

Paper to be presented at the DRUID Summer Conference 2003 on
"Creating, Sharing and Transferring Knowledge: The Role of Geographical Configurations, Institutional
Settings and Organizational Contexts"
Copenhagen/Ellsinore June 12-14, 2003

Theme A

**THE IMPACT OF SOCIAL NETWORKS ON INNOVATION AND
INDUSTRIAL DEVELOPMENT:
SOCIAL DIMENSIONS OF INDUSTRIAL DYNAMICS IN RUSSIA**

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10 May 2003

Abstract:

An increasing number of researchers in fields such as industrial dynamics, technology policy and firm strategy claim that technological development cannot be viewed as an isolated phenomenon but has to be studied as a part of a larger system, an Innovation System. However, there is still a great controversy about the way that channels of interaction between different actors develop and change over time. Bringing the concept of social networks into Innovation System's analysis provides an essential tool for understanding the logic of technological development and industrial structures. To substantiate this theoretical appreciation we complemented it by an empirical study of Russian industrial reconstruction during transition. Extensive analysis of official data, case studies, SME survey and several interviews, illustrated the deep involvement of social networks in the process of industrial transformation.

Keywords: Innovation Systems, Industrial dynamics, Technological change, Social networks, Transitional Economies

JEL - code(s): D21, L16, L23, O33, P31

Introduction.

Innovation, learning and technological development are now seen as systemic activities involving many and diverse actors throughout the economy. A considerable body of evidence pointing to persistent differences in the innovative behaviors of companies located in different countries or regions, suggests that the ability of firms to absorb, generate, and apply knowledge is strongly influenced by the social or institutional context in which they operate.

Various attempts have been made recently to incorporate social and institutional elements into the economic analysis of technological change, and to study the impact of these elements on long-term economic performance (Dosi, [1991]; Nelson, [1993], North, [1990]).

However, while learning is seen as *'predominately an interactive and, therefore, a socially embedded process'* (Lundvall, [1992], p.1), there is still a great controversy about the way that channels of interaction between firms and their social and institutional environment emerge, develop and change over time.

We argue, that bringing the concept of social networks would provide us with a powerful tool for the dynamic analysis of National Innovation Systems (NIS) configurations. The main purpose of this paper is to inquire into the structural role of social networks in shaping innovative dynamics and industrial organization.

Bearing that in mind, we will proceed as follows:

First, we will briefly synthesize theoretical contributions that put stress on the systematic and interactive dimension of technological change, reunited under the common name of Innovation Systems. It will be illustrated that, while being the most rewarding attempt to understand the nature of innovation, these approaches lack the ability to provide the answer to one of the core questions of the study of innovation systems: What is the underlying logic of the interactive development of NISs?

In the following section, it will be argued that one of the ways to bridge the gap between institutions, culture and private firms is through the concept of social networks (Granovetter [1973], [1985]) seen as structures of the social world that both enable and restrict the scope of potential actions and predispose the behavior of individuals and firms.

To substantiate our theoretical reflections, we will demonstrate with a case study that the notion of social networks is an essential tool for understanding the patterns of Russian industrial transformation.

In conclusion, some main outcomes of the argumentation will be summarized, stressing the practical importance of taking social networks in consideration for economic restructuring, development and innovative policies.

1. National Innovation System:

Technological change that undoubtedly is one of the major driving forces of economic growth has been consistently neglected by economic theory. The rising dissatisfaction with standard economic analysis of technological progress gave birth during the last two decades to a number of alternative approaches that consider innovation as a complex process, which couldn't be reduced to the linear R&D-production-marketing model (Kline and Rosenberg, [1986]).

Taking into account extensive historical evidence that illustrates the non-linear development of technologies and limited rationality of economic actors,¹ the technological progress is to be considered as a path and context-dependent, tacit, incremental process (Nelson and Winter, [1982]). Although the bulk of the effort in innovation is to be done by the firms themselves, the difference between national and regional patterns of technological development highlights the importance of external economic and non-economic factors that encourage creative interactions between all parts of the society, leading the economy into "virtuous circle" of technological development (Porter and Stern, [2001]).

The most successful attempt to relate economic, institutional and cultural factors in one analytical frame gave birth to the concept of National Innovation Systems (NIS) (Edquist, [1997a], Lundvall, [1992], Nelson, [1993]). By combining evolutionary approach to the firm and technological change (Teece, Pisano and Shuen, [1997]) with elements of institutional analysis (North, [1990]), the NIS approach stresses that flows of technology and information among people, enterprises and institutions are key to the innovative process. The recognition of co-evolution and mutual inter-dependency of physical and social technologies as a driving force behind economic growth constitutes the core of NIS school.

¹ For example, a counter-efficient, from the technological point of view, standartization of the QWERTY keyboard (David, [1985]) and the phenomenon of high-tech industries localization in Silicon Valley (Saxenian, [1994]).

Innovative Firms and their Environment: Missing Links

Therefore, NIS represents a diversified contextual framework providing several tools for analysis of all dimensions of innovative activities within a country. Competence-based evolutionary analysis gives insights into internal process of innovation, based on learning, within the variety of firms that possess specific routines and assets. However, taking into account that ‘*an organization is not a perpetual motion machine; but an open system that survives through some form of exchange with its environment*’ (Nelson, Winter, [1982], p.87), an innovative firm is seen as functioning within a complex network of co-operating and competing firms and other institutions, whose activities and interactions initiate, import, modify and diffuse new technologies (Edquist, [1997a]; Freeman, [1995]; Nelson, [1993]).

Since firm’s activities are context-dependent in various ways—for example the effectiveness of planning and implementation skills is particularly dependent upon detailed features of the social context—political and social forces need to be taken explicitly into account. Therefore, the institutions and their evolution determine the opportunities in a society, shaping the patterns of technological development (Nelson and Sampat, [2001]; North, [1990]).

The institutional conception allows looking at innovation as a “systemic” function of the society. However, while NIS should be analyzed as a “whole” because any of its elements are—more or less closely—related to each other, it is also necessary to understand the logic behind these relationships. While an interactive dimension of technological change constitutes the main concern of NIS, neither evolutionary, nor neo-institutional economics are appropriate for meso-level analysis. Evolutionary theory mainly studies micro-level phenomena, while its macro-economic analysis of technological change join neo-institutional conceptions that are rather descriptive than operational.

Therefore, in order to take a closer look at the flows of knowledge between various actors of the system, it is sometimes necessary to restrict the analysis to various subsystems of a system of innovation (Edquist, [1997b]).

From Interactive to Dynamic NIS

The most widespread approach for analysis of knowledge flows within innovation system is cluster theory developed by Michael Porter (Porter, [1990]). Analyzing productive links within

industries, firms and supporting institutions appear to be related by informal cooperative agreements that promote knowledge creation and diffusion through the instauration of benefits of an innovation environment of trust.

Therefore, national innovative capacity depends on 3 main factors (Porter and Stern, [2001]):

1. Common innovation infrastructure (human and financial resources, the public policies bearing on innovative activity, and the economy's level of technological sophistication);
2. Cluster-specific conditions (quality of specialized inputs, demand conditions, related industries and competitiveness of the context);
3. The quality of linkages (formal and informal organizations and networks).

However, while the theoretical basis for studying the two first factors is quite strong – neo-institutional theory for the first and cluster analysis for the second, the investigation on linkages is often limited to the qualitative appreciation of scientific research institutions and the quantitative study of available venture capital (Porter and Stern, 2001).

Another body of work within NIS approach attests that innovation is fundamentally a geographical process, giving birth to the “learning region” concept. Taking into consideration the social nature of learning and innovation, innovative processes should work best when the partners involved are close enough to one another to allow frequent interaction and the easy and effective exchange of information. Innovative capabilities are sustained through regional communities that share a common knowledge base. Therefore, the regional level is seen as critical because the factors of space and proximity contribute to the kind of tacit knowledge and the capacity for learning that support innovation (Maskell and Malmberg [1999]).

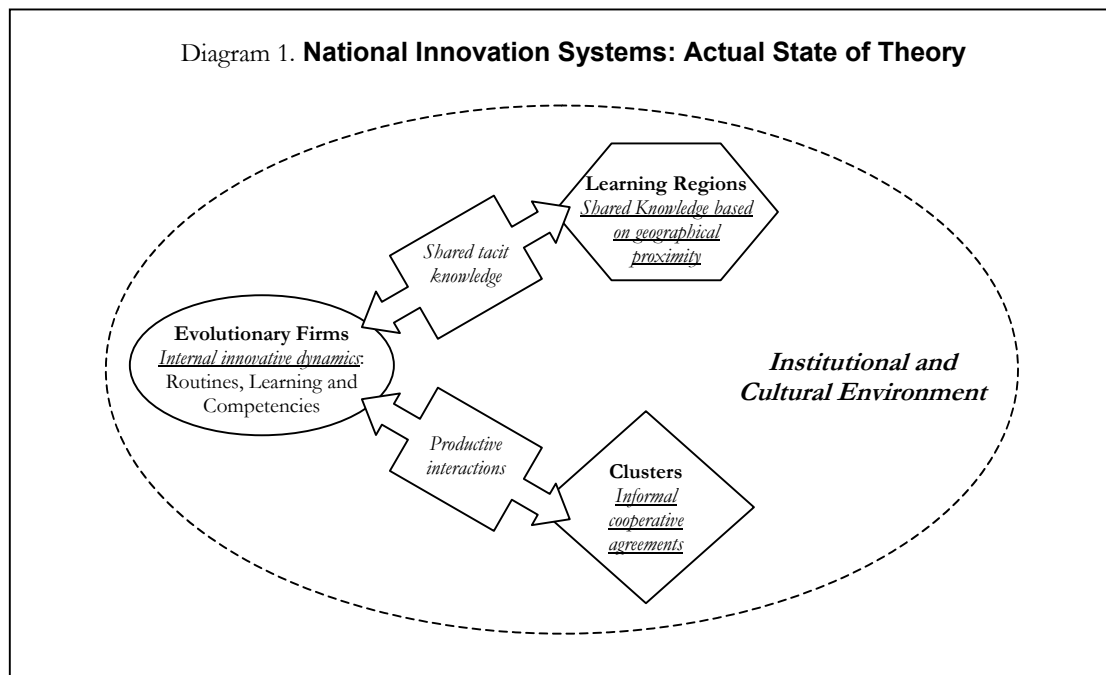
However, several empirical studies contested the hypothesis of tacit knowledge being at the core of proximity logics of innovative arrangements (Grossetti and Bès, [2001]).

As a result, while both cluster and learning region approaches provide functional tools for interactive innovation analysis, they were developed for ex-post studies of structures in place. There is still progress to make in conceptualizing the way national institutional arrangements interact with and shape firm-level processes of knowledge use and development, for it is not completely understood how innovative networks emerge and function (Amable, [2001]).

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To summarize, the NIS theoretical framework appears to be a promising ground for complex innovative interaction analysis. Nevertheless, it still lacks a dynamic component that would bring together a rather heterogeneous set of theories that contributed to the development of the concept (Diagram 1). There are certain gaps in NIS analysis about the kind of logic that brings to life inter-firms cooperative arrangements and how they co-evolve with their environments.



In this respect, we argue that the notion of social networks fills the gaps in analysis of innovation and industrial development: in contrast to purely economic analysis they offer room for human agency, and yet putting emphasis on structure and constraint (Powell and Smith-Doerr, [1994]).

Thus, first, the origins of innovative networks and the types of resources that actors bring to relationship are clearly crucial, which makes part of NIS analysis. Second problem of capturing network dynamics and their consequences, appears much more difficult.

Social networks provide a powerful tool for this type of analysis enabling us to develop a conceptual framework that not only allows to take overall cultural and institutional environment and firm's innovative activities into account, but also highlights the impact of social relations on innovation and industrial development that are not locked into a single institutional pattern.

2. Social Networks as Driving Force of NIS dynamics

Every society is built around relationships. Bringing the concepts of social networks into NIS analysis provides a key access for understanding of dynamic interactions within the system. Social networks are essential not only for explaining the logic of political and institutional arrangements between firms and their environment, but also for understanding the patterns of development of new productive structures and innovative activities.

The guiding idea behind social network analysis is that the behavior of an actor cannot be fully understood unless we relate it to the actions of others with whom the individuals are connected through various network ties. Therefore, behavior and institutions are so '*constrained by ongoing social relations that to construe them as independent is a grievous misunderstanding*' (Granovetter, [1985]).

In general terms, a social network could be broadly defined as an arrangement of the differentiated elements linked to each other by multitude of ties. According to their content (information, advice, friendship, trust, etc.) and strength (amount of time spent together, emotional intensity, etc.), relationships in the network vary between arm's-length and embedded

Arm's-length ties are characterized by lean and sporadic transactions and function without any prolonged human or social contact between parties, who need not enter into recurrent or

continuing relations as a result of which they would get to know each other well (Powell, [1990]; Uzzi, [1996]).

The opposite logic of exchange – embeddedness – results from the distinct social structure of organization networks and the decision-making processes where trust acts as the primary governance structure.

Thus, the process of embeddedness – the emergence and development of social networks – together with the process of decoupling – the network’s fragmentation, ensure the dynamic of social arrangements and interactions.

Social Networks Dynamics: Embeddedness and Decoupling

As noted above, the concepts of embeddedness and decoupling, based upon the idea that behavior and institutions are affected and constrained by social relations, are essential within the social networks perspective (Freeman, [2000]; Granovetter, [1985], White, [2001]).

The notion of embeddedness defines the contingent nature of economic action with respect to cognition, culture, social structure and political institutions, signifying the immersion or partial dissolving of one interactive network into another (Zukin and DiMaggio, [1990]). While the process of embeddedness is mostly about creation and development of social networks, the process of decoupling is defined by opposition and signifies the loosening of the strings of network ties and it’s consecutive dissolution into “social gel” (White, [2001]).

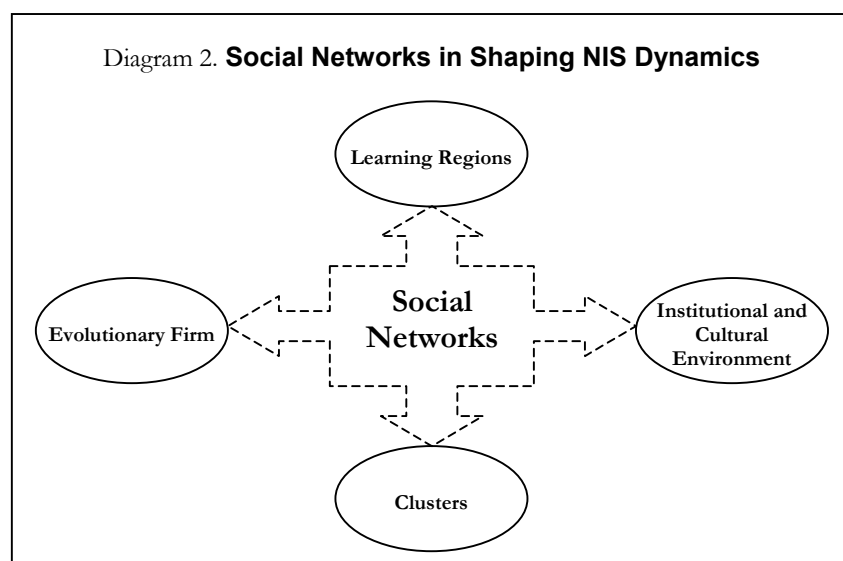
According to the type of relations prevailing in the network, there are two kinds of embedding process: structural and relational embeddedness.

Structural embeddedness emphasizes social control since it “*provides more efficient information spread about what members of the pair are doing, and thus better ability to shape that behavior*” (Granovetter, [1992], p.35). Networks have the ability to develop and disseminate a system of shared and tacitly understood norms and rules on the one hand and a specific language on the other, which allows the network members to act appropriately not only under well-defined conditions but also under dynamically changing contingencies.

Relational embeddedness, on the other hand, is associated with the behaviors of the exchange parties, such as trust, confiding, and information sharing (Uzzi, [1997]). It also refers to the

degree to which exchange parties consider each other's needs and goals defined as the quality of dyadic exchanges (Granovetter, [1992]). Calculative risk and monitoring systems play a secondary role. Information transfer through embedded networks is more fine-grained, tacit and holistic than the typical price data of pure market exchanges, and joint problem-solving arrangements promote voice rather than exit (Hirschman, [1970]).

Although structural and relational embeddedness are critical to the understanding of social arrangements, the embeddedness argument is distant from the broader historical and social context.



Therefore, while institutional and cultural embeddedness is analyzed within NIS framework with neo-institutional tools of analysis, the social networks offer a middle ground for studying relation ties among actors that are primary responsible for their choices. This implies that studying technological change from social networks perspective focuses on relations rather than attributes or characteristics of autonomous individual units, which, within the NIS framework, is examined with evolutionary tools of analysis.

The impact of embedded ties can be threefold:

- First, embedded relations are at least as important from sociological point of view as institutions for promoting trust in the society;
- Second, the over-embeddedness can also stifle effective economic action, leading to the structural inertia, if the social aspects of exchange supersede the economic imperatives. For example, feelings of obligation and friendship may be so great between trans-actors

that a firm becomes a “relief organization” for the other firms in its network. The stronger firms in the network may dedicate resources to weaker members at a rate that outpaces their capacity to rejuvenate their own resources (Uzzi, [1997]);

- Third, the social networks could increase the opportunity of malfeasance. First, because the relations of trust make the network’s actors more vulnerable. Therefore, the use of collective sanctions is an important feature of structural embeddedness. Network parties must know about malfeasance in order to act jointly to condemn or ostracize perpetrators. Second, because force and fraud are most efficiently pursued by teams (Granovetter, 1985).²

Therefore, social networks could have both the most beneficial effects on the society, generating trust and encouraging cooperation, and cause enormous damage by locking the society into rigid networks of connivance. As a result, embedded ties are responsible for development of various kinds of networks that exercise different impact on innovative activities.

Seeing the variety of ties and possible outcomes, it is necessary to specify how different kinds of networks affect the innovative choices.

After a non-exhaustive review of literature on social networks in economics, the next section will investigate how networks influence the abilities of firms to innovate.

Social Networks and Innovation

The network literature underlines the innovative and stabilizing aspects of network patterns. Network building and maintenance is often seen as a precondition for successful innovation and trust but it can also lead to inertia and malfeasance as well as high social and personal costs.

The role of trust in market transactions is increasingly being discussed among economists, which for a long time was the topic of investigation only of sociologists.

Some economists, for instance, associate trust with reputation effects and analyze the trust solely with the tools of microeconomic theory, whereas other economists integrate extra-economic factors into the analysis. Since they attach diverse importance to the phenomena, there

² It is often argued, that in developed societies malfeasance is averted, because existing institutional arrangements make it too costly to engage in, and therefore, discourage malfeasance. However, while even in leading economies

are many forms of conceptualization and the relations between networks of different types that are often left unexplored.

All social networks are, more or less important for innovative activities. Nevertheless, a systemic approach to technological change requires an effort of classification of social networks according their modes of influence on innovative activities. Taking up the classification criteria suggested by Powell and Smith-Doer for productive networks typology, we propose the following types of networks in NIS (Table 1): business groups, regional networks, research and development (R&D) networks and traditional networks.

Table 1. *Four Types of Networks of Innovation*

<i>Types of Networks</i>	<i>Examples</i>	<i>Fundamental concepts</i>	<i>Trust sources</i>
<i>Business Groups</i> Granovetter [1994]	Japanese <i>keiretsu</i> , Corean <i>chaebol</i>	Benevolent authority	Common business group identity
<i>Regional Networks</i> Sabel [1988], Saxenian [1994]	Industrial Districts in Italie, high tech in Silicon Valley	Flexible specialization	Location, kinship, norms of reciprocity
<i>R&D Networks</i> Powell [1993], Grossetti & Bès [2001]	Scientific collaborations in Toulouse region in France	Innovation, learning	Common technological community based on subjacent social relations
<i>Traditional Networks</i> Coleman [1998]	Chinese <i>guanxi</i> , Russian <i>blat</i>	Social resourcing	Shared culture, continuity of relationships

Source: Powell and Smith-Doerr, [1994], modified by the author

It is important to note, that these networks are not isolated from each other and they interact in several ways. The extend and the nature of overlap between networks is especially important for innovative activities, bearing heavily on the extent to which cooperation can be produced over large sectors of the economy, without the intervention of the government.

Business Groups

Business groups are a widespread phenomenon in modern capitalism and are found in many countries under various names, such as the *keiretsu* in Japan, the *chaebol* in Korea, the *konzerne* in Germany and the *grupos economicos* in Latin America.

Whereas it is generally agreed that business groups differ from other economic organizational forms, they could be more or less broadly defined.³ Here, business group is considered as an organizational form of federation of legally independent firms joined together by formal and/or informal mechanisms. Most of the business groups (Indian business houses, Turkish family holdings, the Latin American and Spanish *grupos*, the Russian Financial and Industrial Groups,

this argument could be contested, in developing countries with unclear laws and unsteady institutional structure, malfeasance could be an important issue in functioning of social networks.

³ For example, Granovetter [1994] includes industrial networks, such as the Italian networks, in his definition of business groups, which is excluded from the analysis by Collins [1998].

etc.) have some mechanisms of coordination and control and are active in a wide variety of industries.

From social networks point of view, the emphasize is put on the medley of formal and informal relationships – such as kinship ties, common ethnicity, region, religion and interlocking directorates - that link group affiliates together (Granovetter, [1994]).

The explanation of the emergence of business groups is generally related to three factors:

1. cultural heritage,
2. political economy and
3. market imperfections.⁴

In any case, business groups are based on social linkages (cultural similarities, informal links, everyday contacts, etc.) and arise in situations where they can provide some type of economic advantage for the group members.⁵

The distinctive feature of business groups is the existence of social solidarity and social structure among component firms. In a purely functional sense, the axis or principle of solidarity for a business group is irrelevant, as long as it enables mutual trust to proceed and the group to continue in existence. However, in order to analyze the patterns of development for particular business groups and especially its implication for the technological development, one must understand the internal logic of groups' dynamics.

Furthermore, the role of the State for business groups is important in shaping ownership, authority structure, and relations of groups to financial institutions (Granovetter, [1994]). When States and business groups taken together provide a degree of coordination that balances private, sectoral and national interests, aggregate economic performance could be achieved.

Regional Social Networks

The regional networks perspective helps illuminate the historically-evolved relationships between the internal organization of firms and their connections to one another and to the social structures and institutions of their particular localities (Nohria and Eccles, [1992]; Powell, [1987]).

⁴ While the imperfection arguments is not quite valid for developed economies, as stated out by Granovetter [1994], it could play an important role for the groups formation in he developing countries and transitional economies.

⁵ The economic advantages provided by the group are not necessarily socially efficient: business groups can be found in highly in-efficient as well as highly efficient economic systems.

Several case studies illustrated that the concepts of agglomeration and external economies alone cannot explain why clusters of specialized technical skills, suppliers, and information produced a virtuous and self-reinforcing dynamics of increased technical advances in Silicon Valley, while producing relative decline in Route 128 (Saxenian, [1994]).

The simple fact of spatial proximity reveals little about the ability of firms to respond to the fast-changing markets and technologies. By transcending the theoretical distinction between what lies inside and outside of the firm, the social network approach to regional development offers important insights into the structure and dynamics of regional economies. It directs attention to the complex networks of social relationships within and between firms and between firms and local institutions.

In particular, regional social networks approach helps to explain why equally endowed regions respond so differently to the same external forces. The best-known example is the analysis of divergent patterns of development of Silicon Valley and Route 128 (Saxenian, [1985]).

Silicon Valley has a regional network-based industrial system that promotes learning and mutual adjustment among specialist producers of a complex of related technologies. The region's dense social networks and open labor markets encourage entrepreneurship and experimentation. Companies compete intensely while at the same time learning from each other about changing markets and technologies through informal communications and collaborative practices. Loosely linked team structures encourage horizontal communication among firm divisions and with outside suppliers and customers. The functional boundaries within firms are porous in the network-based system, as are the boundaries between firms and between firms and local institutions such as trade associations and universities.

The Route 128 region, in contrast, is dominated by autarkic (self-sufficient) corporations that internalize a wide range of productive activities. Practices of secrecy and corporate loyalty govern relations between firms and their customers, suppliers, and competitors, reinforcing a regional culture that encourages stability and self-reliance. Corporate hierarchies ensure that authority remains centralized and information tends to flow vertically. Social and technical networks are largely internal to the firm, and the boundaries between firms and between firms and local institutions remain far more distinct in this independent firm-based system.

It is therefore argued, that social networking is the most efficient way of providing the possibility to respond by gathering and disseminating information and reallocating different types

of resources in a fast and cheap manner. That is why regional network-based industrial systems like that of Silicon Valley are well suited to conditions of technical and market uncertainty. Producers in these systems deepen their capabilities by specializing while engaging in close, but not exclusive, relations with other specialists. Network relations promote a process of reciprocal innovation that reduces the distinctions between large and small firms and between industries and sectors (DeBresson & Walker, [1991]).

Further evidence from the industrial districts of Europe suggests that the localization of know-how and information encourages the pursuit of diverse technical and market opportunities through spontaneous regroupings of skill, technology, and capital. The region, if not all the firms in the region, is organized to innovate continuously (Sabel, [1988]).

As a result, spatial proximity is seen as necessary but not sufficient condition for the emergence of regional networks of innovation, that mostly rely on the way that skills and technologies are organized within the complex network of social relationships.

R&D Networks

Studies of electronic and biotechnology industries, which were radically transformed by new technological development, revealed that collaborations in high-tech industries typically reflect more than just a formal contractual exchange. Thus, it was argued that the locus of innovation is likely to be found in social networks: '*Beneath most formal ties, lies a sea of informal relations*' (Powell et al., [1996], p. 120).

Cooperation within R&D networks is both an entry ticket to an information network and a vehicle for the rapid communication about new opportunities and obstacles. However, innovative activities cannot be reduced to a simple process of information acquisition. They emerge from informal R&D collaboration, which usually takes on a more formal and contractual character once such projects lead to feasible products.

These innovative collaborations are often initiated by personal relationships promoted by geographical proximity. However, as innovative process goes along, decoupling mechanisms allow the firms to free themselves from purely geographical context, so that further collaborations could be only distantly linked to the initial social network. Thus, innovative networks dynamics are quite important for national context, since they promote cross-industry and cross regional interactions essential for efficient functioning of innovation system.

Generally speaking, involvement in cooperative R&D projects widens the horizon of a firm's personnel and makes it sensitive to new developments and projects, which are external to the firm and its immediate environment or could be initiated by the firm.

Technological breakthroughs tend to level the playing field for involved firms. These firms also generate profits by exploiting new opportunities, which are created in this whole process. Within R&D networks, mutual need develops rather than the goal to defeat the opponent. Here, the structural position of the firm within the network is decisive. The abundance of ties that link the firm to different networks of relations encourage R&D collaborations, controlling for prior collaborative R&D activity.

Traditional Networks as a Basis of Social Capital

The concept of social capital, pioneered by Bourdieu and Coleman, has been popularized through the works of Putnam, and, recently, it has been taken up as an important concept by international organizations (for example, World Bank). Social capital refers to the institutions, relationships, norms values and understandings that shape the quality and quantity of a society's social interactions through combination of networks that facilitate co-operation within or among groups.

Social capital can be thought of as general framework that supports the process of learning through interaction, and requires the formation of networking paths that are both horizontal (across agencies and sectors) and vertical (agencies to communities to individuals). The quality of the social processes and relationships within which learning interactions take place is especially influential on the quality of the learning outcomes. Thus, social capital plays an important role in fostering the social networks and information exchange needed to achieve collective action - and sustaining a social and institutional environment that is ready to adapt and change.

One of the examples of traditional networks is Chinese *guanxi* that has been one of the major dynamics in China throughout its history, in particular in relation to business conducts.⁶ The Chinese see business either as war or a relationship building activity, preferable the later. You lose face in China if you don't live to your obligations towards family, friends and friends of friends.

⁶ The term *guanxi* refers to relationships among people, blood or social based, but without any precise English equivalent. Luo (2000) defines *guanxi* as transferable, reciprocal, intangible and utilitarian interpersonal linkages with the implication of continued exchange of favours. It defers from friendship and simple interpersonal relationships by including reciprocal obligations to respond to requests for assistance. This reciprocity is only socially binding and without time specification.

Guanxi can be viewed as a social resource because they exist in a latent form not only within one's own network but also between the other networks (*guanxiwang*). *Guanxi* are not only embedded in dyadic relationship, but also an expanded set of relations to all members of the broader network. As a consequence, *guanxi* become an asset at the organizational level as personal relations are dedicated to and used by the organization in order to build productive and innovative linkages (Michailova and Worm, [2002]).

Inter-organizational networks, called *guanxi hu* in Chinese, are built upon personal relationships (Park & Luo, [2001]). Most of these relationships persist for a long time, in many cases extending to a lifetime or beyond, i.e., passed on to successive generations.

The fact that *guanxi* phenomenon persists through time and different forms of government, demonstrate that social and cultural factors are at least as important for networks development as economic ones. For instance, in Chinese societies where people are socialized to think in terms of personal relations, information often resides in networks.

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The presented classification of innovative networks is the result of an effort to systematize the possible ways of dynamic connections between firms, industries and institutions, based on socially shaped relationships between the actors.

As we demonstrated, the impact of different kind of networks on innovative activities could have be of different nature: while business groups and traditional networks represent more rigid and organized forms of innovative interactions; regional and R&D networks, are much more open, flexible and dynamic.

Nevertheless, all of these forms may be present and interconnected within the same NIS. The responsiveness and innovative efficiency of the system rely on the way in which different networks are cooperating. The social construction of innovative activities gives a key insight into the underlying logic of the process of technological change.

Furthermore, the over-embeddedness of the economy in the rigid type of networks (for example, business groups) may be damaging for innovative activities, whereas the development of regional and R&D networks across the NIS generates innovative spin-offs and foster technological change. The importance of the institutional structures and government policies in

dealing with the networks should not be overlooked, since they help to discourage malfeasance and connivance within the networks, thus promoting competitive and innovative arrangements.

3. Social Networks in Russian Industrial Transformation: New Innovative Dynamics *Versus* Structural Inertia

To substantiate our theoretical appreciation of the role social networks for innovation and industrial dynamics, we complemented it by an empirical study of Russian industrial reconstruction during transition.

According to Grabher and Stark [1997], informal networks are a slowly disappearing remainder of central planning. We argue, however, that they are more than that. Previous experiences and legacies are often seen as barriers to the transformation process. However, they are also underestimated as relevant sources for the future.

Through employing the social network perspective, we examined a number of features characterizing Russian industrial transformation from a NIS standpoint, such as cultural and institutional framework, firms' innovative capabilities, and productive linkages. However, we found out that industrial dynamics are tightly embedded not only in institutional structures, but more precisely in close and continuous sets of social relationships, based on trust, power and mutual cooperation. The multitude of social networks shape the structure of Russian industry and has an important impact on technological change and innovative activities of firms.

Bearing in mind that social networks are not static entities, we examined their dynamics by focusing on the way they developed during the centrally planned system, how they evolved in the era of introducing market mechanisms and what is their role for industrial conversion. We use embeddedness and decoupling concepts, as well as the developed typology of social networks, in order to analyze this transformation.

Methodology

Informal networks in Russia are such a widespread phenomenon, that it is quite impossible to overlook their importance for industrial restructuring. However, while the literature on some kinds of networks is flourishing (for example, on *nomenklatura* networks and politicized financial and industrial groups), other types of networks, especially recently emerging ones, are often omitted from the analysis. This lack of attention is mostly due to the importance of informal relationships and tacit agreements on which these networks are based.

Therefore, taking into account the above arguments and difficulties with obtaining data for analysis of emergent networks (which unquestionably requires quantitative as well as qualitative evidence), especially in Russia, we limited the area of study to the heavily industrialized Perm region (Western Urals).

The data collected during the last four years include following sources:

1. Official GOSKOMSTAT⁷ databases including Handbooks “Russia” 2000-2002, “Main Socio-Economic Indicators” 1992-2002, “Russian Industry” 1996-2002, “Russian Regions” 1998-2002, and Perm Region Bureau of Statistics database.
2. Case studies of big regional industrial enterprises (“Morion” telecommunication equipment producer, “Kamkabel”, cable producer, “Metafraks”, chemicals) and regional financial and industrial group (holding “Perm Motors”, producer of aircraft motors);
3. Regional newspapers, several interviews with regional authorities and politicians, and a survey of small regional enterprises;
4. Survey of regional SME (120 interviewee).

Historical Legacy: Social Networks under Communism

Personal networking was predominant in all former socialist countries where structural holes in the planned economy have made networking abilities a necessary competence for managers to being able to fulfill production targets. This “exchange of favors” continues to be a striking feature of doing business in transitional economies mainly because of the weak institutional sanction against renegeing on commitment (Boisot and Child, 1999).

During the Soviet era the Communist Party has placed itself above the law. As a result, the rule of law is not well established in the transitional societies, whereas rules and regulations are easily violated which again results in a propensity for people not to value contracts highly. This means that close personalized relationships naturally are enhanced in a context, where people cannot be sure that they are protected by the law.

In a context where the notion of individuality was meaningless, social networks was a powerful instrument of involving a number of individuals in a complicated set of relationships based predominantly on personal features and exchange mechanisms. It became an essential part of people’s everyday life and an inextricable element of the notions of close friendship and trust.

Two kinds of networks can be distinguished: *blat*, widespread social networks based on mutual exchanges of favors; and *nomenklatura*, Communist Party elite network.

There is no unified and agreed meaning of *blat*. Ledeneva (1997b) defines it as an exchange of ‘favors of access’ in conditions of shortages and a state system of privileges where the ‘favor of access’ was provided at public expense:

- *blat* served the needs of personal consumption and reorganized the official distribution of material welfare;
- *blat* exchange was often mediated and covered by the rhetoric of friendship or acquaintance: ‘sharing’, ‘helping out’, ‘friendly support’, ‘mutual care’ etc.

Intertwined with personal networks, *blat* provided access to public resources through personal channels.” Restricted access is made possible through structural embeddedness: “for it provides information so that parties know with whom to exchange and whom to avoid” (Jones et al., [1997], p. 924).

During the decades of centrally planned economy *blat* was a forced necessity, not a matter of choice. It was, to a great extent, the result of dealing with the permanent shortage of any kind of resources and consumer goods, poor quality and delays in service and as such, it was an essential lubricant of life. *Blat* worked where money did not and almost any transaction could work *po blatu* (through connections) or *po znakomstvu* (through acquaintances).

However, coping with scarcity is not the sole source of *blat* related phenomena. As pointed out by Ledeneva (1997a: 154), the latter resulted from the particular combination of shortages and, even if repressed, consumerism from a paradox between an ideology of equality and the practice of differentiation through the closed distribution system. Additionally, *blat* relationships under socialism should not be confused with or equalized with goods exchange or barter in the literary sense of the term since they have no monetary expression: *blat* is associated with exchanging favors of a special kind, “the favors of access” (Ledeneva, 1997b).

Nomenklatura network could be regarded as a particular network within *blat* networks.

⁷ GOSKOMSTAT stands for Russian Federation State Statistic Committee.

Nomenklatura circle refers to the close Communist Party elite network relating senior officials of State, Party, industrial organizations and research institutes. Since the candidates were selected by the Party members, the *nomenklatura* were quite exclusive.

Therefore, while being less widespread phenomenon than *blat*, *nomenklatura* network represents the most powerful social structure within the socialist economy, exercising a significant role in all spheres of the society.

Social Networks Dynamics in Industrial Restructuring

Post-Soviet reforms deeply affected Russian industry, which underwent profound technological and economic changes. As a result, we could observe a simultaneous development of various kinds of social networks in Russia.

Structural Inertia of Russian Business Groups

The first steps of privatization programs (1987-1994) primarily benefited members of the *nomenklatura* elite who held positions in the ministries or concerns that were to be privatized, or who had “insider” information or access to the planned privatizations due to their positions.⁸ Privatization of banks and profitable enterprises benefited the *nomenklatura* when a number of larger industrial enterprises became shareholding companies, with much of the *nomenklatura* leadership intact after privatization.⁹

The process of state privatization for the benefit of the *nomenklatura* essentially ended with the beginning of the official privatization program, when the public was given an opportunity to sift through the leftovers of state properties.

The *nomenklatura* network is slowly decoupling giving rise to the new Russian business groups, officially known under the name of Financial and industrial groups (FIG), that grew out of the above process of "state privatization of the state." FIGs generally fall into two categories, those based on industry and those with origins in the banking sector.

⁸ As Olga Kryshnanovskaya has noted in a comprehensive study of elites, areas where the elite benefited through "preferential privatization" included the divestiture of state assets (in the form of ministries and government industries), state banks, the distribution system, and profitable enterprises. A typical example of what occurred in privatization of the ministries was that a minister would retire or become a consultant to the former ministry, while a deputy minister became president of the new concern. Acquiring the legal status of a shareholding company, the leadership of the ministry became the shareholders of the newly privatized organization, as well as state enterprises that were under the jurisdiction of the former ministry. The leadership at the head of the ministry was in effect not only privatizing the concern, but privatizing it for themselves (Kryshnanovskaya, 1995).

⁹ The privatization of companies in this category typified the process of privatization in general, as the conditions under which the transactions occurred were of a dubious nature due to the lack of formal legislation guiding the transfer of state property. Kamaz and Avtovaz, two automobile factories that were to play an important role in the creation of the financial-industrial groups, were examples of this form of privatization (Kryshnanovskaya, 1995).

Industry-led FIGs were formed at the time of Russia's transition from communism to enable new enterprise owners (generally the former managers) to maintain control over the firms and reduce the risks of doing business during the unsteady period of transition. The bank-led FIGs were formed when Russia's largest banks began to acquire shares in newly privatized businesses (Johnson, 1997). Therefore, structural embeddedness prevails on relational embeddedness in the composition of business groups in Russia.

The number of officially registered FIGs is under 100, but they control a vast array of financial and industrial concerns, essentially maintaining a stranglehold on the Russian economy. The holdings are so vast, and often acquired so secretively, that the true extent of the FIGs' power is unknown.

FIGs are certainly built up on the remainders of *nomenklatura* network that as a matter of fact ceased its existence, giving place to famous *oligarchs*. Furthermore, there are also a growing number of informal FIGs, which are generally regionally based.

The starting point of their development generally was an existing complex of enterprises and research institutes, already related through supply linkages during the Soviet period. The type of links that connect the group's members is similar to that of national FIGs, but interactions are further strengthened by personal proximity links, so the formalization of the group is unnecessary since the relations of trust often prevail on considerations of purely economic interest.

The biggest FIG in Perm region originated from aerospace industry, based in Perm. The group consists of:

- Holding "Perm Motors" and its 16 subsidiaries organized around aircraft motors production;
- Experimental plant "Iskra", former rocket producer, and its 9 subsidiaries;

While the relationships within "Perm Motors" and "Iskra" are vertically organized, that reflects the persistence of hierarchical structures inherited from the planning economy, the interactions between these holdings are much more complex. The industry was partly privatized with the participation of national FIG "Interros" and foreign investors (Pratt&Whitney), but the State is still one of the major shareholders, detaining 20% to 51% of the shares. Therefore, the group's management remained and offers a perfect illustration of the importance that played *nomenklatura* networks in the restructuring of Russian industry.

The social network, to which the group belongs, shaped not only its organizational structure, but also the patterns of technological conversion. Through the ties of regional networks, the group is tightly connected to the “Gazprom”, national natural gas monopolist, and “Lukoil”, one of the oil oligopolies, very active on regional scene.

“Gasprom” and “Lukoil” are biggest national consumers of oil and gas extraction and propulsion equipment. Seeing the difficulties with getting access to the international market it was very suitable for “Perm Motors” and “Iskra” to adapt their production to the needs of “Gazprom” and “Lukoil”, especially when the demand was guaranteed through informal agreements.

The deal was especially welcome during the first years of transition and the collapse of Soviet market, since it insured the survival of the industry. However, the further diversification has not followed and the group, former pride of national scientific and technological achievements, seems to stagnate as a plain supplier of oil and gas industries. The attempts of development of international research and production projects were blocked or slowed down by the group’s organizational inertia. For example, Pratt&Withney complained about the apparent lack of directors in implementing new technologies and production methods.

Furthermore, a long-lasting conflict with another national aircraft motors producer—“Rybinsk Motors”—belonging to another business group, over intellectual property right of PS-90A motor attests of the lack of cooperation between national firms and the reinforcing role of social networks in the conflicts of interest.

It could be argued, that the business groups played a positive role during the first years of transition in maintaining the productive linkages between the plants and in discovering new market for the group’s production. Nevertheless, the closeness and rigidity of the network in which the group was mostly related, seems to be one of the most important factors that prevent further diversification, a more active participation in national research and productive networks and international cooperation.

Dominance of ‘Route 128’-like Regional Networks

The abrupt halt of the planning economy forced the enterprises into search for new consumers and suppliers, which proved a tremendous task seeing the underdevelopment (or even inexistence) of market institutions, for example banking sector. In these circumstances, the firm’s

management relied heavily on local social ties (family, friends, former colleges and business partners).

Russian regional networks emerged from regional industrial elite's circles with substantial participation of informal networks (including organized crime). They are very politically active on regional level and often determine industrial development policies on the regional level.

These networks are constituted by autarkic corporations, which internalize a wide range of productive activities. Research and production cycle are largely internal to the firm, and the boundaries between firms and between firms and local institutions remain quite distinct. However, the directors of productive enterprises, regional officials and regional media are often related by personal ties and/or considerations of mutual interest.

These social networks were mostly based on proximity links facilitated by everyday contacts, common codes, channels of interaction, and ways of organizing and coordinating behaviors.

Therefore, the social construction of Russian regions follows 'Route 128'-like type of relationships with, probably, a more important informal part of interactions. Connivance matters more than trust in these networks, and their primary role is to protect the regional firms from the intruders of the outside.

However, the potential for regional networks development does exist in Russia, since several enterprises maintain close relations with universities, technical institutes and regional authorities. Nevertheless, the positive effect of these interactions is persistently revoked by the insignificant number of industrial SMEs that could capture spin-offs resulting from industrial plant – university interactions.

Innovation Networks Missing

Innovation networks barely exist in Russia. Essential for NIS efficiency, they yet have to be developed. It is not surprising, that in the vertically structured economy, dominated by business groups and unfriendly for cooperation regional networks, innovative linkages take time to emerge.

Traditional Networks Transformation

The importance of *blat* has not reduced in Russia. Although legal procedures are established, informal contacts have not lost their significance: they give access to information and guarantee

its reliability. However, while the phenomenon persists, *blat* networks did not remain the same.

Nowadays *blat* is especially needed in relation to the tax authorities, the customs offices, the banking sector and the regional administration, in other words, the spheres that constitute the face of shortage at present. *Blat* has become explicitly related to economic interests and the conduct of business whereas in the socialist period it was mainly associated with political considerations and private consumption. *Blat* becomes more and more “materialized” losing its warm and human face and becoming dominated by pragmatism and the rules of the market. The transformation of its nature from being based on moral and ethical considerations to having an explicit financial expression is a phenomenon in itself.

Post-socialist development is marked by a high level of uncertainty and ambiguity. The nature of *blat* transactions is associated with precisely reducing the degree of uncertainty; it is initiated by definite intentions and is rationally controlled. For that reason, *blat* networks play the most important role in the development of SME in Russia.

Furthermore, being the more widespread than other types of networks, they often serve as linkages between business groups, regional networks and different *blat* networks.

Since *blat* networks partly replace innovative networks in relating all other networks, they often play an essential role in initiating of innovative interactions. However, seeing the dominance of family ties upon professional relationships in the *blat* network, it is obvious that they cannot play the same role for technological change as innovative networks.

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To summarize, our empirical analysis, we would like to put forward two main conclusions.

First, in a weak institutional system, as in Russia, networking is a significant resource. In a climate characterized by high uncertainty, having access to reliable information and other resources becomes even more significant. Social networks shaped new industrial system in Russia: sometime they could have impeded private sector development, but they also played a stabilizing role reducing market failures.

Second, it is clear that the dominance of structurally embedded social networks over relationally embedded constrains the choices of Russian firms. The over-embeddedness of business groups obstructs the restructuring of industrial complexes. Moreover, this kind of networking can create new forms of dependency and abuses of political and economic power. The predominance of “Route 128” type of regional networks diminishes the responsiveness of the firms and prevents the circulation of fine-grained information. The actual environment is quite unfriendly for the emergence of innovative networks that cannot be replaced by omnipresent traditional networks, dominated by family-based relationships.

Conclusions

We have demonstrated in the paper that bringing social network analysis into NIS framework is key to a deeper understanding of mechanisms driving industrial development. Additionally, we contribute to the understanding of the phenomenon of how do social networks change and evolve over time by providing country specific examples of network dynamics.

Social networks are especially important for Russia where they already played a significant role in Soviet productive system. While these networks are still powerful and participated actively in the industrial restructuring, their functions and the nature of relationships between the actors underwent important modifications.

However, new type of innovative networks takes time to emerge seeing the structural inertia of Russian business groups and regional networks.

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