Social Networks, Social Capital and Community Economic Growth

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There is a growing literature identifying social capital as a significant factor in national, regional, and community growth. Social capital is thought to generate an institutional environment that cultivates economic growth. Social interactions give rise to trust, the capacity for collective action, and information exchanges. If these social externalities persist, in time they shape the economic environment of the region. Thus, social capital works to create the economic institutions that are "the rules of the game" which govern the distribution and use of resources within society (North).

While institutional economists have advocated the importance of institutions for economic development for several decades, the dominance of neoclassical theory has steered economists away from much investigation into this relationship. Neoclassical theory pays little attention to institutions and treats them primarily as effects rather than causes of economic growth. However, with the emergence of social capital theory (Collier, Woolcock, Coleman), much progress has been made in understanding why social capital impacts economic growth. Social capital has been used to explain the success of endogenous development strategies (Kraybill and Weber, Barkley), to provide a rationale for public policies aimed at preserving rural places (Castle), and to account for the benefits of community networks in economic development (Malecki).

Many rural development practitioners understand, at least implicitly, the link between social capital and economic development, as demonstrated in their emphasis on community self-reliance and endogenous development. Such techniques emphasize the coordination of information and resources among community organizations to improve the business and residential environment of the region.

In this paper, we seek to address empirically how social capital affects economic growth. Like previous empirical studies on this relationship, we use a conditional convergence growth model that includes proxies of social capital. Unlike other studies, however, our social capital proxies are network centrality measures computed from a unique dataset containing organizational networks from 18 rural, US communities. The following section describes our proxies for social capital. A discussion of the conditional convergence growth model follows. Then, we present our data and results. The paper concludes with anticipated extensions to this research project and future uses of the data.

Proxying Social Capital

Physical capital is observable, and the production process of human capital is understood so that proxies for these variables can be identified. But social capital is neither observable nor adequately understood, so defining proxies is difficult. Malecki chooses not to define social capital directly, but rather notes that it cannot be created by an individual's choice. Social capital is the establishment of commonly held customs or virtues of a group. Castle goes a step further and requires social capital to increase the productivity of a group such that the group's productivity is greater than the sum of that of the individual members. Collier focuses on both the social and capital aspects of social capital. Collier argues that social capital is generated when an externality caused by social interaction has a persistent impact. The persistence can manifest itself as the result of repeated interactions (e.g., market transactions with the same seller), or prolonged effects from an initial interaction (e.g., establishment of a structure, like a park or bar, to facilitate interactions).

Collier defines a taxonomy of social capital that highlights the relationship between social interaction and social capital outcomes. Two features of this taxonomy are particularly

noteworthy. First, the taxonomy links different forms of interaction to different forms of social capital. Second, the taxonomy identifies various consequences and sources of social capital. Woolcock argues that proxies for social capital should emphasize its source rather than its consequences, because the inputs into social capital are more easily identified than social capital and its consequences.

Collier suggests measures of social interaction to be the appropriate proxy for social capital, and his taxonomy enables the researcher to isolate the social capital of interest by choosing the appropriate form of social interaction to model. While social capital is unobservable and nonexcludable in nature, the process by which it is created is the opposite. Social interactions are observable and quantifiable, and so measures of social interactions are natural proxies for social capital stocks. Paldam affirms this suggestion and proposes network density as a legitimate instrument. Noting that network analyses provide rich data on social interactions, Paldam also points out that the impact of such interactions is often not comparable between contexts due to inconsistencies in network measurement. This, coupled with the cost of collecting network data, has left this proxy relatively untouched by economists in favor of Putnam's social capital instrument because it can be computed from secondary data. Putnam's instrument measures the average number of organizations to which a person belongs in a given region (or equivalently, the average membership of organizations in a region). For examples of how this instrument can be used to explain per capita income growth see Nayaran and Pritchett, Rupasingha, Goetz and Freshwater, and Knack and Keefer.

Following Collier´s suggestion that measures of social interactions are logical proxies for social capital and Paldam's recommendation of network density as a proxy, we use network centrality diagnostics to measure social capital. Network centrality measures summarize the

level of interactions within a network.   Freeman defines network centrality as an index of the

tendency of each agent to be more `central´ than all other agents in the network. A central agent

is characterized by either a high level of interaction with other agents (called the degree of

centrality and measured as a function of the number of other agents to which an agent is

connected), a high probability of linking any pair of agents (referred to as betweenness), or being

close to all other agents in the network (closeness is determined by the number agents found

between two agents). Each of Freeman's centrality measures captures a different aspect of social

capital:

- degree centrality can be interpreted as measuring the opportunities for information
  exchange that lead to building trust within a community;

- betweenness centrality measures the potential to control/filter information that facilitates
  collective action;

- closeness centrality reflects the efficiency of information dissemination that decreases
  transaction costs.

So degree, betweenness and closeness centralities will be considered in our analysis. In addition,

network density (the number of actual linkages between agents, or relations, in the network

divided by the number of potential relations in the network) will be computed. Potential

relations can be interpreted as a measure of potential interaction in a community, where higher

values indicate greater interaction and higher potential for social capital formation.

The Conditional Convergence Growth Model

We incorporate our proxies into a conditional convergence growth model, based on

neoclassical growth theory. The conditional convergence growth model explains economic

growth of regions as a function of economic conditions in a previous period and structural

differences between the regions that might cause the growth paths to converge or diverge

(Barro). Intuitively, different endowments represented by initial income and capital stocks

clearly affect economic growth, but differing political or social environments could also affect

economic growth. So, control variables in addition to initial income, and labor and capital stocks

are also included to control for these structural differences between regions. The model assumes

that economic growth is an autoregressive process such that the growth rate is a function of the

initial state of the economy and the conditioning variables.

The previous literature examining the social capital–economic growth relationship uses

the conditional convergence growth model to test hypotheses regarding the existence and

strength of the relationship. Often, the relationship is assumed to be linear, so that the model can

be easily estimated using ordinary least squares. Generally, the estimated function takes the

following form:

$$\frac{y_T - y_{T-t}}{y_{T-t}} = \alpha + \beta_1 y_{T-t} + \beta_2 K_{T-t} + \beta_3 X_{T-t} + \beta_4 S_{T-t} + \varepsilon_t$$

where

$y = $ per capita income

$K = $ a vector of human and physical capital measures

$X = $ a vector of social and political variables

$S = $ social capital proxy

$T = 2002$

$T\text{-}t = 1990$

$\varepsilon_t \sim N(0, \sigma^2)$

We have selected a number of variables as proxies for the regressors in the model above.

For capital stocks, education level is used to measure human capital and assessed property values

are a proxy for physical capital stocks. Other sociological and political variables included are

municipal expenditure, labor force participation rate, rural/urban classification, average property

tax millage, and transportation accessibility to the municipality. The social capital proxies are the network centrality measures and network density as discussed earlier.

Our expectations for these variables are as follows. Higher capital stocks, greater highway accessibility, higher government expenditures, lower tax rates, higher quantities of labor, and urban/urban-fringe location are expected to induce faster, positive growth. In addition, higher values of the centrality measures/network density should induce faster growth.

There is a potential problem of causality since our network data is measured at the end of the period under scrutiny. It is conceivable that per capita income growth could influence social capital levels, given our data. A Wu-Hausman test will be used to test for the exogeneity of the social capital proxies. Endogeneity of the network measures would suggest that the network has changed over the period of investigation. To correct for this endogeneity problem, we will include a structural variable that measures change in age composition for each community between 1990 and 2000. Changes in age composition should capture significant shifts of the social network within the community (e.g., increase in social activity due to an influx of baby-boomers) and are intended to control for network change.

Data Requirements

The data for the analysis will come from various sources. The data for income, education and labor supply come from the 1990 and 2000 US Censuses (we will extrapolate per capita income from 2000 to 2002 to maintain consistency between our social capital proxies and income growth). Two highway access variables are tried: shortest distance in miles by road to an interstate highway exchange, and the number of interstate highway exchanges present in the county in which the municipality is located. Both measures are obtained from state department of transportation maps for 1992. Per capita total municipal expenditures and per capita total

capital outlays are taken from the 1992 United States Census of Governments. Average property

tax millage rate on commercial, industrial, mineral and public utility and total assessed value of

non-residential real estate property are from appropriate state agencies. The rural-urban

continuum codes for all United States' counties are available from the Economic Research

Service (US Department of Agriculture).

The network centrality and density measures are computed from surveys of organizations

in 18 small, rural communities (12 in Ohio, 6 in Iowa) collected in 2002 and 2003. The survey,

developed by Kilkenny and Nalbarte, asks the respondent to identify local organizations to or

from which it (1) gives or receives funds, (2) gives or receives information, and (3) gives or

receives political/organizational support (each topic represents a separate question).

Respondents are presented with a list of all identifiable businesses, non-profit organizations and

government institutions in their community. Questions regarding the three types of flows (funds,

information, support) are worded identically for each community. The aim is to make the data

consistent across communities and suitable for cross-sectional analysis. The communities were

selected from a list of municipalities in each state with population less than 3,000 in 2000 to

ensure that the entire geography of the state was represented in the sample. Response rates in

each community exceeded 60%.

Survey responses are recorded in one of six graphs – one for each direction of interaction

(give/receive) for each of the three type of flows. We added the directional graphs (network

terminology for matrix) for each flow together to mitigate the selection bias that arises from non-

response. Once the graphs were added, the resulting graph was recoded so that if a relation

between two organizations was mentioned on either directional graph it received a value of 1, but

if no relation (value = 0) existed in either directional graph no relation is recorded in the resulting graph.[1]

There is an additional difficulty introduced into the model when using network data. Relations between organizations can take two forms: directional (i.e., one agent interacts with another, but the second agent does not reciprocate interaction; e.g., lecturing students is an asymmetric transfer of information), and reciprocal (i.e., the agents interact with each other for mutual gain; e.g., a market transaction). Directional and reciprocal relations map uniquely into two types of response graphs: asymmetric and symmetric. Asymmetric graphs contain elements that reflect directional interactions, whereas the elements of symmetric graphs correspond to reciprocal interactions. Survey data is asymmetric in nature, since the responding parties do not collaborate when filling out the response forms and differences will occur in responses. The researcher must then decide whether or not symmetry is a valid assumption to impose upon the data.

We chose to evaluate the network centrality measures under both asymmetric and symmetric assumptions. On one hand, the asymmetric responses in our study communicate the respondent's perception of his/her relationships with other organizations in the community. Given the unobservable and subjective nature of social capital, perception may have profound implications for its measurement and flow. For example, different perceptions of interactions by organizations within a community will affect how central agents in the network are relative to one another, so the centrality measure will be significantly higher or lower than if no perception difference existed. On the other hand, it seems reasonable that when organizations interact there is mutual benefit, and so the relations should be symmetric. However, imposing symmetry could

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[1] Adding the directional graphs and recoding the resulting graph provides a larger number of relations (because it captures how the respondents interact with non-respondents) than if we just considered the directional graphs independently.

assume too much. Take a case where two agents interact in a producer-supplier relationship, and say that only one agent acknowledges the relationship in his response to the flow of funds question. Imposing symmetry in this situation merely captures market transactions and not social capital since, in general, market transactions cannot generate social capital.[2] Since we have no a priori information about the networks in our analysis, we calculate the network centrality measures under both assumptions. As such, two sets of results will be presented for our model. The first set relies upon asymmetric network data, while the second set uses symmetric network data. (The network centrality measure based upon closeness requires the symmetry assumption, so it is not calculated under the asymmetric data assumption.)

Some of the surveys have taken longer to collect than initially anticipated. Unfortunately, there is not enough variation in per capita income growth of the 12 communities we have to generate meaningful results. Consequently, we do not have empirical results at this time, though we expect to have data from a second state in time to estimate the model for the meetings in July.

Results

Two econometric problems may appear when the model is actually estimated. First, previous studies examining the relationship between economic growth and social capital have found heteroskedasticity in the estimated models. We will test for this and utilize generalized least squares if this condition exists. Second, because of our small sample size relative to the number parameters to be estimated, our parameter estimates may not be stable (i.e., they may change dramatically as the sample is varied). We will use influence diagnostics to test that the parameter estimates are stable for the sample as a whole (Besley, Kuh and Welsch). In addition,

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[2] It is assumed that producer-consumer transactions do not create social externalities (i.e., agents capture the full benefits of trade within the transaction). By definition social capital is an externality generated by social interactions, and therefore it cannot be generated by market relationships.

we will utilize factor analysis to generate two indices of community characteristics to provide controls for factors that affect the convergence process and yet minimize the number of parameters to be estimated in the model. One index focuses on government characteristics and services (government index), such as education and per capita expenditures. The other index consists of labor force participation rate and the distance to an interstate highway interchange (economic index).

Conclusions

We anticipate that social interactions, and hence social capital, will be positively related to per capita income growth, consistent with the findings of Narayan and Pritchett and Rupasingha, Goetz and Freshwater. Such results will lead us to conclude that network centrality measures are adequate proxies for social capital. In addition, we expect to find that asymmetric data fit the model better than will symmetric data. The policy implications are evident, if the hypothesized social capita—economic growth relationship is supported: increasing the coordination of financial resources and information among local organizations can lead to positive economic growth.

One highly desirable extension to this project would be to increase the number of observations (communities). Funding is being sought to develop a database containing survey responses and demographic, economic and sociological data on an additional 102 communities in an additional 8 states. The survey data utilized in this project would also be useful in examining the factors that affect social capital accumulation and flows. We intend to develop a social capital generation model for this purpose. Such a model would be analogous to investment models that explain why individuals choose to invest or divest in physical or human capital. It would provide a much needed framework in the social capital literature to explain

how social capital forms/deteriorates, and it would assist in prescribing policies affecting individual behavior toward social capital investment.

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