

Information, knowledge and social networks: is a new buzzword coming up?*

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Abstract

The analysis of social networks has recently become a central issue in industrial organisation. A growing literature has started to show the importance of social networks in the economy, above all to explain labour mobility and the actual production of innovation. I argue that using such concepts and analytical tools requires a deep understanding of what is meant by knowledge and by the mechanism underlying knowledge accumulation. The aim of this paper is to present a critical review of social networks analysis in industrial organisation. In order to do that, I sum up the sociological theoretical background of social networks and reconsider it using some results of the economics of knowledge.

**Preliminary and incomplete paper; please do not quote without the author's consent.*

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1 Introduction

The analysis of social networks has recently become a central issue in industrial organisation. A growing literature has started to show the importance of social networks in the economy, above all to explain labour mobility and the actual production of innovation. I argue that using such concepts and analytical tools requires a deep understanding of what is meant by *knowledge* and by the mechanism underlying knowledge accumulation.

The first section of this paper concerns the sociological view of social networks. I focus on Mark Granovetter's contributions, because they are universally acknowledged as path-breaking for their wide and rich epistemological and theoretical view. In particular in this section I show and clarify the link between the Granovetter's labour markets analysis (1973 and 1974) and his argument of embeddedness (1985). A definition of social networks is given.

In the following and final section, I present an economic interpretation of knowledge able to treat learning process. According to this framework, I consider the possible application of the social networks concept to communities of practise. In this regard, two kinds of social network are considered as relevant: cognitive and opportunities ones.

2 Social networks

“Social network analysis is an interdisciplinary behavioral science speciality. It is grounded in the observation that social actors are interdependent and the links among them have important consequences for every individual. [...] They provide individuals with opportunities and at the same time potential constraints on their behavior.” [Freeman, 2000, p.350]

TO ADD A BRIEF HISTORY OF THE CONCEPT: FROM SOCIOMETRIC TO GRANOVETTER'S CONTRIBUTES

However, “in their present state of development, the strands of social science research that invoke the network concept lack coherence with respect to terminology, definition, and operationalization” [Powell and Smith-Doerr, 1994, p. 368]. In particular it is possible to delineate two different and distinct perspectives. The former is more abstract and it employs networks as analytical tools and it reduces social networks analysis to a simple collection of analytical procedures. Alongside this abstract approach, there is a rich and lively vein of research with a more real-world flavour. These two approaches could be viewed as complementary: social networks analysis provides a formal, conceptual means for analysing the social world, but it is important that concepts are defined in a precise and consistent way and are grounded in social phenomena.

2.1 Granovetter’s research program

Reading Mark Granovetter’s works is central to get what economic sociologists mean with the social network concept. The aim of the next two paragraphs is to show and clarify the link between the Granovetter’s two main contributions: labour markets analysis (1973 and 1974) and the argument of embeddedness (1985).

2.1.1 Labour market and weak ties

Granovetter’s PhD thesis¹ and his *Getting a Job* (1974), which is a substantial revision of the former, concern labour mobility issues; how individuals become aware of the job opportunity they take; how the information that facilitates job mobility is served and disseminated. In this regard, he argues the effectiveness of the social networks in determining the matching process

¹ *Changing jobs: channels of mobility information in a suburban community*, 1970, Doctoral dissertation, Harvard University.

between supply and demand in the labour market. Doing so, he is able to describe a mechanism which makes labour market performances depend on different individual chances to exchange information.² In the article of 1973, moving from this empirical analysis, he makes some more general theoretical considerations relative to the macro implications of his micro level analysis.

Labour market. Empirical evidence shows the importance of personal contacts and of informal methods of finding jobs. Why are they so important? Why does a given individual use some method rather than another to find a job?

Granovetter tries to answer these questions, analysing a sample of professional, technical and managerial male workers, living in a suburb of Boston, who changed their job in the last five years. He focuses on this segment of the labour market, because it is thinkable that this kind of workers use a more intensive and sophisticated job search strategy than others (e.g. blue collar), and this makes his research hypothesis more falsifiable.

His empirical results show that personal contacts account for 56 per cent of the sample; and above all, it shows that the information from personal contacts is of higher quality: workers that find their job by informal methods are more satisfied, earn more, quit less, and perform more “tailored” tasks.

TO ADD A THEORETICAL EXPLANATION OF THESE RESULTS; SEE REES (1966)

After these preliminary considerations, he focuses on the effective personal contacts providing job opportunities. He classifies contact according to the time spent together by the two people, identifying two kinds of possible category: social family and work colleagues, labelled as strong and weak ties, respectively.

Therefore there exists a trade off between strong and weak ties. The former have more motivation to help with job information, the latter have more useful information, because they provide access to job information that one does not already have. According to this, weak ties are more effective in spreading information around.

² Other scholars had a similar research agenda, but Granovetter was the first to use network analytical tools (Follis 1998; p.15)

Granovetter spends few paragraphs on the motivation to give information and he is not completely convincing about that. He claims that one could give information because he/she would recruit allies in his/her own work place or he would maintain a good reputation signalling competent personnel. He considers the individual motivation but he does not consider the wider context wherein the personal contact is set. For example, the firm or organisation where the personal contact is employed could influence the individual's motivation to give a piece of information. Of course the relevance of this kind of consideration depends on the contents of information and the importance of that for the firm or the organisation to which the contact belongs.³

Weak ties. In the article of 1973 Granovetter generalises some results of his PhD thesis, then re-edited in the 1974 book.⁴ In this article he considers and states clearly the macro implications of small scale interactions.

His argument is based on the following assumption: if an individual (say A) has strong ties⁵ with another two persons (say B and C respectively), then it is not possible for the tie between B and C to be absent. In less generic terms: if A has two close friends, named B and C, necessarily B and C know each other. This assumption based on some empirical results has a logical implication: only weak ties can 'bridge' two subparts of a network. Consequently, cliques of individuals could keep in touch exclusively by weak ties. This implies the validity of the thesis of the strength of the weak ties. Intuitively speaking, this means that "whatever is to be diffused can reach a larger number of people and traverse greater social distance [...] when passed through weak ties rather than strong" [Granovetter, 1973; p.1366].

2.1.2 The problem of embeddedness

Moving from his studies on how social relations affect labour market mechanisms, Granovetter shifts the focus of his analysis to a more general issue. The paper of 1985 concerns the extent to

³ Granovetter is clearly aware of this limitation; see, for example, the conclusive remark of the article 1973: "Treating only the strength of ties ignores, for instance, all the important issues involving their content. What is the relation between strength and degree of specialisation of ties, or between strength and hierarchical structure?" p.1378].

⁴ On this see Granovetter himself (1973) p.1371.

⁵ Also the definition of strength of a tie is more general: it is a combination of time, emotional intensity, intimacy and reciprocal service.

which economic action is embedded in structures of social relations. In doing so, he considers fully the wide theoretical implications of his previous analysis.

Social relations and order. Granovetter starts from a Hobbesian questions: how social and economic order is actually maintainable if every individual aims towards his/her own self-interest. In other terms, if order depends on trust and absence of malfeasance among individuals how it is possible to ensure that any individual behaves trustworthily and honestly.

The theoretical answers that sociological and economic literature usually gives to this are not satisfying, Granovetter claims. The sociologists' approach, labelled as the over-socialised approach, considers the behaviour of individuals depending on his/her proper status or social class. Individuals have completely internalised the rules and norms corresponding to their social status and they behave in conformity with those. According to this framework, society influences individual behaviours rather mechanically and social relations have only a peripheral effect on them.

Economists, with their under-socialised view, simply do not consider relevant any social relation, and they claim that the self-regulating mechanism of market competition is enough to maintain order. Consequently, social relations are aprioristically excluded from the analysis, and order, trust and malfeasance are not considered relevant economic issues.

Despite the apparent difference, both of these views give explanations based on atomised actors and they give no importance to social relations among individuals. The point raised by Granovetter is a simple one, but radical. Trust concerns a relation among individuals and its degree is a property not of the individual involved but of their concrete relation (e.g. friendship, work colleague). Economic action takes place within these networks that make up the social structure. Analysing the individual behaviour embedded in social relations becomes a priority.

“A fruitful analysis of human action requires us to avoid the atomisation implicit in the theoretical extremes of under- and over-socialised conceptions. Actors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by a particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded *in concrete, ongoing systems of social relations.*” [Granovetter, 1985; p.487; emphasis added]

Trust and motivation. The embeddedness argument stresses the role of social networks in generating *trust* and so it claims that social relations “are the structure that fulfils the function of sustaining order.” [*Ibiden*; p.491]

But it is important to not give a mechanical and determinist interpretation of the role played by social networks. As Granovetter himself claims, social relations may be a necessary condition for trust among individuals, but they are not sufficient.

TO BE ARGUED BETTER; SEE GRANOVETTER (1985) PP. 491-493

It is important to keep separate the existence of a relation from the actual motivation for trustworthy behaviour; in other terms, to take into consideration the strength of the ties and the behaviour expected.

2.2 Towards a definition

The concept of social network is based on interdependence among actors and their actions. This implies that the networks perspective focuses on relations rather than attributes or characteristics of autonomous individual units. Relation ties among actors are primary to understanding the behaviour of individual; meanwhile their attributes are secondary.

According to that, it is possible to define a social network as a set of nodes or actors linked by social relationship [Castilla et al., 2002; p.219], or similarly it as a set of social relations among actors [Powell and Smith-Doerr, 1994; p.377].

A relation (or tie) between two actors has both strength and content. The latter concerns the type of relation and it might include information, advice, friendship... and typically some level of trust. Trust is crucial for a tie and it depends both on relational and structural elements. The

former concerns the history of the relation, the latter concerns the characteristic of the network itself: there are kinds of networks more suitable for controlling and monitoring individual behaviours (e.g. a dense network with many connections makes information on one's reputation spread more easily).

The strength of a relation concerns the degree of the relation itself, and it depends on the amount of time spent together, emotional intensity, etc. The tie strength could be interpreted as a measure of social distance between two individuals *directly* connected.

A final remark concerns social network nodes. Could an organisation or an institution be a node of a social network?

Social networks perspective can be employed to analyse any kind of relational data, without any reference to the attributes of an individual unit. In this regard, let me consider the example of trade among nations put forward by Wasserman and Faust [1994; pp.8-9]. In this case, network analysis could be useful to verify the existence of a core-periphery structure in the world economic system. Of course it would be meaningless to speak about trust as one of the contents of the tie. It seems to me that using networks in similar studies risks reducing networks to metaphors and so emptying this concept of any explanatory value.

Therefore we can speak properly of social networks when relations between the actors could (at least potentially) involve some degree of trust.

So it is possible to consider for example firms as nodes of a social network, if that implies some relations among members of the firms (e.g. sales manager; R&D personnel). For example, Castilla et al.'s article (2002) concerns social networks in Silicon Valley, and any network of firms studied involves analysis of relational data among people (e.g. co-founders of semiconductor firms).

3 Knowledge, learning and social networks

Following Arrow (1994), it is plausible to claim that new knowledge is acquired in two different ways: (1) by observing: “[...] acquisition from observing nature,... [or] inferring the knowledge of others by observing their behaviour” [Arrow, 1994; p.7]; by communicating (see Mina, 2002; p.3). Therefore learning could be seen as a continuous interaction among individuals and between individuals and their environment (Popper 1990).

In this regard, it is useful to introduce a clear distinction between *knowledge* and *understanding* (Metcalf and Ramlogan, 2002). Knowledge is a capacity acquired by experience. Experience does not derive from mere repetitions of something but from a deep and *active comprehension of the things known*. Any knowledge has to be achieved, shaped, assimilated, and believed by someone (Polanyi, 1962). According to this, it is personal, idiosyncratic, and can not be disembodied, since knowledge resides in the skills of individuals.

Therefore knowledge cannot be completely communicated. But any individual can represent a piece of proper knowledge by means of a language/code, and he/she can exchange this with other individuals. And any other individual needs a skilful knowledge of that particular code to understand the knowledge hidden in that piece of information.⁶

So what the individuals can exchange is a symbolic representation of knowledge (i.e. information) by communicating. In this way it is possible for individuals to reach a shared understanding⁷ and consequently acquire *individually* a new piece of knowledge by a collective process. Different individuals could come together to exchange information and in this way increase their own knowledge. They share the process but not the product, that it is individual because it depends on individual absorptive capacity.

⁶ Therefore a skilful comprehension of a code is a necessary prerequisite for any act of communicating, because the code has to be used as a tool for understanding the pieces of information received. Knowing a code could be interpreted as the tacit dimension of any communicative act.

⁷“We can say instead that as individuals they have the same understanding in so far as they provide indistinguishable, or at least closely correlated answers to the same questions or if they respond in indistinguishable ways to the same instructions” [Metcalf and Ramlogan, 2002, p.5]

As we consider the application to the division of labour to the growth of knowledge that it is possible to grasp the fundamental role of institutions in coordinating individuals to develop common understanding.

“In this regard, institutions matter in two fundamental ways in relation to the connection between knowledge and understanding. First, they constitute the means to store and communicate information in general and the means to support particular patterns of interaction.[...] This is the question of language, commensuration and symbolic representation in general. [...] Secondly, institutions embody the rules, the standards of socially agreed belief, that are the means to accumulate justifiably true knowledge in relation to science, technology, as well as organisation and social disclosure” [Metcalf and Ramlogan, 2002; pp.5-6]

Firm could be seen as one of these institutions, possibly the most relevant ones in a capitalist economy. In order to clarify this, let me consider what is meant by the *routines* concept in evolutionary economics.

Routines sum up the capabilities and behaviour of organisations. Any given organisation has a certain number of individuals that have different roles and different personal knowledge. Any organisation’s activity requires the co-ordination of the activity of individuals and also that every member carries out the necessary skilful performance. Therefore firm routines have two dimensions.

One dimension is cognitive. Firm decisions and behaviours are results of collective actions. This requires co-ordination among workers; and therefore a common code and automatism are necessary. Every firm member knows what he/she has to do, being sure that the others are carrying out their tasks. From this point of view routines are defined as *shared understanding*.

The second routine dimension concerns the conceptual distinction between labour and the service of labour and between knowledge and the service of knowledge. Every member of an organisation has his/her own knowledge; the organisational routines *induce* every one to make an effort to use his/her knowledge as required. For that reason, Nelson and Winter [1982, pp.??] consider routine also to be a *truce*. Therefore routines have a *governance* dimension too. However this other role of routines is usually neglected or not considered and only in a recent paper Coriat and Dosi (1998) revert to the two-fold original meaning of routines, stressing that they are also “*a locus of conflict, governance and a way of codifying microeconomic incentives and constraints.*” [Coriat and Dosi, 1998; p.104; emphasis in the original] In sum, routines could

be interpreted as a coordinating mechanisms making sure that any member carries out skilfully his/her demanded task. But firms are not the only institutions playing this role.

Individuals and learning processes are embedded in social structures and so it is quite obvious that social networks could be considered a useful concept to analyse how individuals socially interact and develop understanding. What is really interesting to analyse is how social relations interplay with two other institutions: hierarchical ones (e.g. firm) and market.

In order to consider that, the next two sections concern the role of social relations in knowledge accumulation of individuals and of organisations they work for. In particular I focus on social relations among individuals involved in research activities; or in other terms, on communities of practise (e.g. Constant, 1980; von Hippel, 1987).

According to the framework I sum up in the first part of this section, it is possible to define a community of practise as a group of individuals engaged on a recognised subset of applied research questions, with accepted attitudes, behaviours relating to the communication of research findings. Therefore the institutional and social contexts shape the features of knowledge in terms of non-excludability and non-rivalry.

It is plausible to think that communities of practitioners treat knowledge as a sort of club good. Knowing the code determines the community membership and given some established rules the community members exchange information and so doing they accumulate *collectively* individual knowledge. It is possible to distinguish economic agents not only between insider and outsider, but also between members at different social distance from each other. Within these communities, social relations among individuals are probably one of the most important means to develop common understanding, to access information and to be aware of job opportunities.

It is important to specify the actual content of social relations in order to have useful analytical insights. In this regard, it is better to analyse separately social networks involving knowledge accumulation and networks concerning information spreading. The former require collective action between individuals, the latter a diffusion of information. Also if they are clearly logically distinct, they could end up being interconnected and interdependent. This last, but not least, question has to be analysed too. In the next two sections, I will make some considerations on how networks work (e.g. contents and strength of a tie) and I am not going to consider how networks

develop; in other terms the focus will be on some static features of networks not on their dynamics.

3.1 Understanding and cognitive networks

Let me consider von Hippel's contribution (1987) to introduce the argument. Von Hippel considers the informal know-how trading among engineers employed in competing firms and how valuable information flows freely through professional networks.

“A firm's staff of engineers is responsible for obtaining or developing the know-how its firm needs. When required know-how is not available in-house, an engineer typically cannot find what he needs in publication either: much is very specialized and not published yet. He must either develop it himself or *learn* what he needs to know *by talking* to other specialists” [von Hippel, 1987, p.???, emphasis added]

A social network seems to be at work! The **content** of the ties includes the acquisition of a piece of new knowledge by communicating; according to our framework, this implies interaction in order to develop a shared understanding. Therefore the relation content requires coordinated action for both the nodes involved and it implies at least an indirect cost in terms of effort and time. The relation is considered reciprocal and favours have to be returned, directly or indirectly. So trust is present.

The degree of **trust** could be different in any specific tie and depends on the structure of the network itself too. First, trust depends on the history of the ties. In this regard, the network of opportunity could matter (e.g. a job found by information given by a professional colleague). Secondly, the structure and other features of the network could influence the level of trust. For instance, the density of the network could make monitoring easier and control of good or bad behaviour more effective. The density of the network could reinforce the trust and so influence the efficiency of the network itself.

Analysing and measuring the **strength** of every tie is less straightforward when every node has a very similar social role (i.e. professional colleague). Other relevant dimensions (e.g. emotional intensity) could be difficult to detect.

However the actual content of the tie could influence the effective role potentially played by strong and weak ties, independently of how we define and measure them. The Granovetter's thesis of the strength of weak ties could not be valid. For instance, Chwe (1999) shows that the weak ties are relevant for spreading information around, but strong ties matter when the content includes collective action. As we have seen, the plausibility of Granovetter's thesis affects the dimension reachable by an efficient network.

When collective action is involved, **motivations** matter more and have to be deeply analysed. Let me come back to von Hippel's contribution. What it is really interesting is that know-how trading is accepted and in a way is encouraged by the firms engineers are working for. Firms' strategies and actual know-how value influence the behaviour of employees in exchanging know-how information. One firm of the sample analysed does not permit this kind of trading; and particularly valuable piece of know-how are not traded at all.

3.2 Information diffusion and networks of opportunities

A community of practise could be analysed also as a social network of job opportunities; any connected member of the community can provide useful information. But this is not the only method to find a job or to fill a vacancy. Two other means have to be considered: formal method and other social relations that could provide job opportunities.

Let me start to consider the latter. Any member of a community is obviously embedded in a social structure wider than his/her professional network. Everyone has simply many different relations: relatives, neighbours, friends and so on.⁸ Therefore a community network is simply a subpart of a wider social network.

Every relationship of the new network has to be classified relative to its strength, and probably many professional colleague nodes could be considered connected by weak ties, at least in relative terms.

⁸ Indeed, every individual could have different roles too; and so two individual could be professional colleagues, relatives and neighbours at the same time. For simplicity's sake, I assume that being professional colleagues exclude any other relation kind.

But it seems to me that those professional nodes are pretty different from the others and not just in terms of strength. It is plausible to think that professional colleagues are able to give more *intensive* information (Rees, 1966) to both sides of the labour market. First, a professional colleague is able to judge precisely the specific skill and this possibility sounds still more convincing in relation to more and more specialised professions. Secondly, professional colleagues are more likely to be informed of a highly specialised vacancy and to offer better information about the firm having that vacancy to fill.

According to this, it seems to me that if we are analysing the high-skill labour market segment, many nodes are simply not relevant; and they could be excluded. The correctness of this exclusion seems to depend negatively on the dimension of the segment of the market.

On the other hand, the numerical dimension could affect the relevance of the asymmetric information problem. If everyone knows everyone, then the relevance of social relations decrease, meanwhile the importance of *strategic behaviour* and gossip increases.

Let me consider now the formal method of finding a job or filling a vacancy. The relevance of the formal method could also depend on the degree of professional niche. For instance in many professional jobs, specifically in research area, it is possible to signal one's skills in different ways (e.g. publications; patents). Other market mechanisms could function (e.g. the head-hunter agency; university job placement). In conclusion, the relevance of social networks could depend on the effective role played by other mechanisms and so labour market segments have to be carefully and specifically researched.

Let me finally consider the **interdependence** between the two kinds of network. Cognitive and opportunities networks are interconnected at least in two ways. First, it is not excludable that some signalling of a job opportunity could be considered enough in order to satisfy an obligation for received know-how information; and otherwise doing favours could be a strategy to signal proper skills. The motivations of exchanging in one of the social networks could affect the other ones.

Secondly and extremely important, taking a job opportunity increases job mobility and this could create new relations (or eliminate an existing one), and so job mobility could change the structure both of cognitive and opportunities network (e.g. increase the density). Castilla and his co-authors

(2002) stress this particularly in Silicon Valley social networks: “One of the most important aspects of Silicon Valley is the way its labour market works. Extensive labor mobility creates rapidly shifting and permeable firm and institutional boundaries and dense personal networks across the technical and professional population. [...E]ngineers in the Valley move frequently from one project to another. *High mobility reinforces the dense networks*, strengthening their roles as channels through which technical and market information, as well as other intangibles - organisational culture and trust, for example - are diffused and shared among firms.” [Castilla et al., 2002; p. 220; emphasis added]

4 Conclusions and further research

Knowledge accumulation is a socially embedded activity; any individual, whatever member of any kind of organisation has his/her own personal knowledge achieved, shaped, assimilated, and believed. In regard to this, social relations matter. By communicating it is possible for individuals reach a shared understanding and consequently acquire *individually* a new piece of knowledge by a collective process. Communicating is one of the fundamental ways individuals learn.

Therefore the division of labour in knowledge accumulation is central. Firms, or other hierarchical institutions, market mechanisms and social networks could be seen as coordinating mechanisms for knowledge accumulation. Social networks could possibly be seen as one of the most important and pervasive of these institutions. "*Society is more ingenious than the market.*"⁹ The aim of this paper is to explore on the concept of social networks, to provide a definition and to try to consider its potential application to communities of practise.

The concept of social network is based on interdependence among actors and their actions. This implies that the networks perspective focuses on relations rather than attributes or characteristics of autonomous individual units. An essential content of any relation is trust.

Therefore we can speak properly of social networks when relations between actors could (at least potentially) involve some degree of trust. Otherwise there is the risk reducing social networks to metaphors and so emptying this concept of any explanatory value.

The presence of trust is a necessary condition but it is not sufficient. The existence of a trustworthy relationship between two individuals does not obviously imply that both of them are necessarily motivated for cooperating behaviour. It needs to be analysed.

Communities of practise could operate as a social network. These communities could be defined as a group of individuals engaged on a recognised subset of applied research questions, with accepted attitudes, behaviours relating to the communication of research findings. Within these

⁹ With these words, Kenneth Arrow (1987; p.687) comments Dasgupta and David's seminal contributions on new economic of science. In these pair of paper the authors develop an original point of view of knowledge production and allocation issue. Differently from textbook analysis perspective, they do not focus on the features of the public good knowledge and on their consequences on allocation of resource for invention; but they consider how the social organisation of research activities determines the features of knowledge itself. They shift the focus from the inherent features of knowledge to the institutional context in which it is produced and distributed. On this see Stephan's review (1996).

communities, social relations among individuals are probably one of the most important means to develop common understanding, to access information and to be aware of job opportunities.

My arguments concern static features of both cognitive and opportunities networks. First, even if these two kinds of networks are interconnected and interdependent, they are clearly logically distinct. The former involves a collective action (e.g. developing a shared understanding); the latter concerns information diffusion. So the motivations of individuals could be different, because they depend on the relation content. This difference has clear implications. For instance, the plausibility of the strength of weak ties thesis could be different and this affects the relevance of social distance. Sometimes, small geodesic distance between two individuals could be enough to make them really far apart!

Secondly, it is necessary to consider how other institutions affect the individual in using social networks. “Treating only the strength of ties ignores, for instance, all the important issues involving their content. What is the relation between strength and degree of specialisation of ties, or between strength and hierarchical structure?” [Granovetter, 1973; p.1378].

Thirdly, social networks could be important for knowledge accumulation because they could provide job opportunity and consequently stimulate job mobility. The latter is central for some features of network structure itself (i.e. any job change could increase social relations of individuals), but also because job mobility could be a channel of knowledge diffusion (Breschi and Lissoni, 2003). Therefore the effective functioning of the labour market (e.g. how individuals become aware of job opportunities) has to be deeply researched.

My further research will be to apply the social networks concept to a (supposed) community of practise: Italian biotechnology inventors. My first step will be to enrich the information of the CESPRI inventor database (for a description of that, see Breschi and Lissoni, 2003; pp.16-17) by questionnaires. Further data are necessary to detect the effective content of the relation and to define a measure of the strength of the tie.

Considering the data availability, I will try to answer the following questions: is this network providing job opportunities? Are the social interactions with others developing shared understanding? How much does social distance matter?

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