at some point in time need the resources of the supported individual. This incentivizes them to put pressure on deviant (non-supporting) members of the informal risk insurance arrangement to help with resources the affected individual. This is because if the affected individual fails to receive enough support to overcome the shock, the entire informal risk insurance device will be affected. Not only will deviant (i.e. non-

supporting) individuals lose expected future reciprocity from the affected individual, other members will also suffer because the affected individual will not be able to reciprocate as expected. By failing to overcome the shock, the individual falls into deeper poverty and has less redistributable resources to share.

Social ties that are part of informal risk insurance arrangements are strong ties that bind individuals to make reciprocal transfers and provide full support in cases of need (i.e. ties that form the individual's first network layer, as described in Section 2). Only strong ties compel individuals to direct their redistributable resources toward an affected individual. To measure the total stock of redistributable resources that an individual's informal risk insurance arrangement is able to provide in case of idiosyncratic shock, let us consider a threshold, T_i, above which individual *i* deems dyadic ties as binding. In other words, *i* sees the ties having a strength lower than threshold T_i as part of *i*'s second or third network layer. Thus, the informal risk insurance arrangement, *RI*, of individual *j* is:

$$RI(j) = \sum_{\substack{i=1 \\ i \neq j}}^{n} w_i \, \Pi_{g_{ij} \geq T_i}, \tag{3a}$$

$$\text{where } \Pi_{g_{ij} \geq T_i} = \begin{cases} 1 & \text{if } g_{ij} \geq T_i \\ 0 & \text{otherwise} \end{cases}. \tag{3b}$$

Equation (3a) shows the amount of resources that members of *j*'s informal risk insurance arrangement are able to provide to *j* in case of idiosyncratic shock. As mentioned previously, when necessary to ensure that *j* will overcome the shock, the entire stock of redistributable resources in the possession of the members of *j*'s informal risk insurance arrangement are directed toward *j*. In other words, $RI(j)$ shows the extent to which *j* is informally insured against idiosyncratic shocks.

3.2. Information Advantage

Poor individuals rely on their informal risk insurance arrangements to cope with idiosyncratic shocks. However, as discussed in section 2 they may also have access to new information beyond their network segment (i.e. their first- and second-network-layers, consisting of direct and indirect strong ties only) via bridging ties that can help them prevent shocks and improve their livelihoods. This information advantage is valuable because it can lead to opportunities that are unavailable in the individual's network segment.

The information advantage refers to access to new and non-redundant information via bridging ties. To measure an individual's information advantage, we define a matrix for bridging ties $V = (v_{ij})$, where $v_{ij} \in \{0,1\}$. When $v_{ij} = 1$, individuals *i* and *j* are linked by a bridging tie. When $v_{ij} = 0$, the dyadic tie between *i* and *j* is absent, bonding, or binding. We assume γ_{ij} to be the payoff/utility of the information diffused by *j* to *i*. An individual's information advantage (IA) is the following:

$$IA(i) = \sum_{\substack{j=1 \\ j \neq i}}^{n} \gamma_{ij} \prod_{v_{ij}=1} . \quad (4)$$

Equation (4) shows the information advantage of individual *i*, that is, the payoff/utility of the information that *i* receives from bridging ties. To establish and maintain bridging ties, individuals need to divert part of their redistributable resources toward them. This suggests that in a resource-scarce environment, bridging ties may not be a priority. Because asset-poor individuals are more exposed to shocks and do not usually have access to formal risk insurance schemes, they are compelled to invest their resources according to the priorities of building and maintaining their informal risk insurance arrangements, rather than improving their access to new information. This argument is supported by Granovetter (1983), who

builds on the work of Boorman (1975) to argue that strategies of social network expansion via weak ties usually belong to individuals who live in low-risk environments (i.e., the less poor).

4. Applying the New Social Capital Measurement: Taking into Account Individuals' Network Configurations

Let us consider a resource-scarce community *N*, with no access to outside credit, in which aggregate consumption cannot exceed aggregate income.[7] Individuals are risk-averse and may face idiosyncratic shocks. As denoted previously, g_{ij} is the strength of the dyadic tie between individuals *i* and *j*; it can vary from 0 (no tie) to 1 (very strong tie), that is, $0 \leq g_{ij} \leq 1$; w_i denotes the resources that individual *i* is currently able to redistribute within *i*'s network. To show how differing network configurations determine asymmetry of social interactions, we make the following three assumptions to endogenize the other dimensions of individual social capital measurement (i.e., the strength of ties between two individuals, individuals' stocks of redistributable resources, and the strength beyond which a tie is expected to act as an informal risk insurance device):

Assumption 1: The strength of dyadic ties is symmetrical: $g_{ij} = g_{ji}$.

Individuals assign the same strength to their dyadic tie. Thus, if as a function of past social interaction individual *i* regards *j* as a friend, *j* also regards *i* as a friend, with the same intensity of the relationship.

Assumption 2: All individuals within the community have the same stock of redistributable resources, w_i.

This assumption is necessary to allow us to infer that the resulting asymmetry is due to the configurations of individuals' networks, rather than their varying stocks of redistributable resources.

Assumption 3: All individuals within a community agree on the value of the threshold *T*.

If individual *i* regards the strength of the dyadic tie with *j* as above this threshold, thus qualifying it to be part of own informal risk insurance arrangement (i.e., g_{ij} is binding), *j* also regards the tie with *i* to be part of own informal risk insurance arrangement (i.e., g_{ji} is binding). Moreover, other network members also perceive g_{ij} as binding, thus expecting the two individuals to help each other in case of idiosyncratic shock.

In Figure 3, starting with these three assumptions, we consider the network example of individuals from community *N*, where the monetized redistributable resources of each individual are displayed in brackets beside the respective individual. Following Assumption 2, and as Figure 3 shows, the number of monetized redistributable resources for all individuals is 80 units. The strength of the dyadic ties is displayed next to the respective ties between two individuals. Note that the strength of a tie lies between 0 (no tie) and 1 (very strong tie). As Figure 3 shows, the strength of the tie between individuals *a* and *b* is 1. In community *N*, the threshold, *T*, is assumed to be 0.5 and all ties with strengths higher than 0.5 are regarded as binding and expected to act as informal risk insurance devices. Thus, the dotted lines represent weak ties that do not act as informal risk insurance devices.

Table 1 presents the values for the resources available to each individual from community *N* in non-crisis situations (AR), and in case of idiosyncratic shock (RI).

The calculations in Table 1 are based on the numerical example presented in Figure 3, by applying the measurement presented in Section 3 in Equations (1) to (3). The exact

calculations related to the example given in Figure 3 for individual *a* from community *N* appear in Annex 1.

The first column of Table 1 displays the individuals from community N. The second column displays the individuals' current amounts of redistributable resources (i.e., the values presented in Figure 3 beside the individuals). The third column displays computations of the resources the individual receives from the community in *non-crisis* situations. These computations are carried out on the basis of Equation (2) in Section 3.1. For example, the resources individual *a* receives from the dyadic tie with *b* are directly proportional to the strength of *b*'s dyadic tie with *a*, and *b*'s stock of redistributable resources, and inversely proportional to the sum of the strengths of all of *b*'s dyadic ties.[8] A comparison of the second and third columns shows that the current network configuration leads to a net loss of resources for some individuals, such as *a* and *d*, who distribute more resources within the network than they receive. To explain why this happens, Table 2 displays the detailed exchanges made by any two individuals within the community. These calculations are based on Equation (1) in Section 3, according to the aforementioned assumptions.

The first row in Table 2 shows the resources individual *a* provides to the other members of the community. The first column shows the resources *a* receives from members who share a strong tie with *a*. The remaining rows and columns are interpreted in a similar way for the other members of the community. The figures show different individual network configurations determine the asymmetrical interaction and exchange of resources between individuals. For example, *a* provides 34.78 units of monetized resources to *b*, whereas *b* provides 26.67 units of monetized resources to *a*. According to the assumptions, the two individuals have a tie of symmetrical strength and possess an identical amount of redistributable resources (i.e. 80 units). Thus, the asymmetrical exchange of resources occurs because *a* distributes a stock of 80 units of redistributable resources between individuals *b*, *c*,

and *d*, according to their respective tie strengths of 1.0, 0.9, and 0.4 respectively. Individual *b* distributes the same stock of redistributable resources within a different network configuration. More precisely, *b* has ties with individuals *a*, *c*, *d*, and *e* of strengths 1.0, 0.9, 0.8, and 0.3 respectively. Thus, the asymmetry in their current social interaction is determined by their differing network configurations.

The fourth column in Table 1 shows the total amount of resources on which the individual can rely in case of an idiosyncratic shock. The computations are based on Equation (3) in Section 3.1, taking into account the aforementioned assumptions. The results show the individuals from community *N* do not have the same informal insurance against idiosyncratic shocks. That is, the community members do not have the same odds for overcoming an identical idiosyncratic shock. In case of failure to overcome a shock, the negative effects are not limited to the concerned individual, but extend to the other members of the informal risk insurance arrangement. Although these members have invested resources over time to build binding ties with the affected individual, that individual will no longer be able to reciprocate as expected. Because individuals' informal risk insurance arrangements are bounded by the first layers of their social networks (see Section 2), the asymmetry between individual's capacities to cope with identical idiosyncratic shocks is determined by the size of their first network layer. In other words, individuals' capacities to cope with idiosyncratic shocks depend on the number of their binding ties, as well as on the content (i.e., the amount of redistributable resources) of those ties.

Bridging ties (see the tie between *b* and *e*) are of particular interest. Individual *e* does not bring any contribution to any individual forming *b*'s network segment, except to *b.* As discussed in Section 2, the bridging tie between *b* and *e* gives the two individuals access to new information, which may bring both of them new opportunities. However, part of the redistributable resources must be diverted toward this tie to maintain it at the current strength

(in the example from Figure 3, its strength is 0.3). These are resources that could have been otherwise diverted toward the members of *b*'s network segment. This may explain why, in some resource-scarce communities, there are social norms that bound the social interactions of individuals within their kinship or clique. The existence of pressure to compel the individual to develop relationships within the first two network layers is supported by both anecdotal and research evidence. For example, Rosenzweig and Stark (1989) argue that arranged marriages in poor communities are designed to keep resources within the kinship.[9]

5. Conclusions

Social capital is a multidimensional concept. An individual's stock of social capital refers to the resources embedded in the individual's social network. Empirical studies have used various proxies to capture various dimensions of social capital, which may explain why research findings on the role of social capital diverge. To understand how personal social networks affect economic decisions, empirical economic researchers need to identify the dimensions of social capital that bring economic value to individuals.

In this paper, we build on socioeconomic literature to define individual social capital from an economic perspective, and propose a measurement to identify the two dimensions of individual social capital that bring economic value to the individual: (1) informal risk insurance arrangements and (2) information advantages conferred by the social network. These two dimensions make social ties valuable for individuals, thus shaping their behavior.

Our contribution in this paper is twofold. First, we propose a concrete definition for individual social capital from an economic perspective and provide a measurement that identifies the two social capital dimensions that bring economic value to individuals. Future empirical researchers may use this approach to explain the role of individual social capital in shaping individual behavior. Second, the paper contributes to literature by indicating that

differing network configurations drive asymmetrical social interaction between individuals. Future empirical economic research should take into account individuals' differing network positions (i.e., their differing network configurations) to explain their differing outcomes.

As discussed in the introduction, our approach may be especially relevant for understanding of the persistence of poverty and inequality in developing economies. These economies are characterized by environments in which imperfect information, underdeveloped or non-existent formal institutions and limited contract enforcement abound and where social capital may therefore be important to facilitate economic transactions. In particular, we see clear applications of our approach in better understanding and improving the use of microfinance programs. These programs aim at increasing access to financial services for poor households. Many of them use so-called group lending models in which the probability of repayment is increased by making all group members responsible for the loans provided to individual group members. The group lending model is based on the idea that these group members are willing and able to do so because of the social capital they share.[10] Increasing our knowledge of how social capital creates economic value may help improving the design of microfinance social-collateral-backed lending models to help individuals properly (and safely) exploit their stocks of social capital and access credit and other non-financial services.

The analysis in this paper may be extended in several ways. First, we have developed a conceptual framework. We did not derive a formal model. It may be worthwhile for researchers to model individual social capital accumulation starting from the measurement suggested in this paper.

Second, the conceptual framework is built on Lin's (1986) notion of binding, bonding, and bridging ties. Thus, we do not differentiate between bridges to individuals from outside the community and bridges to individuals from within the community that are part of a

different network segment. The consequences of differentiating between these two types of bridging ties may be considered in future research, however.

Third, in Section 4 we make three assumptions to show that asymmetrical social interactions are driven by differing network configurations. These assumptions are necessary to endogenize other factors that drive the asymmetry of social interaction, that is, the asymmetrical strengths of dyadic ties, the stock of redistributable resources of the two individuals, and different values of the threshold T. It may be worthwhile for researchers to discuss how these other factors affect the symmetry of individuals' social interactions.

Fourth, the numerical example in Section 4 we consider a closed community in which individuals have no access to outside credit so that aggregate consumption cannot exceed aggregate income. In this way, aggregate redistributable resources are not increased/decreased by unobserved factors outside the community (which would have been problematic to capture within the concrete numerical example). Yet, in reality individuals may have access to outside credit. This would result in higher (and unequal) access to resources, leading to increased asymmetries between individuals in terms of their capacities to cope with shocks, as well as their capacities to build and maintain personal networks. Future research may investigate the consequences of allowing individuals to have outside credit for the outcomes presented in the paper.

Finally, our conceptual framework does not take power asymmetries between individuals into account. Such "patron–client" relationships may determine asymmetrical strengths of dyadic ties, asymmetries in terms of redistributable resources, and differing network configurations. While the model allows for such asymmetries, in the numerical example (Section 4) we assume the strengths of dyadic ties are symmetrical and individuals have the same stocks of redistributable resources. we make these assumptions to endogenize the measurement dimensions to ensure the asymmetry in social interactions between

individuals is the result of differing network configurations rather than factors such as asymmetrical strengths of ties, different stocks of redistributable resources, or even different values of the threshold T. Again, it may be interesting to analyze the consequences of bringing asymmetric social interactions into the equation.

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ANNEX 1

Below we explicitly describe the underlying theoretical formulas for individual *a*, example from Fig.3

$$r_{ba} = \frac{g_{ba}}{g_{ba} + g_{bc} + g_{bd} + g_{be} + g_{bf} + g_{bg}} * w_b = \left[\frac{1}{1 + 0.9 + 0.8 + 0.3 + 0 + 0}\right] * 80 = 26.67$$

$$r_{ca} = \frac{g_{ca}}{g_{ca} + g_{cb} + g_{cd} + g_{ce} + g_{cf} + g_{cg}} * w_c = \left[\frac{0.9}{0.9 + 0.9 + 0.7 + 0 + 0 + 0}\right] * 80 = 28.80$$

$$r_{da} = \frac{g_{da}}{g_{da} + g_{db} + g_{dc} + g_{de} + g_{df} + g_{dg}} * w_d = \left[\frac{0.4}{0.4 + 0.8 + 0.7 + 0 + 0 + 0}\right] * 80 = 16.84$$

$$r_{ea} = \frac{g_{ea}}{g_{ea} + g_{eb} + g_{ec} + g_{ed} + g_{ef} + g_{eg}} * w_e = \left[\frac{0}{0 + 0.3 + 0 + 0 + 0.7 + 0}\right] * 80 = 0$$

$$r_{fa} = \frac{g_{fa}}{g_{ca} + g_{cb} + g_{cd} + g_{ce} + g_{cf} + g_{cg}} * w_f = \left[\frac{0}{0 + 0 + 0 + 0 + 0.7 + 0.3}\right] * 80 = 0$$

$$r_{ga} = \frac{g_{ga}}{g_{ga} + g_{gb} + g_{gc} + g_{gd} + g_{ge} + g_{cf}} * w_g = \left[\frac{0}{0 + 0 + 0 + 0 + 0 + 0.3}\right] * 80 = 0$$

$$AR(a) = r_{ba} + r_{ca} + r_{da} + r_{ea} + r_{fa} + r_{ga} = 26.67 + 28.80 + 16.84 + 0 + 0 + 0 = 72.31$$

$$RI(a) = w_b + w_c = 80 + 80 = 160$$

[1] See the seminal works of Bourdieu (1986) on the interaction between social capital and cultural capital and of Coleman (1988) on the interaction between social capital and human capital.

[2] Knack and Keefer (1997), Alesina and La Ferrara (2000), Zak and Knack (2001), and Meon and Sekkat (2015) assess the relationship between social capital and economic growth.

[3] Nahapiet and Ghoshal (1998) categorize these different dimensions into three categories: structural social capital (the presence or absence of relationships between individuals, the configuration of their networks, and the standard of connections; e.g., network connectivity and density), relational social capital (type of relationship developed through past social interactions; e.g., respect, acceptance, friendship, sociability, prestige), and cognitive social capital (e.g., shared values and beliefs, common visions, or common systems of meaning).

[4] See Adler and Kwon (2002) for a synthesis of various social capital definitions provided by sociologists.

[5] Soft information refers to information that is difficult or even impossible to summarize in a numeric score, and therefore impossible to verify *ex post* (Petersen, 2004).

[6] Literature has acknowledged the asymmetrical nature of the strength of dyadic ties. Although researchers who model informal risk insurance arrangements (e.g., Genicot and Ray, 2003; Bramoullé and Kranton, 2007; Grandjean, 2014) assume symmetrical strength of dyadic ties for the sake of simplicity, they acknowledge the limitations of the symmetry assumption and indicate that, in reality, ties may be asymmetrical.

[7] This is necessary to keep the focus on the purpose of the numerical example, which is to show that different network configurations lead to asymmetrical social interactions. To do so, we need to hold constant all other variables, including the amount of redistributable resources. Access to external sources of financing would unnecessarily increase the complexity of the discussion by introducing another set of dimensions related to how the redistributable resources of some individuals would vary when they have the possibility of borrowing and considering how much they can borrow.

[8] Again, a detailed discussion of the numerical application is available in Annex 1.

[9] The numerical application in this section can be replicated with the social capital simulator available at http://luminita.postelnicu.net/SocialCapitalSimulator/informal_risk_insurance.html. This simulator has a wider application than the discussion in this paper. In particular, various communities can be designed, and any number of scenarios for network dynamic formation strategies can be analyzed and compared.

[10] Wydick (1999), Hermes et al. (2005), Karlan (2007), Ahlin and Townsend (2007), Feigenberg et al. (2010), Dufhues et al. (2011a, 2011b, 2012 and 2013) and Quoc et al. (2012) investigate how social capital affects the repayment of microfinance group lending.

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