

European Research Council

**ERC Starting Grant
Research proposal (Part B1)**

**Intercohesion: The social network foundations of
innovation**

INTERCOHESION

- Name of the Principal Investigator (PI):
Balazs Vedres
- Name of the PI's host institution for the project:
Central European University
- Proposal full title :
Intercohesion: The social network foundations of innovation
- Proposal short name:
INTERCOHESION
- Proposal duration in months:
60 months

New scientific paradigms, new forms of political representation, and new products and services are key areas of innovation, with a fundamental impact on societal development. To identify the right track to promote innovation, one needs to understand the structures and mechanisms that lead to the creation and implementation of a new idea. While it has long been recognized that innovation is intimately connected with social embedding, it is only now with the emergence of network science that we can analyze fine grained patterns of connections and their dynamics in large datasets. Current research in the social sciences focuses predominantly on how innovations spread, but not how innovations are generated in the first place. This project would open new horizons in understanding mechanisms in the generation of innovation, with specific insights into the kinds of organizational structures and networking practices that maximize innovation potential. This project advances a new argument based on the intersection of cohesive network groups – intercohesion –, and tests this argument against established expectations of long reaching circuits of weak ties. Innovation is analyzed in three domains – academic production, social movements, and business groups – using both quantitative methods and qualitative case studies. To operationalize intercohesion I reach out to methods recently developed in physics, as I adopt the clique percolation method and algorithm to identify overlapping groups. While network science is a burgeoning field in the USA, in Europe it is yet fragmented into local initiatives. A concentrated research project, proposed here, would not only help understanding innovation better, but would also contribute to the consolidation of network research in Europe.

Section 1a: The Principal Investigator**i Scientific Leadership Profile**

My research furthers the broader agenda of understanding historical dynamics in network systems, combining insights from social network analysis, and studies of complex systems in physics and biology. With a degree from Columbia University, and working at Central European University, I am embedded in both the US and European fields of sociology and network science. I am also a social scientist working in interdisciplinary networks through my affiliations with the Santa Fe Institute, and Collegium Budapest. Thus I am uniquely positioned as a researcher to integrate the emerging, and yet fragmented, network science field in Europe. I was designing and executing several large-scale research projects, both with NSF and European funding. I developed new methods, borrowing ideas from the natural sciences, and I was publishing my results in several of the top social science journals.

Over the last decade I developed innovative data collection, data cleaning, and analysis techniques to handle datasets with hundreds of thousands of entries, coding my own algorithms to realize methodological innovations. Beyond innovations in quantitative methods, I was engaged in large-scale discourse analysis projects, networks-based business consulting, and qualitative case study work – over the last fifteen years I conducted hundreds of interviews with businessmen, entrepreneurs, politicians, civic activists, and think-tank researchers. I had also recruited and supervised large research teams, sometimes employing more than twenty research assistants, within the framework of international projects, spanning several countries.

My first large scale research project on business networks was commissioned by the Hungarian Prime Minister's Office in 1999, to provide a comprehensive map of Hungarian political-business networks of the largest 1000 corporations. In this project I was working with ten research assistants collecting data from 20 corporate registry courts on ownership and personnel links, and I wrote two volumes introducing the profiles and network patterns of all the business groups in the country. While results of this research provided a valuable resource for the executive power to locate sources of lobbying efforts, I have also published an article of this research project in *Connections*, the journal of the International Network for Social Network Analysis.

I demonstrated in my dissertation and subsequent research that a historical network approach can tackle substantive research questions. How do processes of transnational and domestic networks come into contact? Does foreign investment disintegrate domestic business network cohesion? Do transnational civic ties sever local ties of activism? In each of these cases a historical network approaches helped identifying the kinds of transnational connections that strengthen local embedding, and the kinds of local structures open to transnational integration.

Data for my dissertation came from an NSF-funded research project (SES-0136995, \$283,167) that I wrote and managed together with David Stark. This project is unique in historical scope in network analysis, as we charted, with a daily time resolution, the complete ownership, political network, and personnel network histories of about two thousand corporations over two decades of history. I organized a team of about twenty five research assistants, and devised a data collection strategy, quality control and data cleaning procedures, and dataset creation. The final datasets consisted of more than a hundred thousand dated entries on ownership ties. Results of this research were published with David Stark in the *American Journal of Sociology* in 2006. That publication already attracted about 30 citations, and is being used in teaching network science at the PhD level, for example at Stanford University.

My development of a historical network analysis perspective benefited from exposure to natural sciences in the interdisciplinary community of the Santa Fe Institute – where I was selected as international fellow between 2003-2006, and Collegium Budapest, where I was a junior fellow in

2004. Approaches to complex systems in physics and biology are highly relevant to social phenomena and the historical development of network systems. I adopted methods both from physics (for example the clique percolation method to identify cohesive communities in networks) and biology (optimal matching sequencing techniques to historical data, originally developed for genome sequencing).

Analyzing the evolution of network structures involves asking questions about agency behind changing structures. A key area to understand experimentation with new ways to organize social ties is the sphere of civic activism. In a subsequent NSF-funded project (SES-0115378, \$316,592) on the technologies of civic organizations I devised a sampling and data collection method to map civic websites in ten countries – a process that involved supervising about fifteen research assistants covering ten different languages to code about six thousand websites. In addition I was supervising a local team of researchers collecting qualitative data – case studies of organizations with innovative technology use (e.g. internet access facilities for the homeless). Results of this research project was published in *The Annals of the American Academy of Political and Social Science*.

Within this same project we developed a survey instrument to analyze the impact of transnational civic ties on the local embeddedness and grassroots activism of civic organizations. Contrary to widely shared fears about the uprooting impact of transnational engagement, we found that most kinds of transnational ties actually help maintaining local roots. Organizations with multiplex transnational connections involved more local activism, and only the uni-dimensional kinds of global ties (e.g. receiving only money without a foreign partner's engagement in actions) lead to uprooting. Our survey was recently replicated in Brazil, with the same results and conclusions. Results of this research was published in *Theory and Society*.

I was also researcher in an FP6 research project, (New modes of governance, € 150,000, component on “Evolving Regional Governance Regimes: Challenges for Institution Building in the CEE Countries”), together with Laszlo Bruszt. We developed a survey to ask civic organizations in six regions – two from each of Poland, Czech Republic, and Hungary – to understand projects within the framework of the European Union developmental funds. This research highlighted links between pre-accession participation and post-accession strategies, and it indicated ways in which civic organizations shape new forms of partnerships with businesses and government agencies. Results of this research were recently published in *Voluntas*.

In a recent research project where I was Co-PI with David Stark, we were exploring the impacts of political connections on business networks (SES-0616802, \$189,346). Within this project, I organized data collection on all the political officeholders that occupied a corporate position in Hungary between 1987 and 2006. The resulting dataset contained about thirty thousand political officeholders, and about a hundred twenty thousand corporate officeholders. Results of this project indicate that political affiliation is becoming increasingly salient in shaping business network ties, even at the cost of sacrificing business rationality. This research also contributed to the discovery of the importance of overlapping group structures, fully developed in this proposal submission.

My recent publication in the *European Management Review* resulted in an invitation to join an interdisciplinary research group on network science at the Haas School of Business, University of California Berkeley, as tenure track faculty. While pondering this opportunity, I persuaded the president of CEU to establish such an interdisciplinary institute at our university, to integrate European network science. The president lent full support to establishing the Center on Network Science with my leadership, and I started building this Center with a mission to become a key hub in European network science. As part of this mission, this year I selected a post doctoral fellow (an ecologist from Italy) to organize an international conference, and to map the network science field in Europe and beyond. This grant application is an element of this mission, to build an international and interdisciplinary team of researchers on network science.

ii Curriculum Vitae**Education**

- 2000-2004 Ph. D., 2004 May 19,
Columbia University, Department of Sociology, New York
- 1997-2000 Ph. D. studies,
Budapest University of Economic Sciences and Public Administration (Corvinus University)
- 1995-1997 M. Sc. in Economics and Sociology,
Budapest University of Economic Sciences and Public Administration (Corvinus University)
- 1992-1995 B. A. in Economics and Sociology,
Budapest University of Economic Sciences and Public Administration (Corvinus University)
- 1988-1992 Budapesti Piarista Gimnázium

Professional experience

- 2008- Associate Professor, Department of Sociology and Social Anthropology, Central European University
- 2007- PhD Director, Department of Sociology and Social Anthropology, Central European University
- 2004-2008 Assistant Professor, Department of Sociology and Social Anthropology, Central European University
- 2000-2003 Researcher, Institute of Sociology, Hungarian Academy of Sciences

Dissertation

“Network Sequences of Social Change: The Transformation of Ownership and Economic Policy Discourse in Hungary, 1987-2001”

Committee:

David Stark, Peter Bearman, Harrison White,
Laszlo Bruszt, Walter Powell

Fellowships

2007	Associate Research Scholar, Harriman Institute, Columbia University
2003-2006	International Fellowship, Santa Fe Institute
2004	Junior Fellowship, Collegium Budapest Institute for Advanced Study
2002-2004	ISERP Fellowship (Institute for Social and Economic Research and Policy, Columbia University)
2002-2004	Doctoral Fellowship from the National Science Foundation
2001-2004	Paul Lazarsfeld Doctoral Fellowship, Columbia University
2000-2001	Fulbright Fellowship, Columbia University

Funding ID

2007-2008	“Evolving Regional Governance Regimes: Challenges for Institution Building in the CEE Countries.” Within the FP6 research project “New modes of governance”. Researcher (with Laszlo Bruszt as Principal Investigator). € 150,000
2006-2009	“Network Dynamics in an Emerging Democracy.” National Science Foundation SES-0616802. Co-Principal Investigator (with David Stark as Principal Investigator) \$189,346
2004-2005	“Technologies of Civil Society in East Central Europe.” National Science Foundation, Small Grants for Exploratory Research SGER-0441999. Co-Principal Investigator (with David Stark as Principal Investigator) \$74,992
2002-2005	“Pathways of Property Transformation: Enterprise Network Careers in Hungary, 1989-2000.” National Science Foundation SES-0136995. Researcher (with David Stark as Principal Investigator) \$283,167
2001-2004	“Organizational Innovation and Interactive Technology among NGOs in Postsocialist Eastern Europe.” National Science Foundation SES-0115378. Researcher (with David Stark as Principal Investigator) \$316,592
1999-2000	“Business groups in transition.” Research grant of the Hungarian Prime Minister’s Office, Principal Investigator € 19 700
1999	“Social networks, organizational culture and financial performance.” Research grant of T-Com corporation. Co-Principal Investigator (with Zoltan Szanto as Principal Investigator) € 21 500

iii Early Achievement-Track-Record**Selected Publications without the PhD Supervisor (David Stark):**

- Balazs Vedres. 2007. "Pathways from postsocialism: ownership sequence and performance of firms in Hungary, 1991–1999." *European Management Review* 4(2):93-105.
- Laszlo Bruszt, and Balazs Vedres. 2007. "The Politics of Civic Combinations" *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations* 19(2):140-160.
- Balázs Vedres. 2005. "The Social Structure of Research Accountability." *Foresight Europe* 2:35-37.
- Balázs Vedres. 2004. "Testing Narratives of Postsocialism: Transition and Sequence Approaches to the Ownership Histories of the Largest Hungarian Corporations, 1991-1999". *Hungarian Review of Sociology*, 16(4):22-47.
- Balázs Vedres. 2001. "The Constellations of Economic Power: the Position of Political Actors, Banks and Large Corporations in the network of Directorate Interlocks in Hungary." In: Sabine Gensior (editor): *Sprungbrett Region*. Berlin, Edition Sigma, 2001.
- Balázs Vedres. 2000. "The Constellations of Economic Power." *Connections - Journal of the International Network for Social Network Analysis* 23(1):44-59.

Selected Publications with the PhD Supervisor (David Stark):

- David Stark, and Balazs Vedres. 2008. "Social Sequence Analysis: Ownership Networks, Political Ties, and Foreign Investment in Hungary" in: John Padgett, and Walter W. Powell (editors): *Economic Transformations and Trajectories: A Dynamic Multiple-Network Approach*. Santa Fe Institute (forthcoming).
- David Stark, and Balazs Vedres. 2006. "Social Times of Network Spaces: Network Sequences and Foreign Investment in Hungary." *American Journal of Sociology*, 111(5):1367-1411.
- David Stark, Balazs Vedres, and Laszlo Bruszt. 2006. "Rooted Transnational Publics: Integrating Foreign Ties and Civic Activism." *Theory and Society*, 35(3):323-349.
- David Stark, and Balazs Vedres. 2005. "Sequenze di rete e investimento estero in Ungheria" *Stato E Mercato* 75(3):391-422.
- Balázs Vedres, Laszlo Bruszt, and David Stark. 2005. "Organizing Technologies: Genre Forms of Online Civic Association in Eastern Europe." *The Annals of the American Academy of Political and Social Science*, 597:171-188.
- Laszlo Bruszt, Balázs Vedres, and David Stark. 2005. "Shaping the Web of Civic Participation: Civil Society Websites in Eastern Europe." *Journal of Public Policy*, 25(1):149-163.
- David Stark, and Balazs Vedres. 2004. "Социальное время сетевых пространств: анализ последовательности формирования сетей и иностранных инвестиций в Венгрии, 1987–2001." *Экономическая социология* 6(1):14-45.

Invited Presentations to Peer-reviewed, Internationally Established Conferences

“The Coevolution of the Political Field and Politicized Business Networks in Hungary, 1987-2006.” International Sociological Association, First ISA Forum of Sociology, Barcelona, Spain, September 5-8, 2008.

“Historical Network Analysis, and the Dynamics of Cohesion.” The Age of Networks: Social, Cultural, and Technological Connections. National Center for Supercomputing Applications, Urbana-Champaign, USA, April 26, 2007.

“Social Times of Network Spaces.” 99th Annual Meeting, American Sociological Association, Regular Session, Economic Sociology. San Francisco, USA, August 14-17, 2004.

“Testing Narratives of Postsocialism: Transition and Sequence Approaches to the Ownership Changes of the Largest Hungarian Corporations, 1991-1999.” Social Science History Association, Annual Meeting, St. Louis, USA, October 24-27, 2002.

“Lock-ins, Sell-offs, and Takeovers: Analysis of Ownership Sequences in Postsocialism.” 98th Annual Meeting, American Sociological Association, Economic Sociology Paper Session. Atlanta, USA, August 16-19, 2003.

“Pathways of Property Transformation.” Sunbelt XXII International Social Networks Conference, New Orleans, USA, February 13-17, 2003.

Organisation of International Conferences

Organizing committee member: “Polities: Politicized Economies and Marketized Parties in Network Perspective.” Harriman Institute, Columbia University, New York, USA, April 6-7, 2007.

Organizing committee member: “What Counts? Calculation, Representation, Association.” 17th Annual Meeting on Socio-Economics. The Society for the Advancement of Socio-Economics, Central European University and Corvinus University of Budapest, Budapest, Hungary, June 30 - July 2, 2005

Selected International Prizes and Awards/

Alex Inkeles Award for Outstanding Graduate Student, Department of Sociology, Columbia University, 2003.

SSHA-Rockefeller Best Graduate Student Paper Award. Social Science History Association, 2002.

Memberships to Editorial Boards

European Management Review (member of the editorial board)

Hungarian Review of Sociology (associate editor)

Section 1b: Extended Synopsis of the project proposal (max 5 pages)**Intercohesion: The social network foundations of innovation**

New scientific paradigms, new issues on the public agenda, and new products and services are key areas of innovation, with a fundamental impact on societal development. To identify the right track to promote innovation, one needs to understand the structures and mechanisms that lead to the creation and implementation of a new idea. While it has long been recognized that innovation is intimately connected with social embedding, it is only now with the emergence of network science that we can analyze the actual patterns of connections and their dynamics, in large datasets. By borrowing methods and techniques from physics and biology, the new interdisciplinary field of network science carries great potential in developing new theories for social phenomena as well. Current research in the social sciences predominantly focuses on how innovations *spread*, but not how innovations are *generated* in the first place. This project would open new horizons in understanding mechanisms in the generation of innovation, with specific insights into the kinds of organizational structures and networking practices that maximize innovation potential.

It has long been recognized that trends in innovativeness are more favorable in the USA and Japan, while Europe is falling behind, to a large part due to fragmented institutional networks. While network science is a burgeoning field in the USA, in Europe it is yet fragmented into local initiatives. A concentrated research project, proposed here, would not only help understanding innovation better, but would also contribute to the consolidation of network research in Europe. I am uniquely positioned to initiate such a project, as someone embedded into American network science, and working in Europe, and as someone publishing in the leading social science outlets, but also connected to research in the natural sciences via engagements with interdisciplinary institutes.

This project analyzes the network foundations of innovation in three domains – academic production, social movements, and business groups – using both quantitative methods of group evolution, and qualitative case studies of innovations. Innovation is the lifeblood of the academic, civic and business fields: Innovative academic work attracts citations, prestige, and resources, and ultimately leads to the emergence of a new paradigm. Innovations in the civic domain activate participants; attract activists, and donations, and results in generating new forms of representation in the political domain. Innovations in business groups lead to increased profitability, the creation of new markets, and the establishment of new product and service categories. While analyzing innovation in *each* of these three fields individually carry considerable intrinsic interest, testing how patterns of network ties promote or hinder innovation in *all* three fields offers an unprecedented possibility to formulate a general theory of network mechanisms in the creation of new ideas, transcending the specific context of any field.

The aim of the project is to formulate a new argument about the sources of new ideas, based on the intersection of cohesive network groups – intercohesion –, and to test this argument against established expectations based on long reaching circuits of weak ties. This established argument, widely shared and recently elaborated in sociology, asserts that innovation happens when actors combine long reaching weak ties to import new ideas, and local, strong cohesive ties to implement them. The argument that I am proposing is about the importance of overlapping, interpenetrating groups: I argue that innovation happens when actors combine resources, understandings, and practices from two strongly cohesive communities that they participate in at the same time. The concept of intercohesion refers to this process of generative tension in overlapping social groups. Returning to the original insights of Georg Simmel, I argue that group overlap is the generative tension, where, by the recombination of resources and practices, new ideas can be generated and implemented with trusted partners. While I argue for the

creative potential of intercohesion, I also expect that group overlaps strain group cohesion, so that groups with overlapping memberships would be less stable than exclusive ones.

To operationalize intercohesion I reach out to methods recently developed in physics, as methods currently available in the social sciences are insufficient. Clustering algorithms used by social network analysts typically parse cohesive structures into separated communities with a resulting blind spot to multiple group membership. Thinking of even the simplest examples from our experience with social groups makes it clear that partitioning into disjunctive social groups is artificial, driven more by limitations of methodological vision than by sociological insight. Joint appointments in academic departments constitute an overlap of two or more departmental groups. Nuclear families form as the overlap of maternal and paternal kinship groups. It is not exceptional to participate in more than one circle of friends. A more realist perspective thus acknowledges that social groups can be cohesive and overlapping. To step outside methodological limitations in the social sciences I turn to clique percolation method and algorithm recently developed in physics, adjusting parameters to the purposes and kinds of data that I will be working with.

The research proposed here aims at fully developing the theoretical idea of intercohesion, building on discoveries in a previous project. In that research project with David Stark (NSF SES-0616802, \$189,346) we mapped the historical dynamics of Hungarian business groups using quantitative techniques. We discovered that overlapping groups experienced higher revenue growth. This research project goes significantly beyond previous research in that it is not restricted to the business context, but considers academic production and social movements as well. This project is also not restricted to quantitative methods (that led to the discovery of intercohesion as a hypothesis), but incorporates qualitative methods to understand the mechanisms of intercohesive creativity. In sum, this project aims at fully elaborating the mechanisms of intercohesion, rather than just testing it a correlational hypothesis.

For each of the three domains I propose to gather data on network ties in a historical perspective – recording the time of creation and dissolution of specific ties – in order to identify emergent and dissolving groups. Academic production is increasingly a team-based effort, where teams are often not named entities, but can be recognized from patterns of co-authorship, co-participation in projects, collegial ties, and co-organization of academic conference panels. Social movements are typically loose alliances of organizations, woven together by ties of co-organized protest action, co-sponsored petitions, projects, and actions. Business groups are strategic collectivities of firms linked by personnel ties, ownership shares and projects.

In each of the three domains I choose specific cases. In academic production I consider two fields: complexity science, and migration studies, both interdisciplinary and with active group formation. In the civic domain I propose to analyze the evolution of social movements in Hungary and Poland from 1988 to 2008. In terms of business groups I will collect data on business groups around firms in the Fortune Global 500 lists from 2005 to 2008, and I will relate these groups with local business dynamics in Hungary, one of the most open economies in the world in terms of foreign ownership. I will apply historical sequencing methods that I developed in preceding publications, methods of group identification from physics and general methodologies from historical sociology to analyze cohesive group evolution and long-reaching weak ties in these quantitative historical network datasets.

Network structures in innovation

Innovation happens by solving the twinned problems of recognizing novel ideas and securing the means to implement them. In short innovation takes solving the “idea problem” and the “action problem”. Network analysis contributed to understanding innovation by uncovering the

structure of ties that channel new ideas. To understand the spread of new ideas, one needs to understand the positions of individuals in networks of flow. When adoption involves taking risk (as adopting a new idea often does), social actors consider the decisions of those that are positioned similarly in the network.

Network analysis also contributed to a better understanding of action. While in many cases social groups are institutionalized (as the Chicago Department of Sociology, or the Parmalat business group), groups relevant to innovation are most often not named. Network analysis provided tools to recognize unnamed communities from the patterns of ties between the members that make it up. Clique identification methods make it possible to recognize packets of high density within a network, and subsequent developments relied on clustering techniques to identify groups at various levels of cohesion. In the academic context for example, a network perspective helped realizing the creative potential of *invisible colleges*, un-institutionalized collectives of researchers. In the business context, network approaches to links between managers via co-participating in directorship boards contributed to identifying core economic elite groups or business groups.

In sum, the current consensus sees two separate network structures relevant to the idea problem and the action problem of innovation: connectivity outside the community helps securing the import of new ideas, while dense ties of cohesion within the community helps with acting on these ideas.

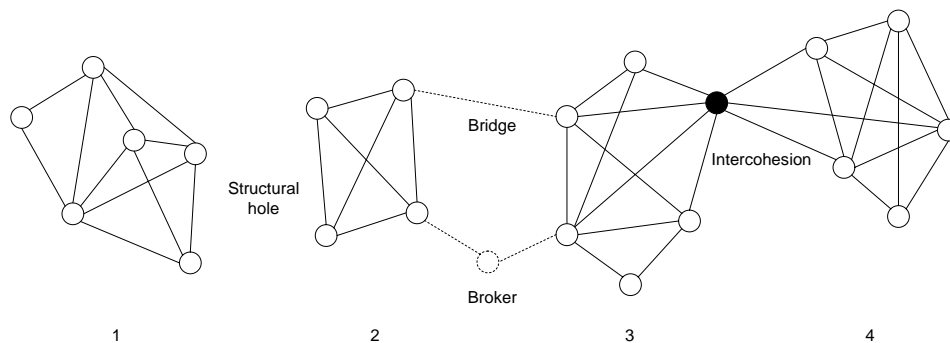
In my view, true innovation is about generating new ideas, rather than adopting them. Let us turn to examples of innovation to highlight this point. In their study of new product development in cellular telephones, blue jeans, and medical devices, Lester and Piore (2004) demonstrate that each of their cases of radical innovation involves combinations across disparate fields, or communities: Fashion jeans are the marriage of traditional workmen's clothing and laundry technology borrowed from hospitals and hotels. Medical devices draw on both basic life sciences and clinical practice. And cellular phones recombine in novel form radio and telephone technologies. They conclude that "without integration across the borders separating these different fields, there would have been no new products at all" (Lester and Piore 2004: 14-15).

If innovation is beyond importing and adopting ideas developed elsewhere, the key question is: How are new ideas generated? The telling phrase in the preceding paragraph is "integration across the borders..." First, Lester and Piore do not refer to "contacts" across borders, for it is not enough for different communities to be *in contact*. Innovation takes closer integration. Second, integration was *across the borders* of communities, not merely tight integration within a community. Thus, translated to the language of network structures, new ideas are generated when cohesive communities interpenetrate – when cohesive groups give up their exclusivity.

The hypothesis of intercohesion states that the overlapping of social groups ignite processes of generative tension, where group members recognize the potential of recombining diverse group-based resources, and are also able to realize this new idea by their discretion over those group-based resources. In contrast to the connectivity-plus-closure perspective, intercohesion rests on different assumptions: social groups are not necessarily exclusive, and new ideas need to be generated, rather than imported. The overlapping of social groups is generative, because intimate access to group-based resources in multiple groups lends itself to *recognizing* new combinations. These group memberships are also conducive to *realizing* these new combinations – members that are insiders in both groups can mobilize group assets towards acting on the new idea. Deep access for generating new problems, new knowledge, and new capabilities (as opposed to transferring already accepted ideas) requires considerable trust, hence familiarity. Such access can only be achieved by being an insider, an accepted member of a group. I argue therefore that productive recombination requires familiar access to resources by

being multiple insiders. Such access is not provided by the narrow bandwidth of the slender ties of bridging and brokerage.

Figure1. Possible connections between groups.



To understand the theoretical importance of the various kinds of links between social groups for innovation, let us consider four possibilities, presented on Figure 1. The first possibility is that there is no link between two groups. On the figure, groups 1 and 2 are not connected. Such a structural hole can be spanned by bridging ties or brokering nodes. When groups become bridged by a connection between members in each group, information can start flowing. Alternatively, groups might become in contact by a third party, a broker that mediates the flow between the two groups, while turning a profit. But a structural hole can be also spanned by a group member that becomes a member of both groups. Intercohesion, the form of contact between group 3 and 4, is distinct from either brokerage or bridging: groups not only become in contact, they interpenetrate by a mutual member.

Methods

Identifying groups and intercohesion. Social network analysis of group cohesion has so far neglected the importance of group overlaps. For methodological ease, techniques of group identification parse network data into disjunct, exclusive communities. To step outside this methodological tradition of group exclusivity, I borrow methods recently developed in physics. To identify cohesive groups I will use a method that starts from cohesive localities, recognizes groups independent of the global network environment, and identifies intercohesive positions. Most methods within social network analysis parse cohesive groups into exclusive sets, so I turn to a method developed by physicists: the clique percolation method. In a recent publication of Gergely Palla, Tamás Vicsek and Albert-László Barabási, the potential for this method as a suitable tool to analyze the evolution of cohesive groups was fully demonstrated.

Historical analysis of group dynamics. To analyze the causal relationship between intercohesion, innovation, and instability, I will use methods, and more general methodological strategies from historical sociology, and sequencing techniques borrowed from genome sequence matching, adopted to historical purposes. From historical sociology, I adopt the concepts of path dependency, conjuncture, and turning point. I will translate these general methodological ideas to practical historical mapping techniques by adopting and refining sequence methods already developed for network purposes in preceding publications. For identifying typical evolutionary paths of group development, I will adopt an optimal matching sequencing technique, tuned to network application. Historical methods provide a typology of group evolution sequences, and helps answering questions on the impacts of intercohesion: Do groups with more intercohesion live shorter? Do these groups experience more member turnover? Are there thresholds in the amount of intercohesion that predict a complete dissolution of a group? These methods will also

enable recognizing alternative mechanisms at work: Do groups with more bridging and brokering connections show more innovation subsequently?

Micro-mechanisms of intercohesion. Qualitative methods will be used to understand network mechanisms of innovation. Case studies of groups and stories of innovations will be collected to answer questions about the practices of deploying social contacts in the process of innovation. Quantitative methods can help in identifying patterns of connections, and correlating these structures with innovation. The key type of question that the qualitative component can answer is about the *content* of social ties: How are ties built? How does one activate a network tie in the case of a specific need? How do actors in the field fill ties with content?

Cases and Data

I consider three diverse social contexts to test the idea that intercohesion contributes to innovation: academic production, social movement mobilization, and business groups. These are three key fields where innovation contributes greatly to societal development. Academic innovation defines new directions for science, and ultimately leads to new applications. Innovation in the civic field improves the efficiency of political representation of what counts and who counts, and ultimately leads to improved decisions. Innovation in the business field leads to profitability and economic growth. Understanding innovation in each of these three domains independently is an important task, but I argue for the importance of incorporating cases from all three domains into one research project.

Within the field of academic production, I will select two fields as cases: complex systems and the sociology of immigration. Both fields featured rich examples of interdisciplinary collaborations. Complex systems research spans information science and archaeology, physics and biology. Migration research features political science and anthropology, economic sociology and criminal justice. Both fields became very active over the last two decades, featuring research institutes, journals, and applications in governance and business consulting. Qualitative case study research will target social movements that especially successful in generating new forms of representation. These will include environmental and human rights groups, corruption watchdog organizations and regional developmental movements.

I consider the history of social movements from Hungary and Poland, between 1988 and 2008. I will collect data on news releases that concern an action from a social movement, from both the Hungarian and Polish news agencies, with the help of native speaker graduate students, and relying on local data collection firms affiliated with the news agencies. Based on a small pilot study at the Hungarian News Agency, I estimate that about ten thousand items will be available in each country. Networks between civic organizations will be drawn up by their co-participation in events (such as a demonstration, petition, conference, or other project). This sampling strategy builds from ties that enter the public sphere as new items, and will not see ties that do not become public. I expect that movement groups that are intercohesive will be more successful in generating issues that will become part of the political agenda. Qualitative case study research will target social movements that especially successful in generating new forms of representations.

This research project will focus on network patterns at the inter-organizational level, in business groups spanning the global-domestic boundary. Specifically, I will consider business groups around the Fortune Global 500 firms, with local data collection in Hungary. Data about personnel and ownership connections among global corporations will be collected from the Fortune 500 database service, and connections among Hungarian firms will be collected from registry courts. I will consider the top 500 Hungarian firms in each of the years between 2005 and 2008. I will conduct qualitative research to understand the operation of business groups.