Title
It takes more than one network to tell the whole story: An initial view at multiplex embeddedness

Author
Fonti, Fabio

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ONE RELATIONSHIP IS NOT ENOUGH:

AN INITIAL VIEW AT MULTIPLEX EMBEDDEDNESS

FABIO FONTI

Department of Business Administration

University of Illinois at Urbana-Champaign

Phone: 217-344-5875

Fax: 217-244-7969

Email: fonti@uiuc.edu

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ABSTRACT

Networks have recently acquired a prominent spot among the mechanisms used to understand differences between organizations. This is probably a due response to the need for understanding an economic world which is increasingly relational in nature. In many of these studies, the focus has been on the association between the organization and the network in which it is embedded, defined for one of the relationships which are deemed critical for the organization (such as a communication network or an advice network). However, while this work helps in exploring the effects of network structure on organizations, it does not capture the fact that within the same organizational network each actor is simultaneously involved in many relationships, which *all at the same time* affect its choice of action.

The goal of this work is to bring this multiplexity into the picture. I am doing so by investigating the effects of multiplex embeddedness (defined as the degree of an organization's involvement in different types of relationships, within a given network) on critical organizational variables, such as growth and internal structure. In this process, I also try to understand what is the influence of two additional variables such as firm's location (being part of the industrial district) and presence of institutional elements (being an industry association member) on network structure, as well as on its effects on the organization.

INTRODUCTION

Many times a given organization (or an individual in such organization) reacts in a certain way to an event (or series of events), and such reaction has neither the magnitude and at times nor even the direction that one would have expected. Among the many likely causes for this to happen, there is a possible explanation on which I would like to elaborate. It may be the case that a different type of reaction has been chosen in consideration for certain relationships that the organization has with other actors in its environment. These relationships may have influenced the organization to such point that its reaction takes the opposite direction to the one an external observer would have expected. Of course, over time, this contributes to the stratification process for organizational outcomes such as growth and profitability.

It could also happen that two different organizations, reacting the same way to a given event, turn out having a different level of benefits associated with such actions: that is, one may result more beneficial with respect to the other, mainly because of the presence of additional conditions that favor the efficiency of such behavior. One of such conditions is the presence of specific relationships between the organization and its environment. For example, the organization may try to increase its interaction with other organizations in the industry to gather more information and face a sudden environmental threat: in this case, the firm may be more successful if it also has many interorganizational trust ties with such other actors, because in this case the information that will gather is likely to be of a better quality. Of course, the opposite situation is also true, whereby an organization's action can be impeded by the absence (presence) of certain relationships. In the case above, we see that the organization with less interorganizational trust ties is at a disadvantage in trying to

gather important information from other organizations in the industry. Also, it could be the case that the presence of too many communication ties will impede the successful enactment of yet more interaction. Since resources in each organization are limited, if an organization tries to increase communication when it already has all of its members at full capacity in terms of time available for interactions (due to lots of links with other actors), the outcome is likely not to be as good as for an organization which instead still has slack resources to be employed for such purpose. In this situation too, in the long term, the difference in the efficiency of specific actions will result in different organizational outcomes.

Both these situations are the consequence of a condition in organizations' life upon which many scholars would agree (for example, see Pfeffer & Salancik, 1978). That is, organizations are strongly influenced in their actions by the different types of relationships ongoing in the network of which they are part together with other members of their environment, such as competitors, customers, governmental agencies, and other institutions. Such network of relationships at the same time enables and constrains an organization's choice of action. A much interesting, but less investigated corollary of this statement is how this degree of involvement of the organization in the network, also called embeddedness (Granovetter, 1985), *in its entirety* affects the organization. The primary purpose of my work is to investigate this question: how the embeddedness in the multiple relationships network in which an organization is involved affects the organization as a whole.

To do so, first I briefly discuss how the network perspective has entered the organizational theory field and how it has evolved into studies of organizational

embeddedness. Second, I point out why I believe it is important to think of relationships as influencing other relationships (i.e. embeddedness influencing embeddedness), as well as to look at their overall influence on the organization. Third, I elaborate on a specific organizational context -- the industrial district -- where embeddedness is thought of being particularly strong as well as critical. Fourth, I assess what could be the role played by institutional elements (namely, the industry association membership) in the emergence and consequences of multiplex embeddedness. Fifth, I delineate an empirical study aiming at testing hypotheses emerging from previous discussion. Finally, I conclude the work with a discussion of my results as well as theoretical and practical implications of this study.

THEORY

The relational revolution: empirical and theoretical aspects

The trend toward globalization, fast technological advancements, and a general increase in the instability and uncertainty of the competitive arena are just some of the phenomena that have recently contributed to a substantial growth in the complexity of organizations, as well as of the environments in which they operate (Kanter, 1989). As a consequence, organizations have become more difficult to manage, due to a relative scarcity of resources, both physical and cognitive, necessary to face these contexts. In order to obtain the resources and -- as a consequence -- the flexibility necessary to cope with such environments (Volberda, 1996), an alternative that many organizations have successfully explored is the strategic use of the social structure in which they operate, via the development of interorganizational relationships (Gulati, 1995, 1998).

Such increasingly relational economic reality has not been matched with a similar widespread attention to this phenomenon on part of scholars studying organizations. In fact, until a few years ago, one of the major problems of management and (to an extent) organizational studies has been the limited focus on to the social context where organizations interact (Pfeffer, 1987; Baum & Dutton, 1996). More specifically there has been relatively little attention has been paid to the role of the relationships that an organization has with other actors in the context in which it operates, as well on the interplay of actions of the other players, and how all these affect (and can be affected by) organizational action and outcomes.

This is probably due to the fact that the two main perspectives on organizational action that have been mainstream for the most part of this century, an undersocialized and an oversocialized view of economic action (Granovetter, 1985), have the common, underlying problem of assuming actor's atomization, which logically leads to a reduced role for social structure. While the undersocialized perspective derives the atomized view from the narrow definition of the actor's goals (in term of self-interest pursuit), the oversocialized one gets it from the assumption that 'correct' behaviors (for a certain actor, with a certain role, in a certain environment) have been internalized by the individual (or organization), hence leaving little or no space to influence on part of ongoing social relationships (Granovetter, 1985).

However, in the last 15 years things have started changed. To the evident trend toward a relational economy, the literature in organizational theory has recently responded with an increased interest in the study of networks (Powell & Smith-Doerr, 1994). Scholars have started to complement more traditional attributes-based analysis of organizations,

with a network perspective; that is, with an examination of the relationship structure in which an organization is active, in order to provide additional insight into critical organizational processes and outcomes.

More specifically, a lot more attention has recently been paid to the construct of embeddedness. While this concept was initially introduced by Polanyi (1944), it owes its current resurgence to the work of Granovetter (1985). In general terms, embeddedness refers to the degree to which an actor -- individual or organization -- is involved in a social system and how, in turn, this level of involvement affects (and is affected by) its behavior (Granovetter, 1985, 1992). More specifically, one prominent research question has dealt with identifying the role of organizational embeddedness in influencing economic action (i.e., organizational performance, alliance formation, organizational survival, and so on). Most of the studies tackling this issue confirm a critical role of the network structure -- and the degree to which organization are embedded in it -- in determining how well the organization is doing (Granovetter, 1985, 1992, 1995; Uzzi, 1996, 1997; Baum & Dutton, 1996; Dacin, Ventresca & Beal, 1999). Table 1 provides a summary of many of such studies.

Insert Table 1 about here

When one relationship is not enough: introducing multiplex embeddedness

The works listed in Table 1 definitely represent a big step forward in understanding the influence that a relationships' structure has on organizations. However, a common problem to most of them is that they focus on the position of the organization in the

network, considering only one relationship at a time. A network is defined as a set of actors and the relationships that are ongoing among such actors (Wasserman & Faust, 1994). While it is interesting to examine the influence on organizational outcomes of the position held by an organization in a network (i.e., its level of embeddedness) for a given relationship (such as communication, for example), this only partially captures the fact that any organization belonging to a given network is embedded in a number of different relationships that are *all simultaneously affecting* its economic decisions, either by cumulatively constraining the available choices or by providing additional opportunities.

This equals to say that the nature of most organizational networks is multivariate: for each set of nodes (organizations), there are several sets of lines (ties) associated with it (Wasserman & Faust, 1994), one for each type of relationships in which actors are engaging (such as communication, advice, knowledge transfer, and so forth). Also, the structure of links among actors is likely to be different for each of the relationships we may consider: i.e., the communication structure is with all likelihood different from the advice structure, and so forth. A multivariate network can be seen as having many overlapping layers of ties among organizations, which all together contribute to the set of alternatives available to the organization, at one given point in time, as well as to the effect that any of such alternative actions may have in terms of outcome for the organization. Hence, the relational effect on the organization, which represents at the same time source of opportunities and of constraints (Powell & Smith-Doerr, 1994), comes simultaneously from all the possible configurations -- one for each relationship -- of the network in which the organization is located (Granovetter, 1973; Dacin et al, 1999).

Therefore, a more comprehensive view of embeddedness would rely strongly on the multiplex nature of any actor, that is on the fact that it is at the same time involved in several different relationships within its network, which may or may not be overlapping and may or may not have similar structure, but that all together influence its behavior. In this sense, the degree of embeddedness of a given organization needs to be interpreted not only in terms of its position within a network for one specific relationship, but also as the cumulative effect that all the relevant relationships in which it participates have simultaneously on its actions (Dacin et al, 1999).

For this reason, I am suggesting here a more comprehensive approach to study of embeddedness. Specifically, I propose to look at how multiplex embeddedness, defined as the degree of involvement of an organization in a multivariate network, affects its ability to compete in the market. It is obvious that, in addition to theoretical merit (Dacin et al, 1999), this approach has quite interesting practical implications. Looking at the effects on organizational outcomes of its position in the many network configurations deriving from the relevant relationships it is entertaining could help organization scholars in providing managers with insights and recommendations rooted in a realistic view of the competitive arena. While single networks studies do continue to have merit, a look at a more multiplex reality can turn out interesting and valuable findings.

While there may quite a lot of relationships in which an organization is involved within its network, a few of these relationships are probably the ones that are more critical for the organization destiny. It is on them that I would like to focus, in exploring the concept of multiplex embeddedness. While there may be various relationships that can emerge as critical depending on the type of organization as well as on the context that is

analyzed, three of them tend to have a sort of overall importance in the functioning of an organization, independently from the situation specifically investigated. They are communication, interorganizational trust, and knowledge transfer. Hence, these are the three relationships on which I will define multiplex embeddedness in this work.

Specifically, an analysis looking at the role of embeddedness in the communication network only may well significantly associate it with organizational performance. However, it is as likely for this association to be a spurious one. In fact, receiving lots of communication from other organizations in the network is not going to positively influence an organization, unless the quality of such communication is high as well (i.e., there is lots of informational content in such communication exchanges). This may happen if, in addition to have a central position in the network in terms of the communication relationship, the organization is also strongly embedded in such network with regards to interorganizational trust. If the organization is strongly positioned in the trust network, this basically indicates that other actors trust it, and therefore are more likely to 'open up' during exchanges. That is, being strongly embedded in the communication network does not provide per se benefits in terms of increased performance for the organization, unless such high level of embeddedness is also present for other critical (in the sense of the resources they provide to the organization) relationships in the network, such as interorganizational trust.

Furthermore, in any organizational network, it is critical the amount of knowledge that the organization can extract from other players in the industry. Such knowledge can be obtained through interactions, but it is also often gain using other means, such as personnel exchange and imitation processes. For this reason, a strong position in the network in terms

of the knowledge transfer relationship is probably going to be associated as well, together with a similarly strong embeddedness for the communication and trust relationship, with improved performance.

Finally, it may be the case that while higher levels of multiplex embeddedness are good for the organization, their full-fledged effects are only felt when such embeddedness is the result of the very same tie, between organization A and organization B, across all three relationships. That is, maybe it is not enough to be strongly embedded in the three relationships when each is taken separately, but it may be necessary to gain centrality in a network which is the result of compounding the three relationships at hand. This is a much more stringent condition than the ones described above, because it entails the need for all three relationships between two organizations to be present, for a tie to exist. The rationale here would be that it is not enough that a given organization has a strong position in terms of all three variables: instead, such strong position must be the result of ties involving the same actors across the three relationships. That is, organization A must be central in terms of the number of ties where it receives information from organizations who trust A and from which A feels it is getting knowledge).

This translates into the following hypotheses:

H_{1a}: High levels of embeddedness in the network in terms of the interaction and interorganizational trust relationships are going to be associated with higher organizational performance;

H_{1b}: High levels of embeddedness in the network in terms of the interaction, trust and knowledge transfer relationships are going to be associated with higher organizational performance;

H_{1c}: High levels of embeddedness in the combined relationships network are going to be associated with higher organizational performance.

Where relations really matter: the industrial district

Another interesting phenomenon which has still to fully catch the attention of many managerial and organizational scholars and that can add to the understanding of the relationship between multiplex embeddedness and organizational outcomes is the issue of firm's location, especially in the context of an industrial district (Piore & Sabel, 1984).

An industrial district is a geographically proximate cluster of institutions, communities and organizations which has shown to be extremely rich in amount and intensity of relationships, as well as provide many benefits to both organizations and communities involved in it (Piore & Sabel, 1984). Industrial districts have also been characterized as an example of a trust-based, networks form of governance (Powell, 1996).

While such phenomenon has been quite investigated by disciplines such as regional studies (Staber, 1996; Sternberg, 1999) and urban planning (Saxenian, 1996; Costa-Campi & Viladecans-Marsal, 1999), the managerial and organizational fields have been less prone to systematically investigate the seemingly superior performances shown by firms located in the district. One reason for this may be due to fact that it is quite difficult to get at the intertwining of relationships that eventually lead to what has been called 'the relational-based competitive advantage' (McEvily & Zaheer, 1999).

Notwithstanding such difficulties, including firm's location in the analysis of the effects of multiplex embeddedness on organizational outcomes by looking at an industry that features at least one industrial district could prove extremely beneficial. In fact, the presence of a very high level of interaction among actors that is typical of an industrial

district will likely allow the emergence of stronger multiplex embeddedness effects, and therefore allow to get a better look at how this phenomenon plays out. In addition, by looking at an entire industry, there will be the possibility to test whether certain properties of multiplex embeddedness are idiosyncratic of high-interactions environments (such as the industrial district), or whether they hold more generally across the industries as a whole (independently by the level of interaction among actors). In the former case, one could then make an argument that these effects could derive from the thick network of civic and institutional engagement that is typical of these areas (Putnam, 1993), thus showing that the cultural and institutional environment in which an organization is active plays a role in determining the effects of multiplex embeddedness. Also, another possible explanation in this case could be related to the role of the government and of local laws in these contexts, given that industrial districts typically feature specific types of legislation as well of firm-government relationships. If the effects were to be the same both inside and outside the industrial district, instead, then this would be evidence that the link between multiplex embeddedness and organizational outcomes are a more widespread characteristic of organizational interaction (thus not being associated with this specific form of regional development). This distinction is also important in view of a possible international comparison that may follow this study, especially given the fact that the industrial district form, while strongly competitive in some realities (e.g., Italy, Germany, Mexico), has not hatched as well in other contexts, like the American one (or, if it has, it has been with characteristics quite different from the traditional European and Asian industrial districts; see Cohen & Fields, 1999).

Finally, by putting together various network analysis techniques (which allow to get at the structural effect on organizations) and the idea of multiplex embeddedness, some additional light could be shed also at the underlying mechanism that are powering the strong development that is typical of such areas. Of course, these relationships may hold only within the industrial district or for the industry as a whole.

Last but not least, it may be that being in the industrial district would positively affect organizational outcome independently of the level of embeddedness they experience. That is, other factors are at play in favoring, for example, organizational performance or growth, above and beyond the influence that multiplex embeddedness may have on such outcomes.

What just discussed translates in the following hypotheses:

H_{2a}: High levels of embeddedness in the network in terms of the interaction and interorganizational trust relationships are going to be associated with higher organizational performance within the industrial district only;

H_{2b}: High levels of embeddedness in the network in terms of the interaction, interorganizational trust and knowledge transfer relationships are going to be associated with higher organizational performance within the industrial district only;

H_{2c}: High levels of embeddedness in the combined relationships network are going to be associated with higher organizational performance within the industrial district only.

H_{3a}: Being located within the industrial district will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the network in terms of the interaction and interorganizational trust relationships;

H_{3b}: Being located within the industrial district will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the network in terms of the interaction, interorganizational trust and knowledge transfer relationships;

H_{3c}: Being located within the industrial district will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the combined relationships network.

The role of institutions

Another element that could potentially influence the relationship between multiplex embeddedness and organizational outcomes is the role played by local institutions. Government (local, regional, and central) as well as trade associations, by creating norms and participating the definition of a socially constructed reality shape the destiny of a specific industry (Scott, 1992, 1995). This statement is especially true if the industry is featuring industrial districts; in fact, in this case organizations are quite visible (since geographically co-located) and this results in the membership in the industry association being a quite visible signal of legitimacy for everybody else in the industry. Additionally, since a given organization has to have enough resources to be able to foot the often quite high bill that comes with the membership, the message sent to the environment is unequivocally one of wealth and stability. Thus, the membership in the association is likely

to pay back for the organization in terms of the higher legitimacy that the rest of the industry is going to associate with such firm.

The level of legitimacy that comes with being a member of the association may result in a higher quality of relationships for the member firm. This means that, since such firm is seen as a more stable and successful actor in the industry, other organizations may try to ingratiate it by exchanging with it more critical knowledge or opening up on more vital issues in the interaction they have with it. Hence, while the amount of relationships would not change, its content and quality would, leading to a 'thicker' content of such flows, ceteris paribus. In this case, membership in the industry association affects organizational outcomes by moderating the relationship between multiplex embeddedness and organizational outcomes. That is:

H_{4a}: Membership in the industry association will moderate the effects that high levels of embeddedness in the network for the interaction and interorganizational trust relationships have on organizational performance;

H_{4b}: Membership in the industry association will moderate the effects that high levels of embeddedness in the network for the interaction, interorganizational trust and knowledge transfer relationships have on organizational performance;

H_{4c}: Membership in the industry association will moderate the effects that high levels of embeddedness in the combined relationships network have on organizational performance.

Additionally, membership in the association brings with it a certain amount of resources that are independent from the networks in which the organization is embedded. These resources are of two kinds: material (in the sense of the services that the association provides to the members, such as marketing support, industry studies, financial advise, and so forth) and cognitive (since a more legitimated firm may have an edge, everything else equal, on a non member if legitimacy is picked up by the market and results in a more favorable treatment of such firm, especially if compared to organizations that are not members of such institution, like for example when an external customer would have to choose a new supplier). Both these resources, while not influencing directly the interaction, trust, and knowledge transfer network, would surely have a positive effect on organizational outcomes. That is:

H_{5a}: Membership in the industry association will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the network in terms of the interaction and interorganizational trust relationships;

H_{5b}: Membership in the industry association will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the network in terms of the interaction, interorganizational trust and knowledge transfer relationships;

H_{5c}: Membership in the industry association will positively influence organizational performance, independently from the effects on it of high levels of embeddedness in the combined relationships network.

Figure 1 summarizes all the hypotheses discussed so far.

Insert Figure 1 about here

Multiplex embeddedness and organizational structure

A third level of this study has to do with the effects of multiplex embeddedness on another organizational outcome, i.e. intraorganizational structure. It is quite likely that the internal structures of the firm are shaped too by the multiple set of social relations in which the firm is embedded. More specifically, an high level of multiplex embeddedness could drive organizations to develop a much more complex internal structure, just because of all the resources and boundary-spanning activities that would be necessary to keep the organization so strongly involved in all these activities. That is:

H_{6a}: High levels of embeddedness in the network in terms of the interaction, interorganizational trust and knowledge transfer relationships are going to be associated with a more complex and structured organizational structure;

H_{6b}: High levels of embeddedness in the combined relationships network are going to be associated with a more complex and structured organizational structure.

This relationship could however take the opposite direction in the case of organizations located in the industrial district. In fact, in these local realities, entrepreneurs are involved in an incredibly rich network of relationships that extends well beyond the professional level, to include kinship, friendship, common community-based association membership, and so forth. This could mean that, while firms outside the industrial district

need to build within the firm all the structure necessary to manage the multiplex relationships they entertain, for firms located within the district a lot of these relationships are taken care of outside the organization (i.e. through kinship ties, friendship ties, and so forth). That is:

H_{7a}: High levels of embeddedness in the network in term of interaction, interorganizational trust and knowledge transfer relationships are going to be associated with a more complex and structured organizational structure, but only outside the industrial district;

H_{7b}: High levels of embeddedness in the combined relationships network are going to be associated with a more complex and structured organizational structure, but only outside the industrial district.

Figure 2 summarizes all the hypotheses discussed above.

Insert Figure 2 about here

It is important to notice that to getting to know what is the optimal balance for an organization in terms of multiplex embeddedness, what specific factors determine such embeddedness in the network for the relationships which are critical for the specific context in which the organization operates, and what is the effect of multiplex embeddedness on organizational structure are three critical elements for the organizational scholar ability to understand the influence of structure on organizations, as well as for the managers' attempt to develop a relational based competitive advantage (McEvily & Zaheer, 1999). Understanding how these different structures interact with each other

creating constrains and at the same time opportunities for a given actor would again prove invaluable to policy makers and managers who would like to guide the evolution of such relationships.

Effects on multiple embeddedness

The two elements introduced above -- firm's location and institutional membership -- can play an important role not only in determining relevant organizational outcomes or moderating the relationship between multiplex embeddedness and such outcomes, but also in shaping the level of multiplex embeddedness altogether. In a sense, the cultural and institutional environment in which an organization is active plays a role in determining not only the effects *of*, but also the effects *on* multiplex embeddedness.

Being part of the same industrial district means first of all that these firms are geographically co-located, which is itself a reason for a much stronger level of interaction in the network, for all three relationships (given that closeness gives the opportunity for higher interaction). Additionally, the idea of industrial district is one that goes beyond co-location, to include an area where organizations are not simply close to each other, but also engaged in an extremely rich texture of interaction, at all levels, from the entrepreneur all the way down to the blue collar workers. This is an additional reason why it could be reasonable to expect higher levels of multiple embeddedness for the organization in the industrial district. That is:

> *H_{8a}: Being located within the industrial district results in higher levels of embeddedness in the network, in terms of the interaction and interorganizational trust relationships;*

H_{8b}: Being located within the industrial district results in higher levels of embeddedness in the network, in terms of the interaction, interorganizational trust and knowledge transfer relationships;

H_{8c}: Being located within the industrial district results in higher levels of embeddedness in the combined relationships network.

As for the membership in the industry association (the institutional element), it may simply give to the member organization additional chances to interact with the other organizations, in the case of periodic meeting, workshops, or seminars that the association sponsors for members. Hence, this may result in higher levels of embeddedness in the network under consideration, either for the three relationships taken separately or when jointly combined. That is:

H_{9a}: Membership in the industry association is resulting in higher levels of embeddedness in the network, in terms of the interaction, interorganizational trust and knowledge transfer relationships;

H_{9b}: Membership in the industry association is resulting in higher levels of embeddedness in the combined relationships network.

These hypotheses are summarized in Figure 3.

Insert Figure 3 about here

The relationships just hypothesized are quite interesting because they may help to shed a light on the antecedents of such networks structures and of the position held here by the organization. While possessing additional points in time would allow to see whether

previous embeddedness could predict future embeddedness (data that unfortunately is very difficult to get and not available here), something that could be still be verified in a cross-sectional study is whether organizations are purposefully trying to network with other organizations, so to increase their level of embeddedness. A perfectly logical way of doing that is to signal it through membership in the industry association, and participation at their events. Understanding what are the determinants of an organization's position in each of these networks is especially important, because it could allow managers and policy makers to strategically architecture the organization's presence in the different networks, so to achieve the desired results.

METHODS

Sample

In order to compare how multiplex embeddedness works within and outside industrial districts, my study has to examine an entire population of organizations, at a national level, in an industry which prominently features at least one industrial district. In this way, I am able to see whether the structure of organizations within the district and the one of organizations outside the district affect organizational outcomes differently.

The need to examine all the organization within an industry -- while extremely interesting for the richness of the data that can be obtained -- is certainly a taxing task. However, an additional reason for this choice has to do with the method that I will use to study embeddedness. In fact, while other types of research are typically using samples for studying specific phenomena, in the case of network analysis (Wasserman & Faust, 1994), the method I will mostly use, this can not be done. In this type of analysis, it is critical to

be able to identify the full structure of relationships ongoing among the members of the network. Hence, for the analysis to be meaningful, it is necessary to obtain data coverage as close as possible to a 100% of the universe that one wants to analyze. Otherwise, the risk for the researcher is to miss out what could be very critical links, and therefore draw incorrect conclusion from the available data. Such risk clearly increases the farther we go from a 100% data response.

On the basis of such premises, I identified a context that fits the specifications mentioned above. Specifically, I will focus my analysis on the multiplex relationships among organizations that make up the Italian industry of producers of machinery and equipment for ceramics manufacturing. Basically, this is the industry that produces any type of machine and related apparatus used in manufacturing ceramics products, from tiles, to brick, to technical ceramics. The reasons for my choice of this particular industry are the following:

- it is relatively contained (a total of 181 firms), and this fits my main methodological criteria for the setting. Since I am trying to get as a complete networks as possible, the fact that the industry as a whole is relatively contained is definitely a plus;
- it is strongly localized, since the majority of the firms are located within the Sassuolo-Castellarano industrial district (an area of about 35 miles radius, located between the provinces of Modena and Reggio Emilia). First, this fits my substantive criteria, which calls for an industry featuring industrial districts. Secondly, having most of my universe concentrated in a relatively restricted area is also a very convenient, because this will make it easier to gather data

from all the companies within the district. Third, it will give me the opportunity, by residing in the district itself, to get a feel for the industry environment, which will further help me in my analysis;

- last but not least, one more reason why this is a good setting is due to the fact that this industry is going through a very negative cycle (the last three years saw total industry sales plummet of almost 25%). This latter feature is important, since for at least one of the relationships in which I am interested (interorganizational trust), one of the main problems is the issue of causality between presence of the relationship and good performance. A possible argument is in fact that once trust is present, then performance grows, which in turns further boosts trust. Hence, this link is quite difficult to extricate. However, by examining relationships in a sector of the economy that has been so badly bruised by international competition and where performances are probably dimming out (especially after the Chinese entered the market as competitors), I think I will at least partially avoid this 'virtuous cycle' issue.

More specifically, the industry association (called ACIMAC) counted 181 companies as belonging to the industry (1999 data, most recent available). In order to belong to the industry, as defined by the industry association, a firm should satisfy two criteria: it has to do more than 50% of its total sales in industry related sales, and these sales must be to the final market (i.e., not in subcontracting agreements). As for this latter point, the rationale behind it is that subcontracting sales should not be counted twice: hence, the sales deriving from a subcontracting agreement do not count toward the 50% threshold just mentioned (this means that if A sells an oven to B and then B sells it to the

final customer, only the amount of the second sale is counted to determine the industry dimensions, and therefore the belonging or not to the sector).

Furthermore, the industry association categorizes such firms in five classes, depending on their sales level:

- class 1, from $500,000 to $2,5 millions in annual sales[1];
- class 2, from $2,5 to $5 millions in annual sales;
- class 3, from $5 to $10 millions in annual sales;
- class 4, from $10 to $20 millions in annual sales;
- class 5, more than $20 millions in annual sales.

After a few visits to the association (located in the heart of the industrial district, in Modena, Italy) and a few meetings with industry experts, I was convinced by these individuals that my universe should consider only some of these 181 firms. Specifically, I came to the realization that I would not lose much by excluding the firms in dimensional class 1. In fact, after looking at the classification split based on 1998 sales data (ACIMAC, 1999)[2], one element comes out as very clear: the upper 4 classes (i.e. class 2 through 5) count for almost all the industry sales. Specifically, in 1998 they counted for 95% of the final sales. Hence, my decision to limit my analysis to firms belonging to class 2 through 5 (i.e. all the firms having more than $2.5 million in final sales in this industry). By doing so I reduced the universe of firms I am going to investigate to 85 firms. Just because my decision to drop the firm in class 1 from my universe of reference may seem very convenient, these are the additional reasons why I should not investigate such firms:

[1] Amounts are transformed from Lire to dollars using a change rate of 1$=2,000Lire, one of the many available (given that the rate changes daily) for the period when the data collection was carried on.
[2] I used the split based on 1998 sales data because the one based on the 1999 data is not yet available. Conversations with the people responsible for assembling such data, though, have confirmed that not much difference is expected in this proportion.

- they are very unstable. Meaning that, given the very low volume of sales, one year they may be part of the industry and the year after they may not be in. This is especially true given the crisis that the industry is experiencing (loss of 25% of the total industry sales over the last 3 years). In this case ‘firms that belong to such class one year are very likely to go back to subcontracting agreements or re-direct their production to a different industry the year after’ (ACIMAC, 1999, pp.17-18);
- they are very often micro-enterprises (one-man firms), which mostly rely on subcontracting agreements with bigger firms in the industry and have also developed some independent product on the side. The fact that they rely most on the skills and time of a single entrepreneur makes it very difficult for a researcher to get the needed time and attention from all these micro-entrepreneurs that is needed for a thorough analysis of the firm’s multiple relational structure;
- a big network data collection is very close not to be technically feasible, especially if the individuals that are interviewed do not have a strong vested interested in the project, and if such individuals are, (like they are in this case) CEOs of their companies. A network data collection for three different types of networks, for a 181 actors’ network, implies a total of 540 questions for collecting the network data only. On top of this one has to add all the other questions that would get a more attributional variables. It is clear that the span of attention of a CEO gets very diminished, very quickly, and the quality of the data that would result from such full fledged survey would probably be poor,

jeopardizing the results of the study. By focusing on the firms that after all are the critical ones -- and that represent almost the entirety of the firms to market -- I am able both to make the study more feasible, to increase the quality of the data collected, and to focus on the relationships that are more critical for the industry.

Data Collection

I plan to administer in person a one and a half hour long questionnaire to an informant (the entrepreneur/CEO of the firm, or at least a top manager in it) from all the organizations that compose such industry which have sales in excess of $2.5 million (i.e., which are in class 2 and above). A complete copy of the questionnaire can be found in Appendix A.

To administer the survey in person is a necessity, since the repetitive nature of some of the questions may result in poor data if the questionnaire is simply mailed to the participants. It has to be kept in mind that for each of the three network questions each respondent must go through a roster of other 84 companies, which can become frustrating especially the second or third time around. Past personal experience in this type of analysis made me realize the enormous difference that a trained interviewer can make in improving the attention threshold of the respondent, and thus the quality of the data collected.

While doing the interviews, I will also reside for several months in the industrial district (in Modena, Italy). This will give me the additional opportunity to understand better the environment in which the majority of such companies do their day-to-day business just by leaving there. Additionally, it will allow me -- as it has already been the case -- to gather information from individuals external to the industry, but well informed

on its dynamics (university professors, consultants, customers), which will additionally improve my insight in the industry dynamics.

The questionnaire will include both relational (network based) and attributional variables. Since some of the independent variables in testing certain are also dependent variables for others (namely, the degree of embeddedness in the network, for the three relationships), instead of splitting the variables description in dependent, independent, and control variables, I will use a different grouping: i.e., relational variables and attributional variables.

Instrumentation: relational variables

In the network section of the questionnaire I plan to collect four different interorganizational networks: communication/interaction, interorganizational trust, knowledge transfer, and social capital[3].

The data about the interaction/communication relationship will be collected using a task-based interaction question. More specifically, I will give each organizational informant a roster which includes all the firms active in the industry (again, dimensional class 2 through 5). As they will look over the list, I will ask them to identify those organizations with which you have had some work-related interaction during the past year, and indicate me the frequency of such interaction, on a scale from 1 (quarterly, or less frequently) to 3 (weekly, or more frequently). Task-based interaction could include conversations in person, in meetings, by phone, via electronic mail, or any other form of communication, all with regards to specific, work-related issues. The choice of a three-items Likert scale, albeit unusual, is justified by the attempt to reduce cognitive strain for

[3] While the former three have already been discusses in the context of hypotheses linked to multiplex embeddedness, the fourth network, the social capital one, will probably be used to test an additional set of related hypotheses on the competitive models in the industry, which represent an immediate addition to this specific work.

the respondents (which will have to answer 336 questions for completing the network section only), as also suggested to me in conversations with other network analyst which collected in the past similar size organizational data sets.

As for the interorganizational trust relationship data, I will collect it by giving the interviewee the following scenario:

> *"Your company has to put together a pool of firms to supply a complete plant or a specific machine to a very good customer of yours. Let's assume that _____ would be among the candidates to be part of such project. Would your company include such firm in the project, with the awareness not to run in a situation where such organization could behave opportunistically against you (for example, trying to steal your client)?"*

Then, I will ask him/her to go down the roster, inserting each firm's name into the statement, and to give me the most appropriate answer for each of them out of three possible choices: 'No', 'Uncertain (neither no nor yes)', and 'Yes'. A major problem with network data collections is that they can not rely on multiple items scales. In fact, a good candidate to determine the network of interorganizational trust would be the Organizational Trust Inventory (also known as the OTI; Cummings & Bromiley, 1996). However, since it is made of 12 items, it is not feasible to submit in a network form (for a network of 85 actor such as this, it would entail to ask 84 x 12 = 1008 questions, only to determine the level of interorganizational trust). Since the OTI is trying to get at the construct of interorganizational trust as a multidimensional one (affective state, cognition and intended behavior), I have in the past used only one of such items to measure it; however, this was done only because in such context only one of such dimensions was

supposedly relevant (Fonti, 1997). Here, however, it may very well be that all three (or at least more than one) dimensions are present; hence, the choice of going with the scenario-based question.

As for the knowledge transfer network, I am using a direct question as well. I will give the interviewee the following statement:

> *How much do you think that _____ has drawn from your company, in terms of products, ideas, and information?*

Again, I will ask him/her to go down the roster, inserting each firm's name into the statement, and to give me the most appropriate answer for each of them out of four possible choices: 'Not at all', 'Very little', 'Some (neither very little nor very much)', and 'Very much'.

Finally, I will collect data on the social capital network by asking to each interviewee the following question:

> *'In critical instances (such as a critical collaboration in a very important contract or the need of information about a brand new customer), to which organization would you turn to?'*

Here, I will ask him/her to indicate to which, among the other 84 organizations in the roster, they would actually turn to.

One additional word must be said here about the fact that I measure all four networks using one-item measures. Measuring such complex constructs relying on only one item may seem questionable. Unfortunately, this is a natural constraint for social network research, where practical considerations strongly hinder the use of multi-items scales, especially when the number of network members is relatively high. In fact, in the

specific network I plan to investigate (size 85x85), each additional item collected would imply 84 (i.e., N - 1) additional questions for each respondent, since it would have to be asked to each respondent, with regards to all the other network members. Some evidence exists that justifies the social network research practice of the one-item measurement. Marsden (1990) found that the roster method used in network research, facilitating the respondent's recall, makes network measures very reliable. In addition, Freeman and his associates (Freeman & Romney, 1987; Freeman, Romney & Freeman, 1987) showed that responses to single-item measures are reliable measures of long-term relationships. Given that I both plan to use a roster to collect the network data and that I am interested in measuring relationships which tend to develop over the long term, I feel more confident in using these one-item measures.

Lastly, one more variable network variable (albeit a little atypical) which I plan to collect are cognitive maps of how each organization perceive the migratory and embedded knowledge (Badaracco, 1991) to be flowing within the industry. Such instrument has already proven to be effective to reduce the complexity of an otherwise very complicated network flow, yet maintaining the underlying structural properties of the networks measured which affect organizational outcomes (see Fonti et al, 2000 for a more exhaustive treatment of this issue). These maps -- and more specifically the thickness of the flows in each organization’s representation of migratory and embedded knowledge flows -- will help me to verify whether significant differences in mental construction of the environment may be accounting for differences in organizational outcomes within the industry.

Before turning to the attributional variables, the general caveat to be made is that a non relational variable can always be turned into a relational one. It is enough to transform it and look at it in terms of differences and similarities among actors (such as in the case of a network where the cell ij entry represents the absolute difference between the year organization i and organization j were founded). While these are not relational variables per se, they have been extensively used in the literature in the context of network analyses.

Instrumentation: attributional variables

Several attributional variables will be collected, both with regards to the informant (respondent) and his/her organization. They will serve mostly as controls, although some of them may also be used as independent and dependent variables.

In terms of demographic data, the following variables will be collected (in parentheses is the specific question that will be asked):

- Respondent's gender;
- Respondent's tenure in the organization, in the case s/he is not the founder ('When did you join your current organization -- month, year?');
- Respondent's position in the organization, in the case s/he is not the CEO ('What is your current position in your organization?');
- Respondent's tenure in current position ('When did you start working in your current position -- month, year?');
- Respondent's age ('What is your age? Please provide the year of birth.');
- Respondent's educational background ('What is the highest level of education you have attended/completed? In what fields?');
- Organization's founding date ('When was your organization founded?');

- Respondent’s experience in the industry (‘When did you first get involved in this industry?’ and ‘Did you have previous industry experience before joining your current organization? If so, for which other organization did you work in the past?’);
- Organization’s size (‘How many employees does your organization have?’);
- Organization’s total sales (‘How much are your organization's yearly sales?’);
- Organization’s % of sales in the ceramics machinery industry, as well as its stability over recent time (‘What percentage (%) of your organization's total sales comes from the ceramics machinery industry?’ and ‘Has this percentage been pretty much stable over the last 5 years? If not, how did it change?’);
- Organization’s % of sales in the ceramics machinery industry that come from subcontracting agreements, as well as its stability over recent time (‘What percentage (%) of your organization's sales to the ceramics machinery industry comes from subcontracting sales -- i.e. sales not directed to the final market?’ and ‘Has this percentage been pretty much stable over the last 5 years? If not, how did it change?’);
- Organization’s reliance on subcontracting from other firms (‘How much your organization relies on subcontracting from other firms -- in monetary terms?’);
- Organization’s sales split among the 13 different families of products, (so called ‘segments’) in which the industry is traditionally partitioned, as well as starting date competing in that segment (‘To which one(s) of the following segments -- complete plant, raw materials, additives and semi-finished products, preparation of raw material, forming, glazing and decoration, drying

and firing, handling and storage, sorting, packaging, and pallet loading, additional and finish machines, quality and production control, environment protection, lab measurement instruments and accessories, engineering services -- does the products your organization manufactures belong? How much do they account for, as a percentage (%) of the total sales? And when did your company start to sell each of these products?');

- Organization's sales split among the 6 different markets on which the 13 families of products are sold, as well as starting date competing in that market ('To which specific markets does your organization cater -- ceramic tiles, bathroom fixtures, tableware, building bricks, refractories, technical ceramics? How much do they account for, as a percentage (%) of the total sales? When did your company start to compete in such markets?');
- Organization's activity on different international markets ('On which national and/or international markets are you active -- Italy, Europe, South America, North America, Asia -- and how much do they account for as a percentage (%) of the total sales?');
- Organizational chart ('Could I have some information on the organizational chart -- hierarchical and managerial structure?');
- Type of positions and managers' names ('More specifically, which kind of managerial positions exist in your organization, and who covers such roles?');
- Extent of email usage in the organization, both internally and in interaction with external actors ('As for email, how much does your organization use it for internal purposes -- i.e., within the boundaries of the organization?' and 'Still

with regards to email, how much does your organization use it for external purposes -- i.e. in its relationships with customers, suppliers, institutions, etc.?');

- Organization's use of a website ('Does your organization have a website? If so, what is its URL address?').

Another set of attributional data I will collect is perceptual data about the organization and the industry. Specifically, the following variables will be collected (in parentheses is the specific question that will be asked):

- Organization's perception of main competitive advantage in the industry ('What does your organization perceive as the main competitive advantage in the industry? What does make your organization stand out from the other firms?');
- Organization's perception of main weakness for any firm competing in the industry ('What do your organization perceives to be the main disadvantage -- i.e. weakness -- for any given firm competing in your industry'?);
- Organization's definition of success in the industry ('How would your organization define 'success' with regard to your industry? Feel free to list as many definitions as you deem necessary.');
- Organizational culture ('How could you describe the culture which characterizes your organization?');
- Organization's perception of main threat in the industry ('Which one does your organization perceive to be the main threat, today, in the ceramic machinery manufacturing industry?');

- Organization's perception of main opportunity in the industry ('Which one does your organization perceive to be the main opportunity, today, in the ceramic machinery manufacturing industry?').

Finally, I will acquire (from a firm specialized in providing company information) balance sheets for all these companies, for the four years from 1996 to 1999. This will result in all sorts of financial data; in particular, I will be interested in the average of the last three years' growth, as a measure of organizational performance (the dependent variable against which to test the multiplex embeddedness hypothesis).

To strengthen and validate the data collected in the interviews, I also plan to conduct some participant observation of the industry dynamics, both by residing several months in the industrial district where the industry is strongly localized while conducting interviews, as well as by spending some work days inside the actual organizations (as for this latter options, I am still negotiating such opportunity).

Analysis

Another aspect for which such research would be contributing to the understanding of the effects of the interaction of different type of relationships has to do with the methodology used to test my hypotheses. In fact, while I may count on established routines to examine structural aspect of multiplex embeddedness by looking at the effects of multiple roles held by the same actor across different networks using blockmodel analysis (see Lorrain & White, 1971; Boorman & White, 1976; White et al, 1976), I am not aware of any procedure yet to analyze the relational aspect of it, by getting at the construct of multiplex centrality, i.e. the different level of involvement experienced by a given actor across different networks. I can surely construct a compounded relationship matrix for all

the possible interactions between the three networks, but as for how to go about analyzing it, there are still many options open.

More specifically, since my hypotheses underline different type of relationships, and try to cast light on different types of dependent variables, a suit of statistical analysis will be used to test them. These will include, as appropriate, descriptive graph theoretical statistic measures, such as different measures of centrality (Freeman, 1979; Borgatti, Everett & Freeman, 1999), as well as non parametric techniques such as QAP and MRQAP (Hubert & Schultz, 1976; Krackhardt, 1988; Krackhardt, 1993; Kilduff & Krackhardt, 1994), OLS and logistic regression, and p*, social influence, and social selection models (Wasserman & Pattison, 1996; Pattison & Wasserman, 1999; Robins et al, 1999; Robins et al, forthcoming). As for these latter, more recently developed techniques (i.e., p*, social influence, and social selection models), special efforts will be made to test as many hypotheses as possible using them

However, since some of the data collected -- especially some of the critical dependent variables, such as performance -- are continuous (and need to be preserved as such, if we want not to loose significant information about these firms), then one must be aware that there are certain limitations/constraints to the use of p* and related (social influence and social selection) models, since these latter techniques are still only operationalized for dyadic dependent variables. This may render necessary the use of alternative techniques in the cases where continuous variables are to be explained.

Appendix A

Ceramic Machinery Manufacturers

Industry Survey

Ceramic Machinery Manufacturers Industry Survey

Fabio Fonti
University of Illinois at Urbana-Champaign

I. Interviewee: _____

II. Company: _____

III. Date: _____

IV. Interviewer: _____

Thank you for taking the time to talk with me today.

As you know from our previous contacts, this survey is part of a study on the ceramics manufacturing industry that I am currently carrying on. I greatly appreciate you taking the time to talk with me about the industry, your organization, and the people and organizations with which you interact within the industry.

During this interview I will be asking you several questions, mostly with regards to your organization.

More specifically, I will start by asking you a few demographic questions about you and your organization. Then, I will move on to ask you how much your organization has interacted with other organizations in the industry, and what are some of the characteristics of this interaction. Finally, I will wrap up the interview by asking you about your perception of relevant competitive patterns in the industry. As for the length of the interview, as I mentioned when we scheduled this meeting, I anticipate it will take between one hour and one hour and a half.

As is true for all the data I collect in this research, everything you tell me is strictly confidential. No one involved in the industry (neither as individuals nor as part of a given organization) will have access to your individual responses. I will only report summary data, from which individual responses cannot be identified.

I thank you once more for taking the time to participate. However, I am also confident that such effort will find compensation in terms of the feedback which will derive to your industry. In fact, I hope that the results of this research will serve the industry as a whole to understand better its own dynamics and uncover more competitive patterns and behaviors that could be used as directions for the development of future organizational strategies. Also, I am available to send you a summary of my research, once it will be completed. If you are interested in receiving such document, just let me know and I will be more than happy to send it to you.

If you have any question or concern, please feel free to contact me (Dott. Fabio Fonti) via phone (0380-3055077) or email (fonti@uiuc.edu).

Do you have any questions before we begin?

Section I
Demographic Questions

I would like to begin by asking you a few general questions about you and your current organization.

1. When did you join your current organization (month, year)?

2. What is your current position in your organization?

3. When did you start working in your current position (month, year)?

4. What is your age? Please provide the year of birth.

5. What is the highest level of education you have attended/completed? In what field(s)?

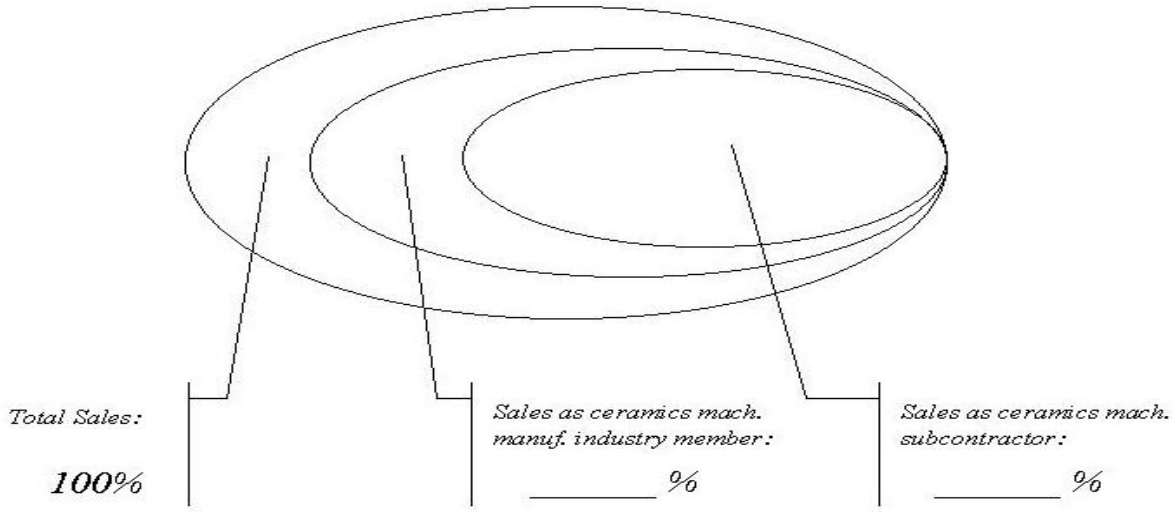
	Middle School	**High School**	**University (Undergraduate)**	**Other**	**Field?**
Attended					
Completed					

6. When was your organization founded?

7. When did you first start to work in this industry?

8. Did you have previous experience in the ceramics machinery manufacturing industry before joining your current company? If so, for which other organizations did you work in the past?

9. How many employees work for your organization?



10. How much are your organization's total yearly sales?

11. What percentage (%) of your organization's total sales is done as a ceramics machinery industry member (both by sales to other ceramics machinery manufacturers and to final clients, such as manufacturers of tiles, bricks, sanitary ware, etc.)?

12. What percentage (%) of your organization's sales as ceramics machinery industry member comes from subcontracting sales to other organizations belonging to such industry (that is sales not directed to the final market, i.e. manufacturers of tiles, bricks, sanitary ware, etc.)?

13. Has the percentage (%) that derives from sales as a ceramics machinery industry member (both to other ceramics machinery manufacturers and to final clients) changed over the last 5 years? If so, how did it change, approximately?

14. Has the percentage (%) that derives from subcontracting sales to other organizations belonging to the ceramics machinery industry changed over the last 5 years? If so, how did it change, approximately?

15. How much does your company buys from subcontractors, in terms of products which pertain the ceramics machinery manufacturing process, as a percentage (%) of your 1999 total sales?

16. If we just limit our attention at the ceramic machinery industry, to which one(s) of the following segments does the products your organization manufactures belong? How much do they account for, as a percentage (%) of your total sales? And when did your company start to sell each of these products?

#	Segment (type of product)	% Sales	Date Sales Began
16.1	Complete plant (‘entire production line’)		
16.2	Raw Materials, Additives and Semi-finished Products		
16.3	Raw Material Preparation		
16.4	Forming (‘dies’)		
16.5	Glazing and Decoration		
16.6	Drying and Firing		
16.7	Handling and Storage		
16.8	Sorting, Packaging, and Pallet Loading		
16.9	Complementary and Finishing Machines		
16.10	Quality and Production Control		
16.11	Environmental Protection (‘pollution abatement plants’)		
16.12	Lab Instruments, Measurement Instruments, and Accessories		
16.13	Engineering Services		
16.14	Other (_____)		
	Total Sales	**100 %**	

17. Always limiting our attention at the ceramic machinery industry, to which specific markets does your organization sell? How much do they account for, as a percentage (%) of the total sales? When did your company start to compete in such markets?

#	Market (sector supplied)	% Sales	Date Sales Began
17.1	Ceramic Tiles		
17.2	Sanitary Ware		
17.3	Tableware		
17.4	Structural Clay		
17.5	Refractories		
17.6	Technical Ceramics		
17.7	Other (_____)		
	Total Sales	**100 %**	

18. On which markets are you active, and how much do they account for as a percentage (%) of the total sales? Moreover, when did your company start to compete in such markets?

#	Market (geographical area)	% Sales	Date Sales Began
18.1	Italy		
18.2	Rest of E.U.		
18.3	Eastern Europe		
18.4	North America (included Mexico)		
18.5	Central and South America		
18.6	Middle East		
18.7	China - Hong Kong - Taiwan		
18.8	Other Asian Countries		
18.9	Africa		
18.10	Oceania		
	Total Sales	**100 %**	

19. Could I have some information on the organizational chart (in particular, on the hierarchical and managerial structure)?

20. More specifically, could you let me know which managerial positions exist in your company, as well as the names of the people in such positions, so that I could send them a very short questionnaire (only two questions) to gather information about their professional background?

21. What is your company's opinion of the quality certification process (such as the ISO 9001)?

22. Does your company have a quality certification (such as ISO 9001)? If so, since when? If not, are you planning to get it in the future?

	Not at all	Very Little	Little	Sometimes	Often	Very Often
23. Now, let's talk about email: how much is it used in your company, for internal purposes (i.e., to communicate within the organization)?	0	1	2	3	4	5
24. Still with regards to email, how much does your company use it for external purposes (i.e. in its relationships with customers, suppliers, institutions, etc.)?	0	1	2	3	4	5

25. Does your company have a Website? If so, what is its URL address?

Section II
Industry Relational Structure
This section deals with your perception of the ongoing structure of relationships between your company and the other firms belonging to the industry. Once again, please remember that your answers are strictly confidential and that there is no right or wrong answer to these questions.

First of all, let me show you a roster of the firms that belong to the industry (see Enclosure A). I would like you to tell me which of these firms are you familiar with (or, at a minimum, which ones have you heard of). Feel free to add any other relevant firm belonging to the industry, if not already included in the roster.

II.1 Task-based Interaction
Among the firms that you have just identified, please point out with which ones your company has had any task-related interaction during the past year; also, please indicate the frequency of such interactions. Task-based interaction could include conversations in person, in meetings, by phone, via electronic mail, or any other form of communication, all with regards to specific, work-related issues.

The possible answers are the following:

A. Know, but don't interact

B. Interact every three months (or less frequently)

C. Interact monthly

D. Interact weekly (or even more frequently)

II.2 Potential Interorganizational Relationships
Here, I would like you to read the following scenario. Then, please tell me your reaction to the hypothetical situation described in it, with regards to each of the firms you have identified in the roster. In doing so, please think about all the organizations involved in the industry and compare them to one another. This is the scenario:
"Your company has to put together a pool of firms to supply a complete plant or a specific machine to a very good customer of yours. Let's assume that _____ would be among the candidates to be part of such project. Would your company include such firm in the project, with the awareness not to run in a situation where such organization could behave opportunistically against you (for example, trying to steal your client)?"

The possible answers are the following:

A. No

B. Uncertain (neither no nor yes)

C. Yes

II.3 Perception of Other Organizations

I would like you to identify what role the firms that you have just identified in the roster play *vis a vis* your company. That is, please indicate whether they are your competitors, partners, customers, suppliers (or subcontractors), or none of these. Also, please keep in mind that each firm may well play more than one of such roles (that is, it can be at the same time competitor and partner, for example on different markets); if this is the case, please let me know.

The possible answers are the following:

A. Competitor

B. Partner

C. Customer

D. Supplier/Subcontractor

E. None of the above

II.4 Entrepreneur's contacts

Here I would like to understand on which organizations you could rely, in the hypothesis of a critical situation. This would help me to draw a map of the potential collaborative efforts in your industry, so to better understand its relational structure. For this purpose, please answer the following question, with reference to the firms you have identified in the industry roster:

In particularly important situations (such as a possible collaboration on a very important contract or the need of information about a brand new customer), to which organizations (or members of such organizations) would you turn to?

II.5 Knowledge transfer

Finally, please answer the following question, with reference to the firms you have identified in the industry roster. In doing this, please think about all the organizations involved in the industry and compare them to one another. The question is:

How much do you think that _____ has drawn from your company, in terms of products, ideas, and information?

The possible answers are the following:

A. Not at all

B. Very little

C. Some (neither very little nor very much)

D. Very much

Section III
Overall Perception of the Organization and the Industry

1. What does your organization perceive as the main strength, for any given firm competing in your industry? What does make your organization stand out from the others?

2. What does your organization perceive as the main weakness, for any given firm competing in your industry?

3. How would your organization define *'success'* for a firm that belongs to your industry? Feel free to list as many definitions as you deem necessary

4. How could you describe the *culture* which characterizes your organization?

5. According to your company, which one is the main threat, today, for any given firm competing in your industry?

6. According to your company, which one is the main opportunity, today, for any given firm competing in your industry?

7. Suppose you could make some changes to improve the industry as a whole, what would you change?

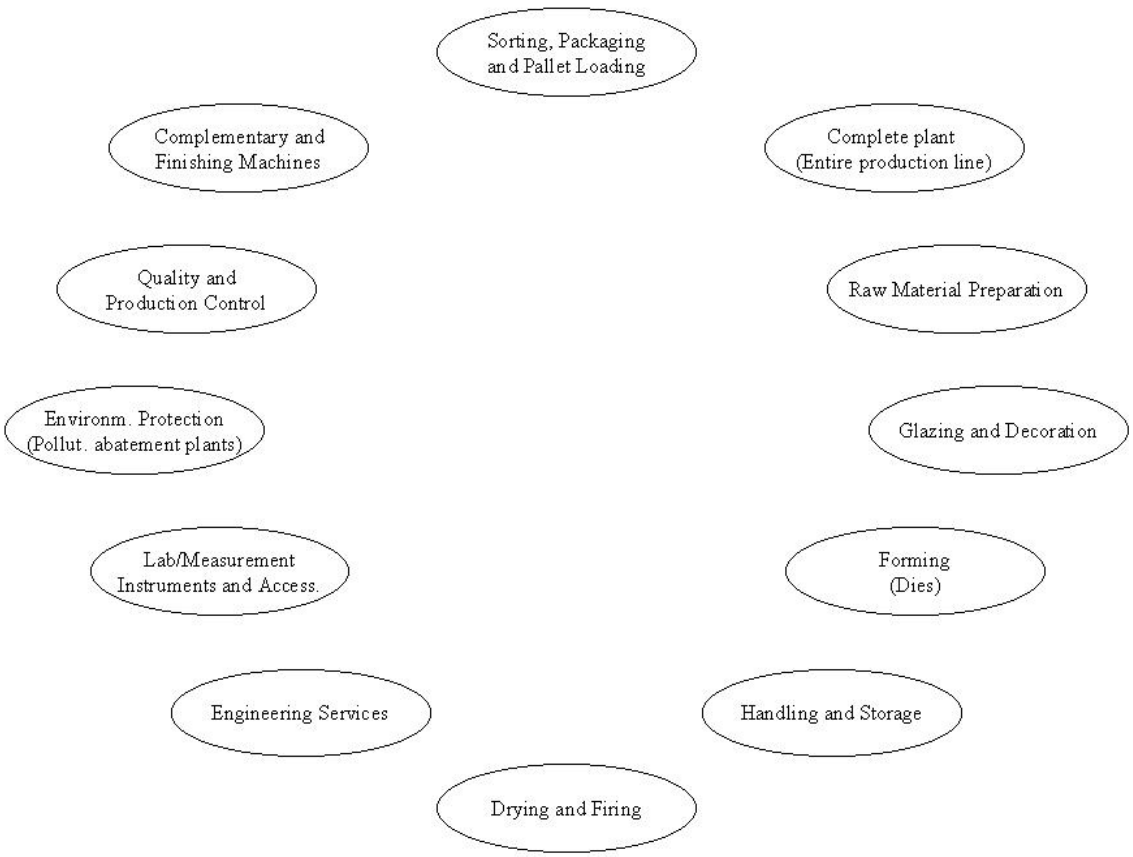
8. Many of the firms in your industry are successfully located in the Sassuolo-Castellarano industrial district. What are the factors behind the success of the district?

9. Does your company have a presence in the Sassuolo-Castellarano industrial district? If so, what kind, and where?

Section IV
Interdependencies within the Industry

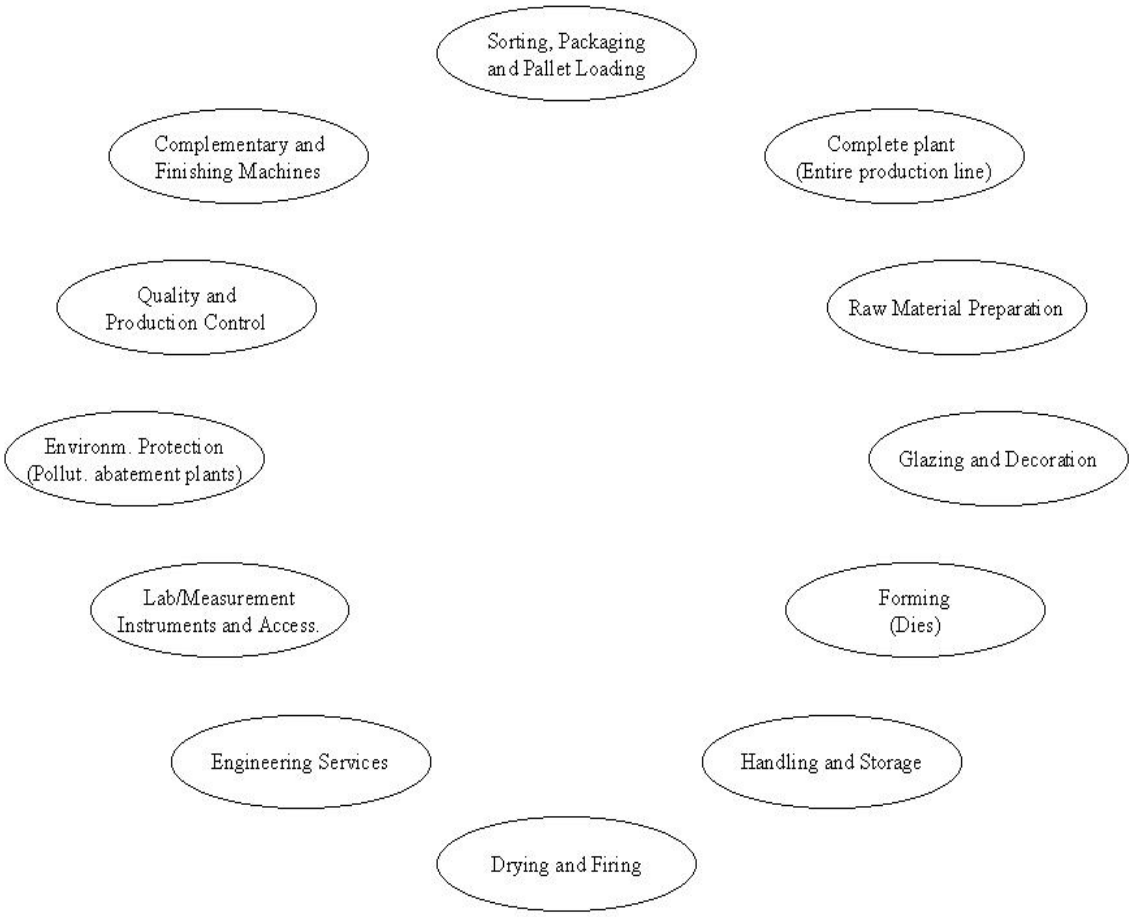
This section deals with your perception of the interrelations between relevant segments of your industry. Once again, please remember that your answers are confidential, and that there is no right or wrong answer to these questions.

1. On this page, you see a picture with the different segments (type of products) that characterize your industry.
   a. Please draw directional lines indicating your perception of <u>existing knowledge transfer</u> among such segments:
      - both within organizations belonging to the same segment (e.g. knowledge transfers between organizations producing complementary and finishing machines);
      - and between organizations belonging to different segments (e.g. knowledge transfers between firms producing environment protection machinery and firms producing glazing and decoration machinery).
   b. For each arrow drawn, provide a rating on a scale from 1 to 7 indicating the amount of knowledge transferred, where 1 represents a minimal knowledge transfer and 7 a considerable knowledge transfer.
   c. Finally, let me emphasize that such flows are directional. This means that it can very well be that A transfers a lot of knowledge to B, while obtaining in return a quite different amount of knowledge.



2. Here you can see the same exact picture shown on the previous page, with the different segments (type of products) that characterize your industry.

   a. Please draw lines indicating your perception of <u>existing collaboration</u> among such segments:
      - both within organizations belonging to the same segment (e.g. between firms producing complementary and finishing machines);
      - and between organizations belonging to different segments (e.g. between firms producing environment protection machinery and firms producing glazing and decoration machinery).
   b. For each line drawn, provide a rating on a scale from 1 to 7 indicating the amount of collaboration, where 1 represents minimal collaboration, and 7 represents very intense collaboration.



Section V
Perception of Industry Association
(This section was reserved to Industry Association members only)

1. Let's focus now on the Industry Association (ACIMAC). What do you think of ACIMAC communication skills toward its members?

		Very Poor	Poor	Sufficient	Good	Very Good
1.1	Information Memos	1	2	3	4	5
1.2	Industry Trade Magazines (Ceramic World Review, Brick World Review)	1	2	3	4	5
1.3	Website	1	2	3	4	5

2. How satisfied are you with the following ACIMAC services, and with the advantages that are associated with being a member?

		Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
2.1	Representation of the industry in the external environment	1	2	3	4	5
2.2	Overall services provided to members	1	2	3	4	5
2.3	Specific results and advantages deriving from our membership	1	2	3	4	5

3. What do you perceive to be the top three advantages of your organization's membership in ACIMAC?

4. Would you have any general and/or specific suggestion to improve ACIMAC services to members that we just discussed here?

Section VI
Interview Wrap-up

1. Could I contact you directly, in the case I had some clarifications to ask about this interview? Let me reassure you that this should never take more than five (5) minutes of your time.

2. If so, which telephone number should I use?

THANK YOU FOR YOUR COOPERATION!!!

Ceramic Machinery Manufacturers
Industry Survey

Enclosure A
Industry Members Roster

X	#	Firm		X	#	Firm
	1	ADI			41	MARTINELLI ETTORE
	2	AIR POWER DIVISION GROUP			42	MASS
	3	ALPINA INDUSTRIALE			43	MATRIX
	4	ASSOPRINT			44	NBP
	5	ASSOSTAMPI			45	NUOVA ERA
	6	AUTIN			46	NUOVA FIMA
	7	BARCOM			47	NUOVE OFFICINE ANCORA
	8	BEDESCHI			48	OFFICINE SMAC
	9	BMR			49	OMIS
	10	CAMI DEPURAZIONI			50	OREGON CERAMICS SERVICES
	11	CBM			51	ORIZZONTE
	12	CEMAR			52	POLIGRAPH
	13	CERTECH			53	PREMIER
	14	CIMA			54	PROGETTI
	15	CIMES			55	REALMECCANICA
	16	CMF			56	RICOTH
	17	COSTRUZIONI MECCANICHE ISOLA			57	SACMI
	18	EUROFILTER			58	SACS TECNICA
	19	EUROIMPIANTI			59	SAEX IMPIANTI
	20	EUROSCREEN			60	SE.TE.C
	21	F.LLI ROSSI			61	SERIGRAFICA TOSI
	22	FAVOLE			62	SERMAT
	23	FDS			63	SIMEC Spa
	24	FERRARI CARLO			64	SIMEC Srl
	25	FORNI FICOLA			65	SITEC IMPIANTI
	26	GAIOTTO			66	SITI
	27	GAMBARELLI IMPIANTI			67	SRS
	28	GAPE DUE			68	STAMPI CERAMICI ROTEGLIA
	29	GAROLL			69	STUDIO 1
	30	GRUPPO BARBIERI & TAROZZI			70	STYLGRAPH
	31	GRUPPO BONGIOANNI			71	SYSTEM
	32	GRUPPO TECNOFERRARI			72	TECNEMA
	33	ICF INDUSTRIE CIBEC			73	TECNOITALIA
	34	INTECO -- IFT			74	TECNOPRESS
	35	IMAS			75	TEKNECO
	36	IPA INTERNATIONAL			76	TSC
	37	IPEG			77	UNITED SYMBOL
	38	ITALFORNI			78	VICENTINI
	39	LB OFFICINE MECCANICHE			79	WELKO
	40	MANFREDINI & SCHIANCHI			80	Other(s) (_____)

Ceramic Machinery Manufacturers
Industry Survey

Enclosure B
Network Answers Log Sheet

#	Firm	Comm	Potentl	Roles	Contacts	K
1	ADI					
2	AIR POWER DIVISION GROUP					
3	ALPINA INDUSTRIALE					
4	ASSOPRINT					
5	ASSOSTAMPI					
6	AUTIN					
7	BARCOM					
8	BEDESCHI					
9	BMR					
10	CAMI DEPURAZIONI					
11	CBM					
12	CEMAR					
13	CERTECH					
14	CIMA					
15	CIMES					
16	CMF					
17	COSTRUZIONI MECCANICHE ISOLA					
18	EUROFILTER					
19	EUROIMPIANTI					
20	EUROSCREEN					
21	F.LLI ROSSI					
22	FAVOLE					
23	FDS					
24	FERRARI CARLO					
25	FORNI FICOLA					
26	GAIOTTO					
27	GAMBARELLI IMPIANTI					
28	GAPE DUE					
29	GAROLL					
30	GRUPPO BARBIERI & TAROZZI					
31	GRUPPO BONGIOANNI					
32	GRUPPO TECNOFERRARI					
33	ICF INDUSTRIE CIBEC					
34	INTECO -- IFT					
35	IMAS					
36	IPA INTERNATIONAL					
37	IPEG					
38	ITALFORNI					
39	LB OFFICINE MECCANICHE					
40	MANFREDINI & SCHIANCHI					

#	Firm	Comm	Potentl	Roles	Contacts	K
41	MARTINELLI ETTORE					
42	MASS					
43	MATRIX					
44	NBP					
45	NUOVA ERA					
46	NUOVA FIMA					
47	NUOVE OFFICINE ANCORA					
48	OFFICINE SMAC					
49	OMIS					
50	OREGON CERAMICS SERVICES					
51	ORIZZONTE					
52	POLIGRAPH					
53	PREMIER					
54	PROGETTI					
55	REALMECCANICA					
56	RICOTH					
57	SACMI					
58	SACS TECNICA					
59	SAEX IMPIANTI					
60	SE.TE.C					
61	SERIGRAFICA TOSI					
62	SERMAT					
63	SIMEC Spa					
64	SIMEC Srl					
65	SITEC IMPIANTI					
66	SITI					
67	SRS					
68	STAMPI CERAMICI ROTEGLIA					
69	STUDIO 1					
70	STYLGRAPH					
71	SYSTEM					
72	TECNEMA					
73	TECNOITALIA					
74	TECNOPRESS					
75	TEKNECO					
76	TSC					
77	UNITED SYMBOL					
78	VICENTINI					
79	WELKO					
80	Other(s) (_____)					

Bibliography

ACIMAC (1999). Settima indagine statistica nazionale. Modena (Italy): Ufficio Studi ACIMAC.

Badaracco, J.L., Jr. (1991). The knowledge link: How firms compete through strategic alliances. Boston: Harvard Business School Press.

Baum, J.A.C. & Dutton, J.E. (1996). Introduction: The embeddedness of strategy. In J.A.C. Baum & J.E. Dutton (Eds.), The embeddedness of strategy, 1-18. Greenwhich, CT: JAI Press.

Boorman, S.A. and White, H.C. (1976). Social structure from multiple networks II. Role structures. American Journal of Sociology, 81: 1384-1446.

Borgatti, S.P., Everett, M.G., & Freeman, L.C. (1999). UCINET V for Windows: Software for social network analysis. Natick, MA: Analytic Technologies.

Cohen, S.S., & Fields, G. (1999). Social Capital and Capital Gains in Silicon Valley. California Management Review, 41(2): 108-130.

Costa-Campi, M.T., & Viladecans-Marsal E. (1999). The district effect and the competitiveness of manufacturing companies in local productive systems. Urban Studies, 36(12): 2085-2098.

Dacin, M.T., Ventresca, M.J., & Beal, B.D. (1999). The embeddedness of organizations: Dialogue and directions. Journal of Management, 25(3): 317-356.

Fonti, F. (1997). Social structure and economic action: A network approach. Presented at the EMOT (European Management and Organizations in Transition) Summer School on "Relational Perspective in Organizational Research". Bologna, Italy, September 1997.

Fonti, F., Whitbred, R., & Contractor, N. (2000). Focusing on the forest when you can't see all the trees: The importance of Cognitive Aggregated Structures (CAS) in new organizational

forms. Presented at the Academy of Management Annual Meeting. Toronto, Ontario, August 4-9, 2000.

Freeman, L. (1979). Centrality in social networks: conceptual clarification. Social Networks, 1: 215-239.

Freeman, L.C., & Romney, A.K. (1987). Words, deeds, and social structure: A preliminary study of reliability of informants. Human Organization, 46: 330-334.

Freeman, L.C., Romney, A.K., & Freeman, S.C. (1987). Cognitive structure and informant accuracy. American Anthropologist, 89: 310-325.

Granovetter, M. (1973). The strength of weak ties. American Journal of Sociology, 6: 1360-1380.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. American Journal of Sociology, 91: 481-510.

Granovetter, M. (1992). Problems of explanation in economic sociology. In N. Nohria & R.G. Eccles (Eds.), Networks and organizations: Structure, form, and action, 25-56. Boston: Harvard Business School Press.

Granovetter, M. (1995b). The economic sociology of firms and entrepreneurs. In A. Portes (Ed. by), The economic sociology of immigration. New York: Russell Sage Foundation.

Gulati, R. (1995). Social structure and alliance formation patterns: A longitudinal analysis. Administrative Science Quarterly, 40: 619-652.

Gulati, R. (1998). Alliances and networks. Strategic Management Journal, 19: 293-317.

Hubert, L.J. & Schultz, L. (1976). Quadratic assignment as a general data analysis strategy. British Journal of Mathematical and Statistical Psychology, 29: 190-241.

Kanter, R.M. (1989). When giants learn to dance: Mastering the challenge of strategy, management, and careers in the 1990s. New York: Simon and Schuster.

Kilduff, M., & Krackhardt, D. (1994). Bringing the individual back in: A structural analysis of the internal market for reputation in organizations. Academy of Management Journal, 37: 87-108

Krackhardt, D. (1988). Predicting with networks: Nonparametric multiple regression analysis of dyadic data. Social Networks, 10: 359-381.

Krackhardt, D. (1993). MRQAP: Analytic versus permutation solutions. Working paper, Carnegie Mellon University, Pittsburgh.

Lorrain, F., & White, H.C. (1971). The structural equivalence of individuals in social networks. Journal of Mathematical Sociology, 1: 49-80.

Marsden, P.V. (1990). Network data and measurement. In W.R. Scott & J. Blake (Eds.), Annual Review of Sociology, 16: 435-463. Palo Alto, CA: Annual Reviews Inc.

McEvily, B., & Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. Strategic Management Journal, 20: 1133-1156.

Pattison, P., & Wasserman, S. (1999). Logit models and logistic regressions for social networks: II. Multivariate relations. British Journal of Mathematical and Statistical Psychology, 52: 169-193.

Pfeffer, J. (1987). Bringing the environment back in: The social context of business strategy. In D.J. Teece (Ed. by), The competitive challenge: Strategies for industrial innovation and renewal, 119-136. Cambridge, MA: Ballinger.

Pfeffer, J., & Salancik, G.R. (1978). The external control of organizations: A resource dependence perspective. New York: Harper & Row.

Piore, M.J., & Sabel, C.F. (1984). The second industrial divide: Possibilities for prosperity. New York : Basic Books.

Polanyi, K. (1944). The great transformation: The political and economical origins of our time. Boston: Beacon Press.

Powell, W.W. (1996). Trust-based forms of governance. In R.M. Kramer & T.R. Tyler (Eds.), Trust in organizations: frontiers of theory and research, 51-67. Thousand Oaks, CA: Sage.

Powell, W.W., & Smith-Doerr, L. (1994). Networks and economic life. In N.J. Smelser & R. Swedberg (Eds.), The handbook of economic sociology, 368-402. Princeton, NJ: Princeton University Press.

Putnam, R.D. (1993). Making democracy work: Civic traditions in modern Italy. Princeton, NJ: Princeton University Press.

Robins, G., Pattison, P., & Elliott, P. (forthcoming). Network models for social influence processes. Forthcoming in Psychometrika.

Robins, G., Pattison, P., & Wasserman, S. (1999). Logit models and logistic regressions for social networks, III. Valued relations. Psychometrika, 64: 371-394.

Saxenian, A. (1994). Regional advantage: Culture and competition in Silicon Valley and Route 128. Cambridge, MA: Harvard University Press.

Scott, W.R. (1992). Organizations: Rational, Natural, and Open Systems, 3rd ed. Englewood Cliffs, NJ: Prentice Hall.

Scott, W.R. (1995). Institutions and Organizations. Thousand Oaks, CA: Sage.

Staber, U.H. (1996). Networks and regional development: Perspectives and unresolved issues. In U.H. Staber, N.V. Schaefer, & B. Sharma (eds.), Business networks: Prospects for regional development, 1-23. Berlin: deGruyter.

Sternberg R. (1999). Innovative linkages and proximity: Empirical results from recent surveys of small and medium sized firms in German regions. Regional Studies, 33(6): 529-540.

Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations: The network effect. American Sociological Review, 61: 674-698.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. Administrative Science Quarterly, 42: 35-67.

Uzzi, B. (1999). Embeddedness in the making of financial capital: how social relations and networks benefit firms seeking financing. American Sociological Review, 64: 481-505.

Volberda, H.W. (1996). Toward the flexible form: How to remain competitive in hypercompetitive environments. Organization Science, 7(4): 359-374.

Wasserman, S., & Faust, K. (1994). Social network analysis: Methods and applications. New York: Cambridge University Press.

Wasserman, S., & Pattison, P. (1996). Logit models and logistic regressions for social networks: 1. An introduction to Markov random graphs and p*. Psychometrika, 60: 401-426.

White, H.C., Boorman, S.A., & Breiger, R.L. (1976). Social structure from multiple networks, I: Blockmodels of roles and positions. American Journal of Sociology, 81: 730-780.

Table 1 -- A synthesis of embeddedness studies

Study	Research Question	Operationalization	Main Claims/Findings
Granovetter (1985)	How economic behavior and institutions are affected by social relations?	N/A	Most behavior is closely embedded in networks, avoiding the extremes of under- and over-socialized views of human action
Granovetter (1992)	Under which conditions can economic sociology improve on the explanation of economic action and institutions offered by neoclassical economics?	N/A	Three conditions: pursuit of 'noneconomic' goals (such as socialization), embeddedness of economic action, and social construction of institution. Distinction between relational and structural embeddedness.
Zukin & DiMaggio (1990)	Is there a common thread in the themes sociologists use to fill the gap created by the paradigm crisis in neoclassical economics?	N/A	Fundamentally, they all reflect the conviction that economic action is characterized by four different types of embeddedness: cognitive, cultural, social (structural), and political.
Uzzi, 1996	Moving beyond theoretical statements, how can we measure the effect that embeddedness in a network structure has on economic action?	Relational embeddedness is measured with 'first-order network coupling' (sum of the strength of all the direct outgoing ties -- as a % of the total amount of ties -- squared, divided by the number of ties). Structural embeddedness is measured with	Embeddedness has a negative effect on organizational failure; however, after a certain level (threshold), such effect reverses itself (it turns into positive).

		'second-order network coupling' (first, calculate the sum of the strength of all the direct incoming ties -- as a % of the total amount of ties -- squared, divided by the # of ties, for each network member with whom the focal actor has a tie; then, sum all these results and divide for the # of direct ties of the focal actor).	
Uzzi, 1997	How concretely structural embeddedness operates, and what are its implications for the competitive advantage of organizations?	Two types of ties are brought up by interviewees: arm's-length ties (ref. to as 'market relationships') and embedded ties (ref. to as 'close or special relationships').	Embedded ties have three main components (trust, fine-grained information transfer, and joint problem-solving arrangements), which regulate expectation and behaviors of involved parties. Sudden shifts may transform embeddedness from an advantage into a liability (issue of tightly coupled system).

Figure 1
The relationship of multiplex embeddedness, firm's location, and institutional membership with firm performance

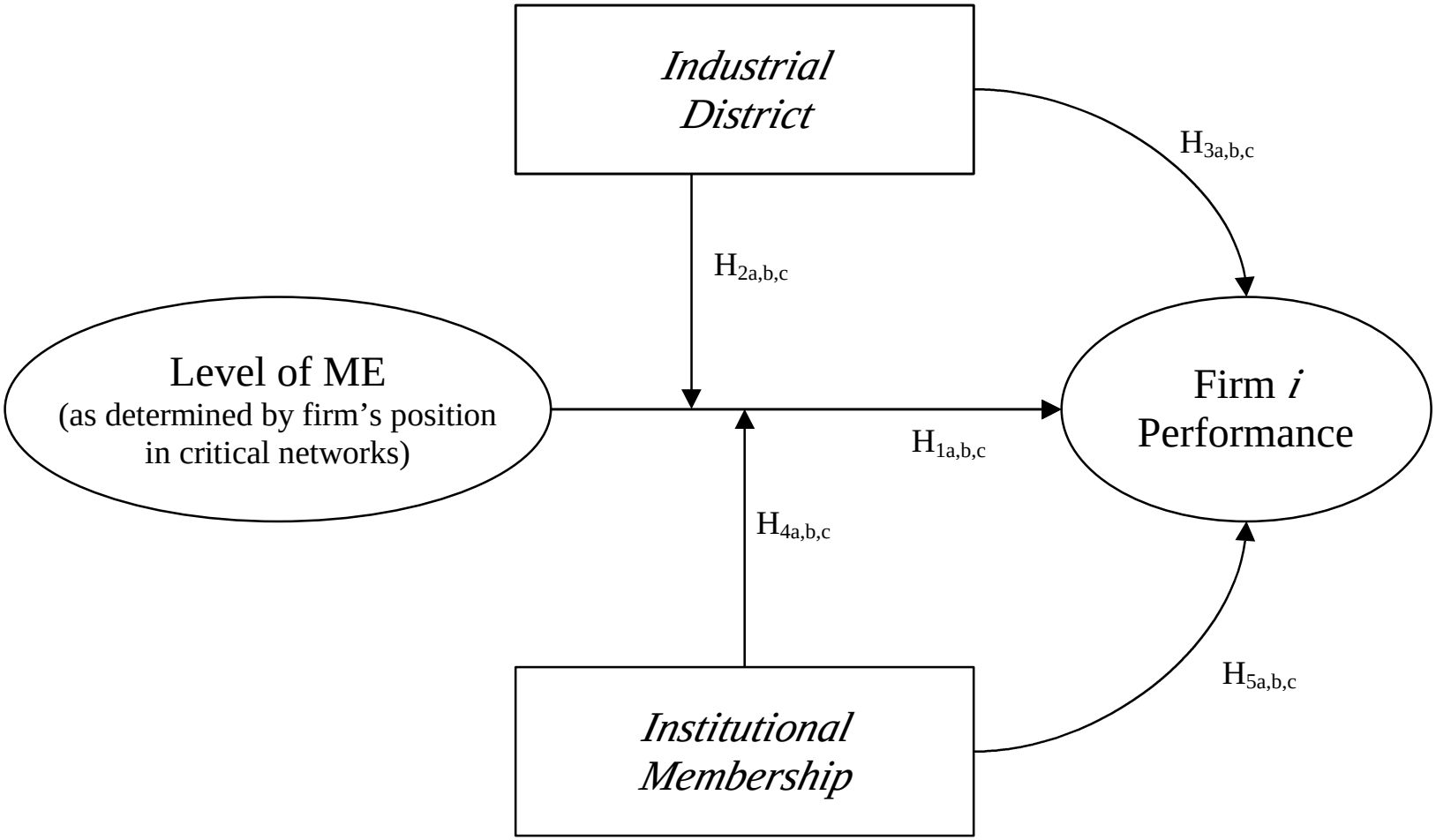


Figure 2
The relationship of multiplex embeddedness and firm's location with organizational structure

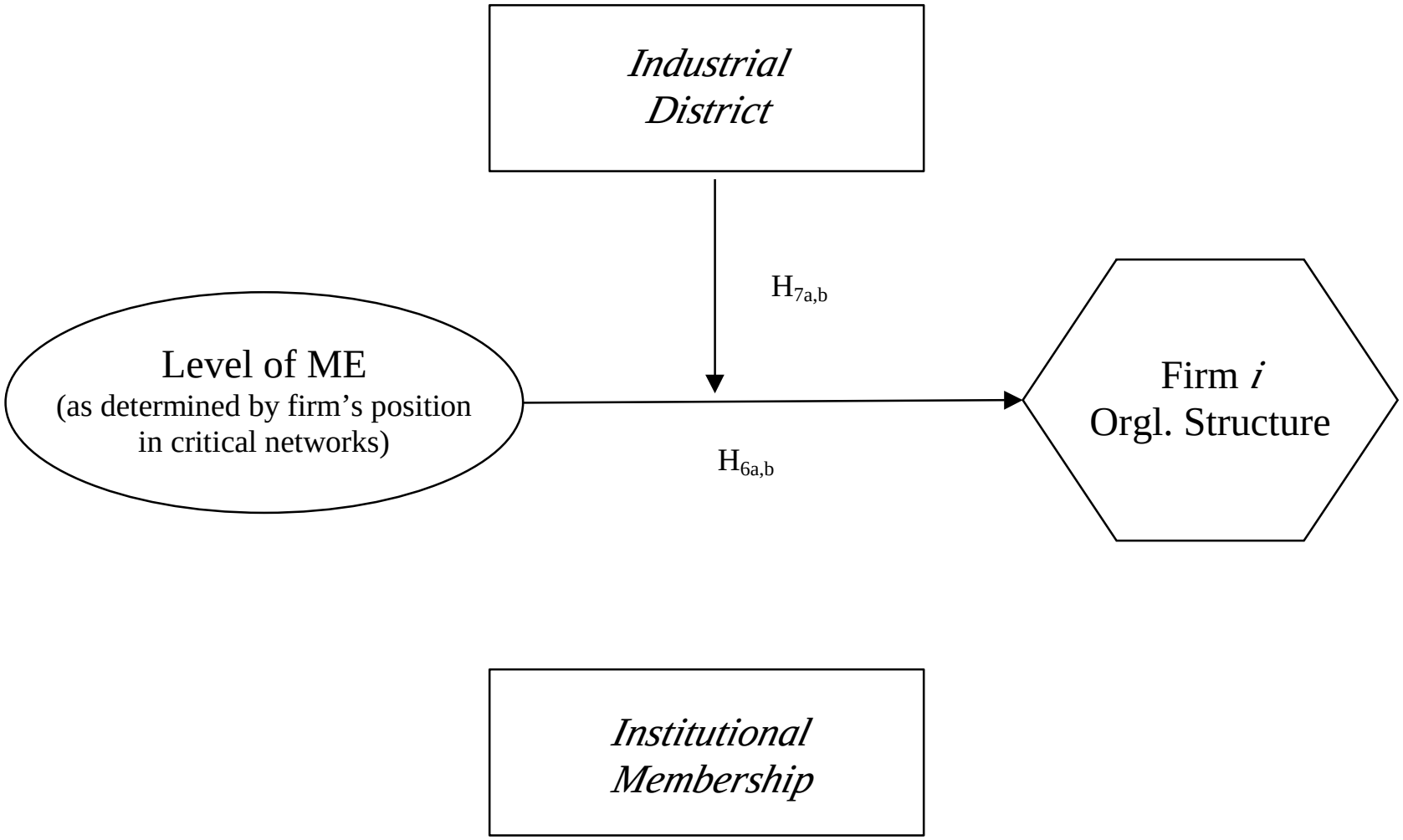


Figure 3
Influence of firm's location and institutional membership on multiplex embeddedness