

PROPOSAL COVER PAGE

1. LEGAL NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE Iowa State University		3. NAME AND TITLE OF AUTHORIZED ORGANIZATIONAL REPRESENTATIVE (AOR) Thane Peterson, Director, Office of Sponsored Programs Administration		
2. ADDRESS (Give complete mailing address and Zip Code) 2207 Pearson Hall, Room 15 Ames, Iowa 50011-2207		4. A. Telephone No.: 515-294-5225	b. Fax Number: 515-294-8000	c. E-mail Address: GRANTS@IASTATE.EDU
5. ADDRESS OF AOR (If different from Item 2.)				
6a. TYPE OF PERFORMING ORGANIZATION (Choose 1 only)			6b. In addition, PLEASE CHECK ANY OF THE FOLLOWING THAT APPLY:	
01 <input type="checkbox"/> USDA Agency	08 <input type="checkbox"/> Private For-Profit	<input type="checkbox"/> Alaska Native-Serving Institution		
02 <input type="checkbox"/> Other Federal Agency/Department	09 <input type="checkbox"/> Private Non-Profit	<input type="checkbox"/> Cooperative Extension Service		
03 <input checked="" type="checkbox"/> 1862 Land-Grant University	10 <input type="checkbox"/> Public Secondary School	<input type="checkbox"/> Native Hawaiian-Serving Institution		
04 <input type="checkbox"/> 1890 Land-Grant University (including Tuskegee Univ.)	11 <input type="checkbox"/> State, Local or Tribal Government	<input type="checkbox"/> Hispanic-Serving Institution		
05 <input type="checkbox"/> 1994 Land-Grant University	12 <input type="checkbox"/> Individual	<input type="checkbox"/> Historically Black College or University (other than 1890)		
06 <input type="checkbox"/> Private University or College	13 <input type="checkbox"/> Other	<input type="checkbox"/> School of Forestry		
07 <input type="checkbox"/> Non-Land-Grant Public University or College		<input type="checkbox"/> State Agricultural Experiment Station		
		<input type="checkbox"/> Tribal College (other than 1994)		
		<input type="checkbox"/> Veterinary School or College		
7. TITLE OF PROPOSED PROJECT (140-character maximum, including spaces) Network Analysis for Communities				
8. PROGRAM TO WHICH YOU ARE APPLYING (Include Program Area and No. Refer to Federal Register announcement or program solicitation where applicable) USDA-National Research Initiative 62. Rural Development		9. TAX IDENTIFICATION NO. (TIN) 426004224	10. CONGRESSIONAL DISTRICT NO. IOWA - 3	
11. DUNS NO. (Data Universal Numbering System) 5309844		12. PROPOSED START DATE Sept. 1 2002	13. DURATION REQUESTED (No. of months) 24 months	
14. TYPE OF REQUEST (Check only one) <input checked="" type="checkbox"/> New <input type="checkbox"/> Renewal <input type="checkbox"/> Supplement <input type="checkbox"/> Resubmission <input type="checkbox"/> Resubmitted Renewal <input type="checkbox"/> Continuing Increment <input type="checkbox"/> PD Transfer <input type="checkbox"/> [PRIOR USDA Award No. _____]			15. FEDERAL FUNDS REQUESTED (From Form CSREES-2004) \$111,000	
16. PROJECT DIRECTOR (PD) Maureen Kilkeny		17. PD BUSINESS ADDRESS (INCLUDE DEPARTMENT/ZIP CODE) 181 Heady Hall Ames, IA 50011		
18. A. PD Phone No: 515 294-6259	b. PD Fax No.: 515 294-4545	c. PD E-mail Address: kilkenny@iastate.edu		
19. CO-PD(S) NAME		TELEPHONE NUMBER	E-MAIL ADDRESS	
20. IF THIS IS A RESEARCH PROJECT, WILL IT INVOLVE RECOMBINANT DNA, HUMAN SUBJECTS, OR LIVING VERTEBRATE ANIMALS? <input type="checkbox"/> NO <input checked="" type="checkbox"/> YES (If yes, complete Form CSREES-2008)		21. WILL THIS PROJECT BE SENT OR HAS IT BEEN SENT TO OTHER FUNDING AGENCIES, INCLUDING OTHER USDA AGENCIES? <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES (If yes, list Agency acronym(s) & program(s))		
By signing and submitting this proposal, the applicant is providing the required certification set forth in 7CFR Par 3017, as amended, regarding Debarment and Suspension and Drug-Free Workplace; and 7 CFR Part 3018 regarding Lobbying. Submission of the individual forms is not required. (Please read the Certification included in this booklet before signing this form.) In addition, the applicant certifies that the information contained herein is true and complete to the best of its knowledge and accepts as to any award the obligation to comply with the terms and conditions of the Cooperative State Research, Education and Extension Service in effect at the time of the award.				
SIGNATURE OF PROJECT DIRECTOR(S) (All PDs listed in block 16 or 19 must sign if they are to be included in award documents)			DATE	
SIGNATURE OF AUTHORIZED ORGANIZATIONAL REPRESENTATIVE (Same as Item 3)			DATE	
SIGNATURE (OPTIONAL USE)			DATE	

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

**UNITED STATES DEPARTMENT OF AGRICULTURE
 COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE
 NATIONAL RESEARCH INITIATIVE COMPETITIVE GRANTS PROGRAM
 TABLE OF CONTENTS**

Section	Total # of Pages in Section	Page #
A. Proposal Cover Page (Form CSREES-2002)	1	cover
B. Table of Contents	2	this page
A. Project Summary (Form CSREES-2003)	1	next page
C. Project Description	16	1-15
D. References to Project Description	2	16-17
E. Facilities and Equipment	1	19
F. Collaborative Arrangements Iowa: Flora & Flora.....18 Ohio: Kraybill22 Oklahoma: Rogers.....23 Oregon: Weber.....25	13	20-26
G. Vitae and Publication List(s)	26	33-58
H. Conflict of Interest List(s) (Form CSREES-2007)	16	59-74
I. Results from Prior NRI Support	2	75-76
J. Budget (Form CSREES-2004)	10	
K. Budget Justification	1	
L. Current and Pending Support (Form CSREES-2005)	1	
M. Assurance Statements (Form CSREES-2008)	1	
O. NEPA Form (Form CSREES-2006)	1	
P. Additions to Project Descriptions	5	
Q. Personal Data on Project Director(s) (Form CSREES-2002)	1	
shading indicates that the shaded section is not in this file		

COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

PROPOSAL TYPE

Project Director(s) (PD): Kilkenny, Maureen R.

**For National Research Initiative
Competitive Grants Program
Proposals Only**

PD Kilkenny, Maureen R. Institution Iowa State University

Standard Research Proposal

CO-PD _____ Institution _____

Conference

CO-PD _____ Institution _____

AREA Award

CO-PD _____ Institution _____

Postdoctoral

New Investigator

Strengthening:

Career Enhancement

Equipment

Seed Grant

Standard Strengthening

Project Title: Network Analysis for Communities

**For Higher Education Program
Proposals Only:**

Key Words: social network analysis, social capital, capacity building, keystone sector

Need Area: _____

Discipline: _____

The United States and other countries are actively seeking alternatives to farm subsidies to support rural development, often through local capacity building. However, there has been little cross-section analysis of initial capacity (measured by social capital or network), and no identification of desirable community network structures with respect to economic outcomes. This project will begin to fill these gaps.

It is a collaboration of five teams across four states (IA, OH, OK, OR) and two disciplines, Economics and Sociology. Using a common survey protocol, each of the teams will collect community network data such as purchases/sales/donations/loans/grants between all entities, information flows between groups, tax or transfer payments between businesses and local government, and commitments of political support between institutions; from 12 geographic communities (towns) in their state. Each will apply existing social network analysis techniques and new Keystone Sector Identification techniques to quantify the community network structures, also known as social capital, in each surveyed town.

The social network data will be augmented with the geographic, economic, demographic, and fiscal data needed to test the various hypotheses posed in each subcontract. This will demonstrate feasibility and start to generate an unparalleled cross-section data base which will also be made available to the public via the web. Techniques that have proven useful in single observation or case-study analyses will be developed into techniques based on samples suitable for hypothesis testing and generalization.

Each subcontract will also investigate a unique rural development issue. The questions include: (i) are community network structures different, or (ii) better with respect to economic outcomes, (iii) how comparable are social capital and network measures, (iv) what is the dependence of local policy choices on community network composition, structure, and quality, and (v) do economic outcomes determine or depend on community network characteristics?

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average .50 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Network Analysis for Communities

Overview

Why do some towns thrive but others fail, controlling for differences in history, natural resources, scenic endowments, sectoral economic activity, location, demographics, proximity to market centers, or local fiscal policies? What is it about thriving communities that helps them succeed at attracting and retaining population and/or employment? Can we identify specific economic, institutional, or social relations as sufficient for local economic growth? Are the amounts or qualities of community network relations associated with ability to self-finance development projects or achieve other economic outcomes that require coordination? Is each town unique, or are there attributes in common among successful or among failing towns? These are some of the questions to be addressed in this research project.

Five research teams have come together from four states (Iowa, Ohio, Oklahoma, Oregon) and two disciplines, Economics and Sociology, to collect and analyze community network data to address these questions. A community network, like a social network, is a set of entities within a town and the relations between them (Wasserman and Faust, 1994). Community network data includes, for example, data on purchases or sales between firms; information flows between groups; tax or transfer payments between businesses and local government, donations from individuals to organizations, and commitments of political support between institutions (Kilkenny and Nalbarte, 2000). We propose to develop new community network analysis techniques to support rural development research, extension, and policy analysis.

Our objectives are to develop ways to quantify the roles of various entities in small towns and to use these measures to test (i) are community network structures different, or (ii) better with respect to economic outcomes, (iii) how comparable are social capital and network measures, (iv) what is the dependence of local policy choices on community network composition, structure, and quality, and (v) do economic outcomes determine or depend on community network characteristics?

These objectives extend from describing networks, to developing new methods, to testing for associations between network structures and local economic outcomes. Thus, this project offers both fundamental and mission-linked research. New insights from the research will inform rural community development outreach and engagement programs in the U.S. and internationally.

The project has three notable aspects. One, it will generate an unparalleled unique data base and make it available to the public. Two, it will help U.S. rural development researchers retain a leading role in collaboration with rural development researchers around the world. Three, it promises to develop techniques that have proven useful in one-off, case-study analyses into techniques based on samples suitable for hypothesis testing and generalization.

The cross-section database on community networks will be augmented with data on natural resources, scenic endowments, sectoral economic activity, location, demographics, proximity to market centers, and local fiscal policies. To our knowledge it will be the first cross-section network database of this kind. It will be made publicly available to researchers by linking the arrays in downloadable format to the Keystone ID webpage (<http://www.econ.iastate.edu/faculty/kilkenny/keystoneID.htm>).

Elaborating on the second aspect- this project will help U.S. rural development researchers

advance network analysis methods for community development at a critical time. The United States, Australia, Canada, and Europe are actively seeking alternatives to farm subsidies to support rural development. In Europe, the LEADER I, II and LEADER+ Programs under the EU's Agenda 2000 focus on the development of local institutional and self-help capacity (Bryden, et al, 2001). And, while there is a long tradition of supporting institutions for rural development in the United States, there has been little cross-section analysis of initial capacity (social capital or quality of community networks) or the impacts of projects on such capacity, and no identification of desirable community network structures. This project will fill these gaps and support policies aimed at building local capacity for development.

European and Australian rural development specialists have already initiated projects to apply the community network analysis methods described in the "Keystone ID" web book (e.g., Carvalho, 2001a). They are using the keystone ID protocol to quantify town networks and to inform capacity-building projects. They have also agreed to contribute their data to create an international, multi-community cross-section database (see letters in Addenda). The international collaboration is coordinated by the PD on this proposal through the e-mail net group and web page. This "Network Analyses for Communities" project will significantly enhance the U.S.'s contributions to this international collaboration.

The third notable aspect is the development and application of cross-section methods for network analysis *of* communities. Information about high-quality town networks will be useful *for* communities interested in enhancing their own abilities to coordinate local economic development efforts. Knowledge about how network structures are related to outcomes can inform community development efforts. Evidence that even remote towns with no special endowments are thriving and adapting to new opportunities, maybe because of the special character of their community network, can inspire and encourage rural towns anywhere.

Six deliverables are proposed (see also Figure 1):

1. The first is the set of publicly available, internally consistent data on the networks of 60 towns across the USA. Each of the teams will provide network data on twelve (or more) towns in their states. All survey data will be collected using the same protocol. The data will be augmented with side information on history, natural resources, scenic endowments, sectoral economic activity, location, demographics, proximity to market centers, and local fiscal policies, in forms that guarantee the anonymity of the surveyed towns and entities within those towns. These data will be made available to the public on the Keystone ID website.

Five more deliverables are the rural development research projects to be undertaken by the teams in four states, using the new data in whole or in parts. Briefly and in alphabetical order by state, these are:

2. Iowa (Kilkenny, PD): Using the 60 augmented town network data, pre-test cross-section methods to analyze community networks. Identify keystone sectors and structural holes. Identify methods to test for the association of specific network types (observed at time t) with economic pre-conditions at time t-j and economic outcomes at time t+j. Identify

methods to test whether each network is unique or whether successful/struggling towns have similar network structures.

3. Iowa (Flora and Flora): This component brings sociological methods and analyses to the project (e.g., Flora and Flora, 1993). It will relate network analysis to social capital, and examine the two in relation to economic development. Previous work on social capital and/or network analysis has been carried out in communities in a few Midwest states. The Keystone ID survey data and research will relate the network patterns discerned in the 12 towns surveyed within this component to the data already gathered on various other indicators of social capital.

Communities in the earlier study will be ranked in terms of their levels of both *bridging* and *bonding* social capital (Agnitsch, Flora, and Ryan, 2001). Bonding social capital occurs among individuals or groups who are rather homogeneous in their social characteristics; bridging social capital involves linkages among individuals that are different from one another (Nayaran, 1999). At least two communities from each quadrant of the cross-tabulation of these two variables will be chosen (High-high, low-low, high-low, and low-high). Thus, it will be possible to test if the community network patterns (money, information, and support) differ according to this typology of social capital, and whether economic development efforts also follow a pattern with respect to the typology.

4. Ohio (Kraybill): This project will collect the basic network data and plan an extension of the research on *internal* networks to identify and measure *external inflows* and *external outflows* of money, information, and support. Kraybill will also collaborate on the approaches for testing relationships between network structures and economic outcomes (see Kilkenny project above, and Sorte & Weber project below).

5. Oklahoma (Rogers): Municipal sales tax (MST) records provide a measure of retail sales activity within a jurisdiction over time, and reflect the extent to which communities use available tools to finance local infrastructure. Possible links between community network structure and local tax policy will be investigated. Factors that determine social and economic network formation may also influence local tax policy choices. Communities with different keystone sectors may be more likely to implement different local tax policies. In addition, communities with more integrated social networks may be likely to tax themselves relatively more to provide local public infrastructure. The additional infrastructure may, in turn, increase quality of life and promote economic viability.

6. Oregon (Sorte & Weber): One of the fundamental assumptions in one strand of the social capital literature is that people make investments in social capital because they expect economic payoffs from those investments. The hypothesis to be tested in this component project is that these payoffs (and thus the strength and character of the keystone sectors in various communities) depend on the economic structure of the community (sectoral composition, distribution of income), the level of economic well-being (per capita income, poverty rates), the social and demographic composition of the community (ethnicity, age of population), and the size of the community and proximity to

metropolitan centers. This component will explore the importance of these factors both within Oregon and across the entire cross-sectional dataset.

All components will generate new approaches to analysis. Some of the research will appear in scholarly presentations and academic publications. All the components will generate new insights about the relationships between network structures and economic and policy outcomes, and new ideas about networks for successful communities.

Background and Significance

This project seeks new approaches to sustainable rural development. It continues the search for the sufficient economic and social conditions for local economic growth. If we know the sufficient conditions, efforts focused on achieving those conditions may more efficiently sustain local development.

The previous work on “Keystone Sector Identification” was financed by the Tennessee Valley Authority Rural Studies Program in 1997 and 1998. It culminated in the web book (Kilkenny and Nalbarte, 2000) and an MS degree (Nalbarte). The web book describes how existing social network analysis techniques (Burt (1992), Granovetter (1973), Freeman (1977), Knoke (1990), Emirbeyer (1997), Scott (1991), and Wasserman and Faust (1994)) can be applied to analyze a town. It also introduces new graph theoretic methods for identifying what are called “keystone sectors” in communities. **A 'keystone' sector (where sectors are broadly defined to include social organizations, institutions, government agencies, as well as businesses) is a unique entity without which a community structure would be fundamentally and detrimentally altered.**

That research was called the “Prairie Dog Theory of Rural Development,” because it was inspired by a popular press article arguing that prairie dogs were the “keystone species” of a prairie ecosystem. In an arch, the keystone is the one with the unique wedge shape at the top of the arch that is critical for the arch’s structural stability. While all other stones in an arch substitute for one another and can be removed (in pairs), the arch will fall apart if the keystone is lacking. The term *keystone species* was first coined by ecologists in the late 1960s with respect to the species uniquely responsible for the structure and integrity of an ecosystem. Kilkenny and Nalbarte coined the term “keystone sector” for use in community development analysis, and developed a set of analytical methods to identify it.

The keystone methods help a researcher do three main things: (1) quantify a community's network structure, (2) describe the roles of all types of entities in that community, and (3) identify the critical, or keystone, entities in the community. Given the scope of the keystone survey, it can highlight the importance of *non-business* entities that would not even be considered, much less identified as critical, using the prevailing 'critical sector' or traditional 'industrial targeting' approaches familiar to economists.

The point of departure is the knowledge that sustainable economic development is not achieved merely by chasing industry using funds from outside. Many communities struggle even after successfully attracting or retaining businesses using externally provided subsidy funds (see

Rogers and Tao, 2001). And many communities thrive without relying on external funds for industrial recruiting. Some thriving communities tax themselves to provide incentives to attract businesses (and people follow), as described in Kilkenny (2000). Furthermore, industry mix or levels may not be the limiting factors that distinguish these thriving from failing communities. Some thriving communities offer such good schools and attractive social environments that they attract population (and businesses follow) e.g., Sheilds, Deller, and Stallmann (2001), or Deller, et al (2001).

Attempts to channel more funds to an industry in a community than the community itself is willing or able to raise can even be counterproductive. Industrial targeting may crowd-out otherwise sustainable activity, or, may be an imbalanced use of funds (Jacobs, 1985). If there are no market failures, why should external, non-market intervention be needed to ensure that a valued and profitable business is present in a town? Abstracting from market failures, public support at best does what the market would have done anyway, but at a higher cost. Local, self-financed entrepreneurs find it difficult to compete with government-subsidized activity. The wasting of public funds and the undermining of private sector incentives is known to economists as “crowding out.” *Externally* engineered and financed development may bring dependency rather than sustainability. This project seeks to identify the community structures that support *internally* engineered and financed development.

There will be market failures, however, where transaction costs are too high. Kranton (1996) has argued that non-market reciprocal exchanges substitute for search costs and help lower transaction costs. Transaction costs may be too high in communities where entities are isolated or lack intermediaries. In this case, since industrial targeting does not address the cause of the market failure, even though a spurt of job growth may be induced by an injection of external funds the high transactions costs will choke off further growth. This also highlights the possibility that the “key” to sustainable community economic development may be *non-industrial*, and that its absence leads to the market failures that undermine economic activity and sustainability. This project will not only identify which but also test whether keystones are necessary for desirable economic outcomes.

These and other analyses all suggest the importance of “social capital” in economic sustainability (Flora and Flora, 1993). Economists and political scientists are attempting to measure the relationship between social capital and economic growth (Putnam, et al., 1993; Knack and Keefer, 1997). The economists’ studies look for the dependence of macroeconomic performance (growth in regional or national gross product) on cross-section region-wide indicators of associational activity, trust, and civic cooperation. The hypotheses are that high-trust societies waste fewer resources protecting themselves from malfeasance; have cheaper, more credible and stable governments institutions; have more access to credit; and risk more on innovation—all of which lead to higher rates of national investment and national growth (see also Fukuyama, 1995). This project will test if the keystone methods provide better indicators or measures of the social capital in a community with respect to local growth than, for example, a count of the number of churches or bowling teams per capita.

In their first study, Kilkenny and Nalbarte identified *banks* as a keystone sector with respect to money, information about community affairs, and support. While that finding is consistent with

the hypothesis that well-functioning capital markets are necessary for development, it is premature to conclude that banks are the one and only critical sector in all communities on the basis of just one observation (one community network). Cross-section methods for analyzing multiple community network structures are not, however, well-developed (Faust and Skvoretz, 2000). The emphasis has been on the development of statistical models for predicting individual roles within a network with one or more relations (Fienberg, et al. 1985, Anderson, Wasserman and Crouch, 1999; Wasserman and Pattison, 1996; Pattison and Wasserman, 1999). This project will generate the cross-section database and develop cross-section methods for predicting how outcomes relate to community networks, and vice-versa.

Methods

The synergy --the total is greater than the sum of parts-- of this project arises from linking unique projects to a common protocol (Figure 1). The common survey and analysis protocol unifies all components. The unique research activity by each subproject adds value to the whole.

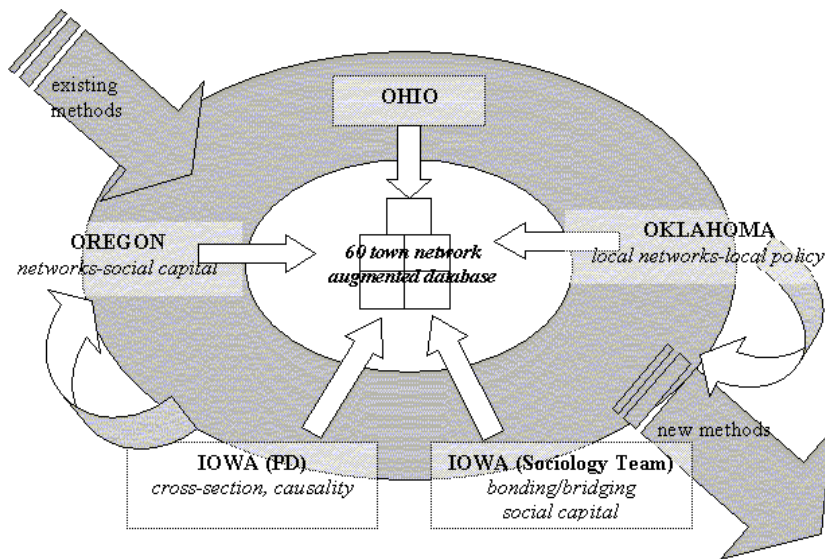


Figure 1. Schematic Overview

Figure 1 illustrates that each subcontract component will provide 1/5 of the 60 cross-section surveys to the cross-section pool of network data. The common background is the Keystone Sector Identification survey protocol and analysis method. All components are informed by existing research and experiences. Each component informs and is informed by the research done in the other components.

Survey Methods

The basic survey protocol is outlined in Kilkenny and Nalbarte (2000); following Lauman (1985) and Galaskiewicz (1979). Each team will survey 12 towns. The sample will be drawn randomly from the set of populated places in each collaborator’s state within 10% of the state’s average place population. For example, the Iowa towns for the pretest ranged in population from

1,900-2,300. Some of the sub-projects will not follow the sampling protocol in order to conduct comparisons with previous methods or to make use of particular side information. All departures from the common sampling protocol are explained in the Addenda on subcontracts.

Business and non-business entities in each town are identified using business directories and the web. From the business directory for the state one obtains firm names, contact persons names, addresses, and size (number of employees) for each business in each town. The number of entities to be surveyed in each community is contained by limiting the businesses surveyed to those with 10 or more employees. Yahoo!.com Yellow Pages provides names, telephone numbers, and mailing addresses of churches, clubs, associations, schools, and public officials. Finally, local persons, such as the county Extension agent, or a local minister, are contacted by telephone to obtain information on civic institutions that may otherwise be overlooked. This need for local word-of-mouth information makes it prohibitively difficult to conduct this kind of survey from far away.

Each entity will be sent, by mail, a survey containing a cover letter, three tables, a response card, and a stamped, pre-addressed return envelope (Appendix). The tables list all the other entities to be surveyed in that town, and pose six survey questions in pairs following Lauman (1985). The first poses the following pair:

- 1) To which organizations on this list would your organization be likely to pass an important **information** concerning community affairs?
- 2) To which organizations on this list does your organization rely upon for **information** regarding community affairs?

The respondent is instructed to mark a check on the list next to the entities to whom they *give* information, and in the second column, from whom they *received* information. Note that the question specifies the type of information shared: information about community affairs. This is by design. We wish to highlight information flows about non-rival, non-excludable, and possibly non-market opportunities or threats. Note also that the response is dichotomous: yes or no. The assumption is that respondents will tend to list the entities they usually or most frequently share information of a public-good nature. The dichotomous response may obscure variations in intensity, but it also reduces error variance due to interpersonal non-comparability of rankings or scales (what is “a lot” to one respondent may be “a little” to another). We also expect some bias due to recent recall. These are also reasons why sampling a large number of networks is warranted.

The second table in the survey poses the following pair of questions:

- 3) To which organizations on this list does your organization give **funds** as payments for services rendered or goods received, loans, or donations?
- 4) From which organizations on this list does your organization get **funds** as payments for services rendered or goods received, deposits, or donations?

Again, the respondent was instructed to mark a check on the list next to the entities to whom they *give* funds, and in the second column, from whom they *received* funds. Again, the response is dichotomous.

The third table in the survey asks:

- 5) Which organizations on this list does your organization feel a special duty to stand

behind in time of trouble: that is, to which organization would give **support**?
6) Which organizations on this list would be likely to come to your organization's **support** in time of trouble?

The pretest response rate was 74% within two weeks. Telephone follow-up netted responses from all other non-respondents who answered the first call and were in fact still resident in the community. A small number of non-responses can be ignored without diminishing the dimensionality of the town network. This follows from how dyadic relational data are recorded.

The relational data is recorded using EXCEL in dichotomous directional arrays (defined below). If either actor in the dyad reports the existence of an arc, the arc is recorded in the summary array for that relation. Non-respondent nodes are thus retained, but due to lack of measurement, the number of arcs in the network may be underestimated for some agents. This is another possible source of measurement error and a rationale for replicating network surveys before drawing conclusions.

Network Analysis Methods

Social network analysis methods quantify the interdependencies within and among private and public sector community entities; quantify the relative importance of entity types. The keystone methods determine the sensitivity of the network structure of the community to the loss of particular entity types.

A community network is a finite set of *entities* and the *relations* between them (Kilkenny and Nalbarte, 2000; after Wasserman and Faust, 1994). In the basic keystone protocol, membership in the set is limited to entities that are physically located within the community jurisdiction, such as residents and businesses in the town. Relational data always pertain to two entities, called *dyads*.

There are two types of relations i) *directional or non-directional*, and ii) *dichotomous or valued* (Berge, 1962; Wasserman and Faust, 1994). A directional relation has an explicit origin and destination. Directional relations are called *arcs*, and are represented by a line with an arrowhead. A dichotomous relation is recorded as either the presence or absence of a tie between two entities in the set as either (0,1). An example of a directional dichotomous relation is public safety agency A's provision of services to taxpayer B. Since a public good is by definition non-rival, provision or not, and use or not, are the relevant measures.

Relational data can be presented in matrices and illustrated by graphs. A *sociomatrix* for Keystone Sector Analysis includes a row and a column for each entity in the network (i.e., they are square, which is not required of a generic sociomatrix). An arc (flow of INFO, MONEY, or SUPPORT) from source A to sink B (that is not reciprocated) is recorded as 1 in cell (A,B), and a 0 in cell (B,A). (Note also that the 'from row, to column' convention of graph theory is the opposite of Social Accounting Matrix (SAM) convention). The graph of sociomatrix data has a *node* for each entity. The directional data for keystone analyses are presented in what is called a *digraph*, with arcs having arrowheads at the sinks to indicate the direction of flow, Berge (1962); Robinson and Foulds (1980).

Let a_{ij} denote the existence of a relation (arc) from agent i to agent j . Agents i and j are *adjacent* if there exist either of the two arcs, a_{ij} or a_{ji} . The number of arcs beginning at a node is called the *outdegree* of the node, measured as the row sum for the node in a dichotomous sociomatrix (outdegree of actor $i = \sum_j a_{ij}$). The number of arcs ending at a node is called the *indegree* of the node, measure by the column sum (indegree of actor $j = \sum_i a_{ij}$). These measures are made comparable across communities of different sizes (different numbers of entities in the networks) by normalizing (dividing by the total number of non-reflexive arcs or ties.) A *path* is a sequence of arcs where each node and arc are distinct (Scott, 1991). Agents in a network that are all *connected* to each other by one path can be classified as a subset of the network, called a *component* (or a *sub-graph*).

These and other basic concepts operationalized in Kilkenny and Nalbarte (2000) are needed to apply graph theory and network analyses to quantify and compare community networks and keystone sectors (see also Scott, 1991, or Wasserman and Faust, 1994). With them we quantify (1) the quality of the community network overall; (2) the relative roles of various entities; and (3) aggregated (blocked) community network structure. Existing software called UCINET (Borgatti, Everett and Freeman, 1999) is available to conduct those analyses. Then we conduct the keystone excision tests (Kilkenny and Nalbarte, 2000) using the EXCEL spreadsheet program developed and provided by Kilkenny to identify each community's keystone(s).

The *density* measure describes general level of linkage among the entities in the community. It is the proportion of observed to total possible relations, in percent terms. If density is 100% every entity is reciprocally related to every other entity. A lower percent density indicates how far from *completion* the community network is. Formally, *density* of a digraph (d) is the actual number of non-reflexive arcs ($a = \sum_i \sum_j a_{ij}$) in proportion to the maximum possible number of non-reflexive arcs:

$$d = \frac{a}{N(N-1)}$$

For example, the density measures for the eighteen Iowa community sociomatrices collected in the pretest are shown in Table 1. Average density measures across the six communities are 19%, 27% and 26% for MONEY, INFORMATION, and SUPPORT, respectively. INFORMATION and SUPPORT linkages are more *dense*, and thus more *complete*.

Note also that while six is too small a cross-section, there is some evidence that density measures within communities are correlated or complementary across relations. Town B is relatively dense with respect to all three relations compared to the other towns in the sample. Does this imply that Town B's network is superior or better supports economic development? This is testable. With a large enough sample and economic data on each town at time $t+j$, we could empirically test for the dependence of economic success on community network densities (at time t) using these three quantitative measures (continuous variables) in a regression. The temporal priority of the network data would allow us to assume that network structures precede economic outcomes.

Table 1.	Density					
	MONEY		INFORMATION		SUPPORT	
	town	%	SD	%	SD	%
A	17%	0.38	16%	0.37	21%	0.41
B	30%	0.46	40%	0.49	48%	0.5
C	18%	0.38	26%	0.44	26%	0.36
D	17%	0.37	25%	0.43	25%	0.43
E	19%	0.39	42%	0.42	22%	0.42
F	14%	0.35	13%	0.34	16%	0.36
average	19%		27%		26%	

Which entities are distinguished either because they receive a lot from other entities, or, because they give a lot to other entities? *Prominent* entities are those that are

frequently involved in relationships with other entities.

Overall, the proportion of entities (by type) in the pretest sample who are locally prominent is presented in Table 2. This summary evidence suggests that **newspapers, associations, and/or schools** are prominent in every town. But **industry** is prominent in only two towns (A,C). A **bank** is a prominent source of MONEY in Town D, and another bank is a prominent source and sink of INFORMATION in Town B. A newspaper is prominent for MONEY and SUPPORT in Towns A, B, and C. The pretest data suggest that town networks vary significantly. We want to know if this variation is systematic, that is, if it is associated with the local economy.

Table 2. locally prominent types		proportion of type with prominence > mean+1sd					
		MONEY		INFO		SUPPORT	
		give	receive	give	receive	give	receive
1	associations	22%	22%	33%	22%	22%	22%
2	banks	14%	0%	14%	7%	7%	0%
3	churches	13%	8%	8%	5%	15%	5%
4	industries	22%	10%	7%	12%	12%	15%
5	media	29%	43%	14%	14%	29%	29%
6	public	16%	17%	12%	16%	20%	16%
7	retail	13%	13%	16%	13%	13%	13%
8	schools	17%	33%	22%	44%	33%	11%
9	service	3%	8%	8%	10%	8%	3%

To identify which types of entities play significant roles as intermediaries, we measure *global centrality* (Freeman). When an entity has a position of strategic significance in the overall network, that entity is considered globally central. The ubiquity of an entity's ties make them global, and the shortness of the paths make them central. Globally central entities are detected using both *closeness* and *betweenness* measures. Closeness refers to how often an entity is in a shortest path. Betweenness refers to how often it functions as an intermediary (reducing transaction costs?). Both measures rely on a measure of distance called a *geodesic*, the length of the shortest path between two nodes. Wasserman and Faust (1994) define it as follows:

Betweenness ($C_b(n_i)$) measures the probability that the most efficient path from actor j to actor k is through agent i . Assuming each one-step tie has equal weight and that

interactions occur through the shortest routes. Then, $c_b = \sum_j^g \frac{g_{jk}(n_i)}{g_{jk}}$ where $1/g_{jk}$ is the probability that a particular geodesic (path) is chosen, g_{jk} is the number of geodesics linking actors j and k, and $g_{jk}(n_i)$ is the number of geodesics that go through entity i.

Again, the raw measures vary with the size of the network. We standardize before comparisons are made between the different size town networks. For betweenness measures, the standardization factor is $(N-1)(N-2)$, where N is the number of agents in the town network.

Table 3 summarizes the relative pretest frequency that each type of sector plays a significant

Table 3.	Betweenness		
	% significantly more between		
type	Money	Info	Support
associations	0%	22%	11%
banks	7%	7%	7%
churches	15%	8%	15%
industries	7%	5%	5%
media	29%	0%	43%
public	24%	17%	18%
retail	10%	10%	10%
school	22%	28%	22%
service	8%	5%	3%

articulating role. With respect to MONEY, note that banks are less often significant intermediaries compared to the media, public sector, and schools. (Industry is generally not a significant intermediary for money, either.) Schools, associations, and public agencies are significant intermediaries with respect to INFORMATION (“about community affairs”). It is noteworthy that media are less often noteworthy intermediaries for information than clubs or schools. But media are often intermediaries with respect to SUPPORT, as

are churches. Overall, note that private sector businesses and banks, while they do occasionally function as significant intermediaries in some communities, are less important compared to churches and clubs, media, and the public sector.

A *blockmodel* is created from an elemental sociomatrix in two steps. First, the entities are partitioned into discrete subsets. This step is called "blocking" (see Freeman, 1992). Second, 0/1 ties are assigned between each pair of subsets. We will apply the tie assignment methods introduced by Kilkenny and Nalbarte (2000):

Sinks Substitute Criterion: the arc (\mathbf{b}_{AB}) between two blocks (A,B) for a given relation is 1 if there is an arc (t_{ij}) from every actor in the row block to at least one actor in the column block, otherwise the block tie is 0:

$$\mathbf{b}_{AB} = 1 \text{ if for all } i \in A \exists j \in B \text{ s.t. } t_{ij} = 1; \text{ else } \mathbf{b}_{AB} = 0$$

Sources Substitute Criterion: the arc (\mathbf{b}_{AB}) between two blocks (A,B) for a given relation is 1 if there is an arc (t_{ij}) to every actor in the column block from at least one actor in the row block, otherwise the block tie is 0:

$$\mathbf{b}_{AB} = 1 \text{ if for all } j \in B \exists i \in A \text{ s.t. } t_{ij} = 1; \text{ else } \mathbf{b}_{AB} = 0$$

The **keystone sector** is the one that plays a unique role and without which the community is fundamentally and detrimentally altered. We will apply at least one of the tests described in

Kilkenny and Nalbarte (2000) after identifying the roles of individual entities, grouping entities by type, and assigning ties in the resulting block models.

The “Fracture Test” is non-directional: if the excision of a sector fractures the connectivity of the network or breaks up the component structure, that sector is a keystone. The fracture test is easy to apply graphically. But it focuses on one-step ties rather than complete paths and directional relations (arcs). In more complex networks, an analytical alternative to the simple fracture test, which we call the Efficient Path test may be more appropriate.

The “Efficient Path” test measures the effect of the excision of a sector on the lengths of the shortest paths between the remaining sectors. If the excision of a sector makes those geodesics longer or (equivalently) reduces the closeness of the remaining entities, the excised sector is a keystone. Our efficient path test is designed to highlight a sector's contribution to efficiency. It documents any reduction of efficiency in a network following the excision of a sector.

The first step in the test is to document the shortest paths (geodesics) between sectors in the intact network. These are the closeness measures, but take care to normalize so that comparisons can be made later, because excision will change the size of the network. Then, excise a sector and re-compute normalized closeness for the remaining sectors and the average for the network. If the excision increases any of the other shortest paths, the average closeness will fall. This suggests that the excised sector had an efficiency-enhancing role, and is a candidate for keystone sector. Again, there may be more than one keystone sector according to this criteria.

Traditional statistical/econometric methods will be investigated for use in testing for the dependence of economic outcomes on community network structure and types of keystone sectors. The units of observation are towns. The dependent variable(s) may include employment, %occupancy, income/capita, land values, or other useful indicators, in levels or rates of change form. The usual explanatory variables include prior level or mix of employment, endowments (particularly human capital), natural resources, proximity to market centers, demographics, local fiscal policies, etc. Explanatory variables will enter contemporaneously if exogenous, lagged if simultaneously determined. With the results of this project, we can expand the set of explanatory variables to include community network variables. We will identify tests for the significance of (lagged) network variables such as density, network centrality, dummies for keystones in models of economic outcomes. The reverse temporal priority can also be taken advantage of to test for the dependence of network structure on prior economic conditions.

Additional testable hypotheses are outlined in the attached subcontract proposals. Table 4 summarizes the contributions of each subcontract to the database, research, and outreach goals:

Table 4.	60 town data	X-section network variation	network measures of social capital	policy choices depend on network?	economic outcomes depend on network?	new techniques
Iowa (Kilkenny)	√	√	√		√	√
Iowa (Flora and Flora)	√		√			√
Oklahoma (Rogers)	√	√		√	√	√
Ohio (Kraybill)	√	√	√		√	√
Oregon (Weber&Sorte)	√	√	√		√	√

Limitations

The quality of the network data is limited by how inclusive or comprehensive is the list of town entities to be surveyed. Civic organizations, clubs, voluntary associations, and other organically local institutions are hard for outsiders to find. Yet, those are likely to be important keystone entities in their communities. For this reason in-state collaborators are preferred for conducting the surveys, even though the surveys are conducted by mail. We concluded that we needed a team of collaborators across the country for this project. But it is always more difficult to coordinate collaborative projects than to deliver a self-contained one. We hope that our subcontract approach reduces the coordination burden, since each subcontractor is explicitly responsible for the deliverables they propose. That decentralizes responsibility to the subcontractors.

On the other hand, the common survey and analytical protocol across all subcontracts unifies the project and ensures the comparability of the town network data in the ultimate cross-section database.

Case studies, such as analyses of one or two town networks, are not welcome/difficult to publish in high-quality economics journals. If this project was to collect and analyze a small number of town networks, this would be a limitation. Indeed, the “keystone species” concept has not yet attained respectability among ecologists largely because the studies are biased samples (focusing on the author’s favorite species) and observations of single ecosystem networks (not samples of many ecosystems). Our project starts to overcome that limitation by initiating the collection of a cross-section database. That cross-section methods are not yet well-developed may also appear to some like a limitation. To us, it looks like an opportunity. Furthermore, we will make our data available to others via the website download links, so that those limitations are relaxed for other researchers too.

There are, however, still some potential sample selection bias and sample stratification issues. In most of the subcontract surveys, the units of observation (towns) will be randomly selected from among towns of average size population. In three subcontracts, however, towns will not be randomly selected. This raises the issues of sample selection bias, and we must be careful about drawing generalizations. One of the subcontracts (Oregon) plans to survey towns of different

sizes. This highlights the possibility that networks vary systematically across population size strata. However, given the lack of precedents, no one knows ultimately what all the stratification issues are. Again, while some may see this lack as a limitation, we see it as one of the motivations for conducting this project.

Some of the subcontractors are concerned about the limitations of Boolean (0/1) or dichotomous data about network ties as opposed to valued data. There are well-developed techniques for analyzing valued data, (e.g., Input-Output analysis is a perfect example; see also Robins, Pattison, and Wasserman (1999)) so there are no limitations in that case. Other subcontractors believe that dichotomous relations are the most appropriate ways to non-rival, non-excludable flows. An example of a directional dichotomous relation in a non-rival and non-excludable flow is public safety agency A's provision of services to taxpayer B. In this case, provision or not, and use or not, are the relevant measures, i.e. (1,0). Again, all subcontractors find dealing with dichotomous or valued relations as an opportunity or challenge rather than as a limitation.

Schedule

YEAR 1	conduct town surveys	apply network analysis	test hypotheses	document research	submit written research	report progress to NRI	augment data and put on web
Oct-Nov-Dec '02	√	√	√	√			
Jan-Feb-Mar '03	√	√	√	√		√	
Apr-May-Jun '03	√	√	√	√			
Jul-Aug-Sept 03	√	√	√	√	√	√	√
YEAR 2							
Oct-Nov-Dec '03		√	√				
Jan-Feb-Mar '04		√	√		√	√	
Apr-May-Jun '04			√		√		
Jul-Aug-Sep '04		√	√	√	√	√	√

The table above summarizes the planned timing of each activity across subcontractor teams by quarter. Specific subcontracts will vary. In general, town network surveys are to be conducted within the first year. Subcontractors will enter the survey data and analyze it throughout the project, especially as data will be shared among subcontractors.

The second year will be devoted to developing the cross-section methods to be pre-tested. The documentation of procedures and outcomes will occur throughout the period under all subcontracts.

Opportunities to present research at scholarly meetings occur every quarter. For example, Southern Regional Science Association meetings are typically held in either February or April. American Agricultural Economics Association meetings are held in August. Rural sociologists have summer meetings also. In fall there are the North American Regional Science meetings.

The first international symposium on Keystone Sectors is planned for late spring 2003 in Portugal (see Addenda from Carvalho).

Semi-annually we expect to submit progress reports to the NRI Rural Development program officer. The last step is to augment each town network data with the economic, geographic, and demographic information (taking care that the town's identity is not revealed), and to post the augmented data on the web for public access.

D. References to Project Description

- Agnitsch, Kerry, Jan L Flora, and Vern Ryan (2001) "Bridging and Bonding Social Capital and Community Action," presented at *Society for Community Research and Action*, Atlanta, GA, June 7-10.
- Anderson, C., S. Wasserman, and B. Crouch (1999) "A p* primer: Logit models for social networks," *Social Networks* 21:37-66.
- Borgatti, Steve; Martin Everett, and Lin Freeman (1996) *UCINET IV Version 1.64 AnalyticTechnologies*, Harvard, MA; <http://www.analytictech.com/>
- Berge, C. (1962) "The Theory of Graphs and Its Applications." New York: Wiley.
- Bryden, John. et al (2001) "The Dynamics of Rural Areas" Arkleton Centre for Rural Development Research, Aberdeen, Scotland.
- Burt, Ronald S. 1992. Structural Holes: The Social Structure of Competition. Cambridge, MA: Harvard University Press.
- Carvalho, Pedro (2001a) "Keystone Sector Methodology Applied to Portugal: A New Approach to Rural Development Strategy," REAL Discussion Papers 01-T-4, Regional Economics Application Laboratory, Urbana-Champaign, IL.
- _____ (2001b) "Enhancing Transaction Cost Economics, The Social Network Analysis Advantage, Social Capital as a Production Factor" doctoral dissertation, University of Beira, Portugal (forthcoming).
- Deller, Steve, Tsai, ST-H., Marcouiller, D., and English, D.B.K. (2001). "The Role of Amenities and Quality of Life in Rural Economic Growth." American Journal of Agricultural Economics. 83(2):352-365.
- Emirbayer, Mustafa. 1997. "Manifesto for a Relational Sociology." American Journal of Sociology. 103(2):281-317.
- Faust, Katherine and John Skvoretz (2000) "Comparing Networks across Time, Space, and Species," unpublished manuscript, University of South Carolina; November.
- Fienberg, S.E. Meyer, M.M. and Wasserman, S. (1985) "Statistical Analysis of multiple sociometric relations," Journal of American Statistician Association, 80(389): 51-67.
- Flora, Cornelia B. and Jan L. Flora. (1993). "Entrepreneurial Social Infrastructure: A Necessary Ingredient." *The Annals of the American Academy of Political and Social Science* 529:48-58.
- Freeman, L. (1977) "A set of Measures of Centrality Based on Betweenness," Sociometry, (1): 35-41.
- _____ (1992) "The Sociological Concept of a 'Group': An Empirical Test of Two Models," American Journal of Sociology 98:152-166.
- Fukuyama, F. (1995) Trust :The Social Virtues and the Creation of Prosperity, New York: The Free Press.
- Galaskiewicz, Joseph. 1979. Exchange Networks and Community Politics. Beverly Hills, CA: Sage.
- Granovetter, M. (1973) "The Strength of Weak Ties," The American Journal of Sociology, 78(6): 1360-1380.
- Jacobs, Jane (1985) Cities and the Wealth of Nations.
- Kauffman, S.A. (1988) "The evolution of economics webs," in P.W.Anderson, K.J. Arrow and D.Pines (eds). The Economy as a Complex Evolving System. New York:Addison-Wesley: 125-146.

- Kilkenny, Maureen (2000) "Private Co-operation for the Public Good" Chapter 26:207-213 in Small Town and Rural Economic Development, P. Schaeffer and S. Loveridge, editors; Westport, Conn., *Praeger Press*.
- Kilkenny, M., and Laura Nalbarte (2000) Keystone Sector Identification: A Graph Theory-Social Network Analysis Approach, *Web Book of Regional Science*, <http://www.rri.wvu.edu/WebBook/kilkenny/editedKeystone.htm>, West Virginia: Regional Research Institute.
- Knack, S. and Keefer, P. (1997) "Does Social Capital have economic payoff? A cross-country investigation," The Quarterly Journal of Economics, 112(4): 1251-1288.
- Knoke, David. 1990. Political Networks: The Structural Perspective. Cambridge: Cambridge University Press.
- Kranton, R. (1996) "Reciprocal Exchange: A self-sustaining System," The American Economic Review, 86(4): 830-51.
- Lauman, E.O. (1985) "Interorganizational Resource Links in Towertown, U.S.A.," from A collection of problem from many Fields for the Student and Research Worker by Andrews and Herzber, New York: Springer-Verlag.
- Narayan, Deepa. 1999. Bonds and Bridges—Social Capital and Poverty. Poverty Research Working Paper No. 2167. World Bank, Washington, D.C. (<http://www.worldbank.org/poverty/scapital/library/narayan.pdf>)
- Pattison, P. and S. Wasserman (1999) "Logit Models and Logistic Regression for Social Networks: II. Multivariate relations," British Journal of Mathematical and Statistical Psychology 52:169-193.
- Putnam, R. (with R. Leonardi and R.Nanetti) (1993) Marketing Democracy Work. Princeton University Press.
- Robins, Garry, P. Pattison, and S. Wasserman (1999) "Logit Models and Logistic Regression for Social Networks: III. Valued relations," Psychometrika 64:371-394.
- Robinson, D. F. and Foulds, L.R. (1980) Digraphs: Theory and Techniques. Gordon and Breach
- Rogers, Cynthia and Jill Tao (2001) "Targeted Economic Development Programs in Florida: A Quasi-Experimental Analysis" Tennessee Valley Authority Rural Studies Program, Contractor Paper 01-06, <http://www.rural.org/publications/reports.html>.
- Scott, J., (1991), "Social Network Analysis," London: SAGE Publications Ltd.
- Shields, Martin, Steven C. Deller, and Judith I. Stallmann. (2001) "Comparing the Impacts of Retiree versus Working-Age Families on a Small Rural Region: An Application of the Wisconsin Economic Impact Modeling System. Agricultural and Resource Economics Review. 30(1):20-31.
- Wasserman, S. and Faust, K. (1994) Social Network Analysis, Cambridge University Press.
- _____ and P. Pattison, (1996) "Logit Models and Logistic Regression for Social Networks: I. An Introduction to Markov Graphs and p*" Psychometrika 61:401-425.

An Analysis of Small Communities in Iowa

A Research Proposal

Jan L. Flora
Professor of Sociology
Iowa State University
317D East Hall
Ames, Iowa 50011-1070
Phone: (515) 294-4295
E-mail: floraj@iastate.edu

Cornelia B. Flora
Professor of Sociology
And
Director, North Central Regional Center for Rural Development
Iowa State University
108 Curtiss Hall
Ames, Iowa 50011-1050
Phone: (515) 294-1329
E-mail: cflora@iastate.edu

Conceptual Background

In examining several centuries of regional and community history of the Italian peninsula, Robert Putnam (1993a) draws this striking conclusion regarding much of northern and central--in contrast to southern--Italy:

These communities did not become civic simply because they were rich. The historical record strongly suggests precisely the opposite: They have become rich because they were civic. The social capital embodied in norms and networks of civic engagement seems to be a precondition for economic development, as well as for effective government. Development economists take note: Civics matters (Putnam 1993b: 37).

This *embeddedness* perspective differs from the rational choice view that social capital is principally a resource to be used by individuals for their own self-interested ends. (See Olson, 1965, for a classic statement of rational choice applied to public goods.) In contrast, embeddedness suggests that actors are constrained by a pattern of relationships of which they are only a part. Each actor possesses a degree of freedom of action, or agency, but that agency is shaped or nudged in certain directions by being “embedded” in existing networks of social relations and commonly held beliefs.

In this sub-project, we propose to link network analysis to social capital, and to examine the two in relation to economic development. Burt (1992), Knoke (1990), Emirbayer and Goodwin,

(1994), Emirbayer (1997), Wasserman and Faust (1994); and Scott (1991) suggest a variety of applications of network analysis at the community level. Whether called structural analysis (Berkowitz, 1982; Wellman, 1988; Knoke, 1990), network analysis (Emirbayer and Goodwin, 1994; Scott, 1991; Wellman, 1983; Galaskiewicz, 1979), strong and weak ties (Grannovetter, 1973), or structural holes (Burt, 1992) the approach involves identifying and assessing relationships among elements of a social system. Further, there is evidence in the sociological literature that community social capital and network patterns affect economic development (Agnitsch, et al., 2001; Flora, 1998; Flora, et al., 1997; Flora and Flora, 1993; Sharp, 2001).

Project Description:

The first objective of the research is to expand the pool of case study communities with keystone sector analysis. At least 12 small, rural communities, mostly in Iowa and the Midwest, will be examined using the survey instruments developed in Kilkenny and Nalbarte (2000).¹ The research will also relate the network patterns discerned to data already gathered on various other indicators of social capital.² For this reason, 8-10 of the cases will be in Iowa. The remainder (one each) will be chosen from among the following states: Nebraska, Missouri, Kansas, New Mexico, and North Carolina. Previous work on social capital and/or network analysis has been carried out in one community in each of those states. The communities to be chosen will be below 5,000 in population and most will be in the 2000-2500 range.

Communities in the earlier study will be ranked in terms of their levels of both bridging and bonding social capital. At least two communities from each quadrant of the cross-tabulation of these two variables will be chosen (High-high, low-low, high-low, and low-high). Bonding social capital occurs among individuals (or organizations composed of individuals) who are rather homogeneous in their social characteristics; bridging social capital involves linkages among individuals that are different from one another (See Nayaran, 1999, for a description of these two kinds of social capital). Thus, it will be possible to test if the community network patterns (MONEY, INFORMATION, and SUPPORT) differ according to this typology of social capital, and whether economic development efforts also follow a discernible pattern with respect to the typology.

The work in Kansas was carried out in the early 1970s (see Sharp, Flora, and Killacky, 2000). That community, a large non-metro city, offers the opportunity to carry out longitudinal network analysis focused on the changing role of banks in forming business networks, and the relation of those networks to civil society organizational networks. The initial study showed banks to be at the center of multiple business networks. Business leaders and employees from the core firms in those cliques were over-represented in the leadership of the most densely interlocked civil society clique in the community. With bank deregulation and the incorporation of local banks into regional bank holding companies, the central role of banks in local affairs may have diminished substantially.

² A considerable amount of social capital data have been gathered on 99 communities in Iowa (See Ryan, et al., 1995a, 1995b), including a survey of residents, egocentric network data (sample of residents in 30 of the 99 communities), and key informant data on community action and community-level social capital indicators.

References

- Agnitsch, Kerry, Jan L. Flora, and Vern Ryan. 2001. "Bridging and Bonding Social Capital and Community Action," paper presented at the Society for Community Research and Action, Atlanta, GA, June 7-10, 2001.
- Berkowitz, S. D. 1982. *An Introduction to Structural Analysis: The Network Approach to Social Research*. Toronto: Butterworth & Co.
- Burt, Ronald S. 1992. *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.
- Emirbayer, Mustafa. 1997. "Manifesto for a Relational Sociology." *American Journal of Sociology*. 103(2):281-317.
- Emirbayer, Mustafa and Jeff Goodwin. 1994. "Network Analysis, Culture, and the Problem of Agency." *American Journal of Sociology*. 99(6):1411-54.
- Flora, Cornelia B. and Jan L. Flora. 1993. "Entrepreneurial Social Infrastructure: A Necessary Ingredient." *The Annals of the American Academy of Political and Social Science* 529:48-58.
- Flora, Jan L. 1998. "Social Capital and Communities of Place," *Rural Sociology* 63, 4 (December): 481-506.
- Flora, Jan L., Jeff Sharp, Cornelia Flora, and Bonnie Newlon. 1997. "Entrepreneurial Social Infrastructure and Locally-Initiated Economic Development in Nonmetropolitan U.S." *Sociological Quarterly* 38(4):623-645.
- Galaskiewicz, Joseph. 1979. *Exchange Networks and Community Politics*. Beverly Hills, CA: Sage.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*. 78(6):1360-80.
- Kilkenny, Maureen, and Laura Nalbarte. 2000. "Keystone Sector Identification: A Graph Theory-Social Network Analysis Approach" in *The Web Book of Regional Science* (Regional Research Institute, West Virginia University: Morgantown, WV). Available online at <http://www.rri.wvu.edu/WebBook/>.
- Knoke, David. 1990. *Political Networks: The Structural Perspective*. Cambridge: Cambridge University Press.
- Narayan, Deepa. 1999. Bonds and Bridges—Social Capital and Poverty. *Poverty Research Working Paper No. 2167*. World Bank, Washington, D.C. (<http://www.worldbank.org/poverty/scapital/library/narayan.pdf>)
- Olson, Mancur. 1965. *The Logic of Collective Action*. Cambridge, MA: Harvard University Press.
- Putnam, Robert D. 1993a. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.
- . 1993b. "The Prosperous Community: Social Capital and Public Life." *The American Prospect*. 13:35-42.
- Ryan, Vernon D., Andy L. Terry, and Terry L. Besser. 1995. "Rural communities, structural capacity, and the importance of social capital". Paper presented at the Rural Sociological Society Meetings, Washington, D.C., August 17-20.

- Ryan, Vernon, Terry Besser, Paul Lasley, and Jan Flora. 1995 "Comparing (Community Name) with Sigma: Iowa's Typical Community." RDI-01 to RDI-99, College of Agriculture, Iowa State University (99 separate community reports in this series), 20pp.
- Scott, John. 1991. Social Network Analysis: A Handbook. London: Sage Publications.
- Sharp, Jeff .S. 2001. "Locating the Community Field: A Study of Interorganizational Network Structure and Capacity for Community Action." *Rural Sociology*, 65(3): 403-424.
- Sharp Jeff S. and Jan L. Flora. 1999. "Entrepreneurial Social Infrastructure and Growth Machine Characteristics Associated with Industrial-Recruitment and Self-Development Strategies in Nonmetropolitan Communities," *Journal of the Community Development Society* 30, 2:131-153.
- Sharp, Jeff S., Jan L. Flora, and C. James Killacky. 2000. "The Growth Machine and Voluntary Sector: Analysis of Business Elite Involvement in Civic Organizations of a Nonmetropolitan City," unpublished paper, June.
- Wasserman, Stanley and Katherine Faust. 1994. Social Network Analysis: Methods and Applications. Cambridge: Cambridge University Press.
- Wellman, Barry. 1988. "Structural analysis: From method and metaphor to theory and substance." in Social Structures: A network Approach, edited by Barry Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- . 1983. "Network Analysis: Some Basic Principles." in Sociological Theory edited by Randall Collins. San Francisco: Jossey-Bass Publishers.

The Ohio Project

Dave Kraybill

The purpose of this project is to conduct keystone surveys and analyses in 12 Ohio communities. The procedures to be followed are outlined in Kilkenny and Nalbarte. Network analysis will be utilized to identify actors (individuals and organizations) in the community who occupy central positions within the community as well as central positions creating links between the community and outside resources.

Surveys of local business, development and leading social organizations within the community will elicit information about the sharing of information, money, and support between organizations. Informants will be asked to identify from a roster of community organizations all those organizations that have either provided or have been provided resources by the informant's organization in the last year.

The network data regarding the flow of money, information and support among local organizations and extra-local organizations will be analyzed using the UCINET software and spreadsheet algorithms written by Kilkenny. Affiliation matrices for money, information, and support will be analyzed to determine those organizations occupying central positions (betweenness) within the community as well as between the community network and extra-local actors. Following this organizational analysis, the network data from the individuals identified by reputation for having extra-local linkages will be integrated into the analysis to determine the role of individuals in facilitating the flow of resources within the organizational structure.

Individuals who are identified as central in facilitating the flow of resources from outside into the community will be subsequently interviewed to determine the nature of these relationships (professional status, formal or informal, strategic or general). The final analysis should help to identify the extent to which organizational and individual linkages facilitate or impede the flow of information within the community and between the community and the outside.

Keystone Sectors and Local Tax Options: An Analysis of Small Communities in Oklahoma

A Research Proposal

Cynthia L. Rogers
Assistant Professor of Economics
University of Oklahoma
729 Elm Ave, Room 329
Norman, OK 73019
Phone: (405) 325-5843
E-mail: crogers@ou.edu

Project Description:

Despite the surge in the U.S. economy in the late 1990's, policy makers have been concerned about the continued weakness in rural economies. While there is a general understanding of the characteristics associated with rural economic losers—e.g., rural remoteness, dependence on natural resource industries, and reliance on retail trade as an economic base—less is understood about the efficacy of programs developed to address rural economic weaknesses.³ As noted by Drabenstott and Sheaff (2001, page 1), states are taking the lead in formulating initiatives and creating a “new laboratory of rural policy innovation.”⁴ The effectiveness of rural programs, particularly those pertaining to small communities, has not been thoroughly investigated, however.

Lack of community level data creates a major obstacle for conducting rural policy analysis. Consequently, survey-based research is especially valuable in this arena. In particular, the research on keystone sector analysis attempts to provide a better understanding of community networks for rural communities. As with all survey research, however, it takes considerable resources to accumulate sufficient cross-sectional observations for identifying common network structures, as well as connections between types and economic development prospects.

As an alternative to survey based data, Rogers (2001) highlights the potential for using municipal sales tax (MST) records as a very practical source of data for rural communities.⁵ If a MST is in place, a tax is applied to all qualified sales (sales subject to sales tax) occurring within a local jurisdiction. The municipality's retail sales tax base is computed by dividing tax collections by the tax rate. Consequently, the MST records provide a measure of retail sales

³ Drabenstott and Smith (1996) highlight these factors in an investigation of rural winners and losers in the American Heartland. Drabenstott, Mark, and Tim R. Smith. (1996). “The Changing Economy of the Rural Heartland,” *Economic Forces Shaping the Rural Heartland*. Conference Proceedings: Center for the Study of Rural America, Federal Reserve Bank of Kansas City. Downloaded from <http://www.kc.frb.org/RuralCenter/mainstreet/MainStMain.htm> 10/11/01.

⁴ Drabenstott, Mark, and Katharine Sheaff. (March 2001) “Looking to the States for New Rural Policies,” *The Main Street Economist: Commentary on the rural economy*. Center for the Study of Rural America, Federal Reserve Bank of Kansas City, pages 1-4. Downloaded from <http://www.kc.frb.org/RuralCenter/mainstreet/MainStMain.htm> 10/11/01.

⁵ Rogers, Cynthia L. (2001). “Using Municipal Sales Taxes to Evaluate Small Town Economic Development,” Unpublished manuscript. University of Oklahoma.

activity within a municipal jurisdiction over time. Furthermore, local governments have been increasingly relying on local sales taxes for revenues since the 1970's. For example, in 1970 only 23 states authorized local option sales taxes compared with 33 states in 1997 (NCSL 1997, page 7).⁶ Consequently, understanding the implications of the increasing reliance on MSTs is important for evaluating rural community development.

This project proposes to investigate possible links between keystone sectors and local tax policy. Notably, the factors that determine social and economic network formation may also influence local tax policy choices. Communities with different keystone sectors may be more likely to implement different local tax policies. In addition, communities with more integrated social networks may be likely to tax themselves relatively more to provide local public infrastructure. The additional infrastructure may, in turn, increase quality of life and promote economic viability.

The focus of this part of the project will be on small, rural communities in Oklahoma. Features of its MST rules, as well as its demographics, make Oklahoma an ideal candidate for the analysis. In Oklahoma, as in over a dozen other states, municipalities can determine whether to impose MSTs and at what rate through local elections.⁷ In 2001, a little over 83% (493 communities) of Oklahoma's municipalities imposed MSTs. Notably, the MST base must conform to that of the state sales tax. This uniformity makes the MST bases comparable across communities. The MST collections and rate data are conveniently available from the State Tax Commission. Oklahoma is mostly composed of very small communities. A little over 46 % of the places tracked in 1999 Census population estimates had fewer than 500 people and 73% had fewer than 1,500 people. The smallest community imposing an MST had an estimated 1999 population of 5. The focus on very small communities, those less than 2,500 people, is important since data are particularly difficult to get for such small places. Consequently, empirical analysis of economic development for small, rural communities is relatively sparse.

The first objective of the research is to increase the pool of case study communities investigated with keystone sector analysis. A minimum of 12 small, rural Oklahoma communities will be investigated using the survey instruments developed in Kilkenny and Nalbarte (1999).⁸ The research will also provide a synthesis of local fiscal policy with community network formation and so contribute to the understanding the underlying diversity and dynamics of rural communities. A further potential benefit is that local tax data, when available, are more cost effective than survey data. Thus, establishing a connection between local tax policy choices and keystone sectors characteristics could potentially aid in the assessment of rural policy analysis.

⁶ See the National Conference of State Legislatures (NCSL, 1997), particularly the discussion on page 7, for an overview of state-local fiscal policy trends and details about local option taxes. National Conference of State Legislatures. (1997). *Critical Issues In State-Local Fiscal Policy: A Guide to Local Option Taxes*. (Denver, CO and Washington, D.C.: National Conference of State Legislatures).

⁷ As discussed in Rogers (2001), the degree of local determination of MST rates varies across states.

⁸ Kilkenny, Maureen, and Laura Nalbarte. (2000). "Keystone Sector Identification: A Graph Theory-Social Network Analysis Approach" in *The Web Book of Regional Science* (Regional Research Institute, West Virginia University: Morgantown, WV). Available online at <http://www.rri.wvu.edu/WebBook/>. Downloaded 11/12/2001.

OREGON STATE

December 9, 2001

Dr. Maureen Kilkenny
Department of Economics
Iowa State University
565 Heady Hall
Ames IA 50011

Dear Maureen:

For a number of years I have been interested in the role of institutions in local economic development and have been attempting to keep current on the work on social capital as it has been emerging in the sociology and economics literature. In particular I have been following the work of Emery Castle here at Oregon State University as he developed his thinking on social capital in (Emery N Castle, "Social Capital: An Interdisciplinary Concept" *Rural Sociology*, forthcoming 2002), and "total rural capital" (Emery N. Castle, "A Conceptual Framework for the Study of Rural Places," *American Journal of Agricultural Economics*, 80(3):621-631, August 1998). I have also been drawn to the institutional analysis of Douglas North and have argued that successful adaptation to the forces affecting rural economies requires institutional and organizational change (see David S. Kraybill and Bruce A. Weber, "Institutional Change and Economic Development in Rural America," *American Journal of Agricultural Economics* 77(5): 1265-70, December 1995).

I am therefore very pleased to be involved in the innovative project to identify keystone sectors and explore both the factors that generate these sectors and their possible role in determining the relative economic fortunes of rural communities. This project would help us to think about how social and economic incentives and behavior affect the kind of institutional, economic and social infrastructure that supports local development. One of the fundamental assumptions in one strand of the social capital literature is that people make investments in social capital because they expect economic payoffs from those investments. Our basic hypothesis in this project is that these payoffs (and thus the strength and character of the keystone sectors in various communities) depend on the economic structure of the community (sectoral composition, distribution of income), the level of economic well-being (per capita income, poverty rates), the social and demographic composition of the community (ethnicity, age of population), and the size of the community and proximity to metropolitan centers. We would hope to explore the importance of these factors both within Oregon and across the entire cross-sectional dataset I am particularly interested in the importance of the income inequality and poverty variables.

We will commit to surveying 12 Oregon towns and contributing the data to the cross sectional database. We would follow the established protocols to make our work comparable to that of the other project collaborators.

Oregon is a relatively rural state (population 3.5 million, with 27 percent of the population living in nonmetropolitan areas). The state economy depends on agriculture and food processing for 8

percent of the jobs, and on wood products for 11 percent. (Waters et. al. *Journal of Agricultural and Resource Economics*, July 1999) There are about 240 cities with the median size town having about 1600 population. We would propose to select the 12 towns from both the relatively populated Western third of the state and the arid sparsely settled two-thirds east of the Cascade Mountains. We would select from the 83 Oregon small towns of 1000 to 5000 population and look both at those within metropolitan areas and those remote from urban centers. We would seek your guidance in identifying any other appropriate criteria for selection, so that our results would mesh with the others.

.This project is complementary to work that Emery Castle is doing on social capital and sustainable communities, and we would seek his input into our project as we began to design our questionnaire for the survey. This project would also be very supportive of OSU's new Rural Studies Program (which Emery directs), and we would seek to draw students in this program into the survey work, perhaps by designing a Rural Studies class in the Spring of 2003 to introduce students to keystone sectors in rural communities and collect some data.

I look forward to working with you and the others on this exciting project.

Sincerely,

Bruce A. Weber

Professor