

SRDC Working Paper Series 03-01

A Model of Social Capital Formation

Cathleen Johnson

January 2003

SOCIAL RESEARCH AND DEMONSTRATION CORPORATION

This paper was prepared as background to the Community Employment Innovation Project (CEIP). CEIP is sponsored by Human Resources Development Canada (HRDC) and the Nova Scotia Department of Community Services (NSDCS). This paper was produced for the Social Research and Demonstration Corporation (SRDC). The views expressed in this paper are the author's and do not necessarily reflect those of either HRDC or NSDCS.

The Social Research and Demonstration Corporation is a non-profit organization and registered charity with offices in Ottawa, Vancouver, and Sydney, Nova Scotia. SRDC was created specifically to develop, field test, and rigorously evaluate social programs. SRDC's two-part mission is to help policy-makers and practitioners identify social policies and programs that improve the well-being of all Canadians, with a special concern for the effects on the disadvantaged, and to raise the standards of evidence that are used in assessing social policies. As an intermediary organization, SRDC attempts to bridge the worlds of academic researchers, government policy-makers, and on-the-ground program operators. Providing a vehicle for the development and management of complex demonstration projects, SRDC seeks to work in close partnership with provinces, the federal government, local programs, and private philanthropies.

Copyright © 2003 by the Social Research and Demonstration Corporation

Table of Contents

Figures	iv
Acknowledgements	v
Abstract	vii
Introduction	1
Definition of Social Capital	3
Social Capital in Relation to Other Forms of Capital	5
Sources of Social Capital	7
Consequences of Social Capital	9
A Model of Social Capital Formation	13
Social Networks	14
Dynamics of Social Capital Formation	15
Discussion of Simulation Results	18
Implications for CEIP Research	23
The Theoretical Impact of CEIP on Social Relationships in Cape Breton	23
Measuring the Impact in Cape Breton	24
References	27

Figures

Figure		Page
1	Twelve-Player Network With 12 Links	15
2	Total Net Benefit and Total Social Capital, 2,000 Periods, Linear Model	19
3	Comparison of Size of Network, Total Social Capital and Total Net Benefits	20
4	Total Net Benefit and Total Social Capital, 2,000 Periods, Quadratic Model	21

Acknowledgements

I am grateful for the critical comments of John Dickhaut, Aljaz Ule, and Reuben Ford. I also thank Robert Gilles, Vince Crawford, Larry Samuelson, and Sudipta Sarangi for constructive comments on the modelling of social capital, and Shahrooz Feizabadi for programming.

The Author

Abstract

This paper begins with a short discussion of the definition of social capital. The relationship to other forms of capital is discussed. The concept is informed by the work of Bourdieu, Portes, and others that distinguishes the sources and consequences of social capital. The definition is then used to examine the endurance of social networks with regard to a model of social capital formation. Finally, this model of social capital and its underlying social networks will be operationalized as outcome measures for the Community Employment Innovation Project (CEIP).

Introduction

This paper has three aims: (1) to discuss the concept of social capital, its sources, and its consequences; (2) to present a model of social capital formation; and (3) to use the insights from this discussion and model simulations to outline the potential sources, consequences, and development of the social capital in Cape Breton, Nova Scotia during the Community Employment Innovation Project (CEIP) demonstration.

Increasing evidence suggests that social capital is an important determinant in trade, crime, education, health care, and rural development (Bates, 1999; Grootaert, 1998; Paldam, 2000; Pantoja, 2000; Rose, 1998, 1999; Serageldin, 1998; van Bastelaer, 1999). Woolcock and Narayan (2000) sum up the intuitive idea of social capital well. They say the “basic idea of ‘social capital’ is that one’s family, friends, and associates constitute an important asset, one that can be called upon in a crisis, enjoyed for its own sake, and/or leveraged for material gain. Those communities endowed with a rich stock of social networks and civic associations will be in a stronger position to confront poverty and vulnerability, resolve disputes, and/or take advantage of new opportunities” (p. 3). During recent years, social capital has become a topic of study in sociology, political science, and economics. Much of the recent interest can be attributed to work by Bourdieu (1986), Coleman (1988, 1990), Jacobs (1961), Portes (1998), and Putnam (1993, 2000).

Social capital may be an important determinant in some economic situations because it represents an asset, although social capital differs from physical and financial capital because it is more difficult to measure and is sometimes non-convertible. Woolcock and Narayan (2000) note a distinctive feature of the social capital approach in understanding poverty. For some individuals, social capital may represent their only asset. “Living on the margins of existence, the social capital of the poor is the one asset they can potentially draw upon to help negotiate their way through an unpredictable and unforgiving world” (Woolcock, 2000, p. 19). For example, Bornstein (1996) writes about the Grameen Bank in Bangladesh that lends only to small groups called *lending circles*. These lending circles guarantee repayment for each member. The primary asset of these circles is social capital.

Because of the diverse interests in studying social capital, there is no single definition of social capital. However, to study the effect of a program like CEIP on social capital, the concept has to be operationalized. This is the purpose of this paper.

Definition of Social Capital

The definition of social capital has an interesting contemporary history. The French sociologist Bourdieu aptly defines social capital as “made up of social obligations (‘connections’), which is convertible, in certain conditions, into economic capital . . .” and again as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (1986, pp. 243, 248). Social capital is, in other words, the value of social obligations or contacts formed through a social network. Social networks are the medium through which social capital is created, maintained, and used. In short, social networks convey social capital. As early as 1961, Jacobs gave anecdotal evidence for the importance of social capital formation for the functioning of society: “These [neighbourhood] networks are a city’s irreplaceable social capital. When the capital is lost, from whatever cause, the income from it disappears, never to return until and unless new capital is slowly and chancily accumulated” (1961, p. 180). Lowry (1977) was the only early economist to use the concept; specifically, he used the concept to argue against neoclassical theories of racial income inequality and their policy implications. In his 1988 paper, Coleman defines social capital as “a variety of entities with two elements in common: They all consist of some aspect of social structures, and they facilitate certain action of actors — whether persons or corporate actors — within the structure” (p. S98). Portes (1998) highlighted the lack of specificity in Coleman’s definition and to the absence of Bourdieu’s related research from Coleman’s references. Portes suggests that this vague definition “opened the way for relabeling a number of different and even contradictory processes as social capital” (p. 5). Burt (1992) spells out social capital as “friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital” (p. 9).

Portes (1998) confirms the above observations that Bourdieu, Coleman, Burt, Loury, and other academics created a consensus “in the literature that social capital stands for the ability of actors to secure benefits by virtue of membership in social networks or other social structures” (p. 6). Woolcock and Narayan (2000) write about the growing consensus among social capital scholars. However, Woolcock (2000) also highlights one of the major criticisms of the literature; that much interest in social capital has been “fueled by a definition that includes not only the structure of networks and social relations, but behavioural dispositions (such as trust, reciprocity, honesty), and institutional quality measures (‘rule of law’, ‘civil liberties’, etc.)” (p. 7). For example, a recent work by Knack and Keefer (1997) explores the link between social capital and economic performance. They use survey questions about trust and civic co-operation as a proxy for social capital. They find that trust and civic co-operation have significant impacts on aggregate economic activity. This institutional quality definition veers off the path established by Bourdieu and others. It may not seem so different but the extension is enough to send other researchers further off course, thereby distorting the sources and consequences of this asset. This definition of social capital, sometimes measured by country level “trust” and “governance” scores makes for interesting research but it has led critics to accuse social capital of becoming all things to all people.

The following section describing the four types of capital will help to define social capital more precisely and to distinguish it from other forms of capital.

Social Capital in Relation to Other Forms of Capital

It would be nearly impossible for humans to exist without the benefits derived from social learning, participation in social institutions (such as family, community, coordinating behaviours, and norms), and information transference. Fundamentally, these activities are a function of interaction. When complemented with accumulated labour, these activities result in the accumulation of all forms of capital.

Capital can be embodied in four forms: physical, human, cultural, and social. The capacity of physical and human capital to generate profits is well understood in economics. Social capital is increasing in popularity, and some economists are beginning to write on the subject (for example, Bowles (1999), Durlauf (1999), Glaeser, Laibson, and Sacerdote (2000), Knack and Keefer (1997), Paldam and Tinggaard Svendsen (2000), and Temple and Johnson (1998)). However, the roles of embodied cultural and social capital as assets are still not well explored in economics. Bourdieu (1986) defines *cultural capital* in its fundamental state¹ as the acquisition of cultural characteristics (such as education, culture, and language) by an individual. In particular, this definition is not completely satisfactory from an economic perspective because it coincides with aspects of human capital. A better definition of embodied cultural capital would be the value to an individual of the *ability to participate in society*. The ability or skill possessed by an individual to perceive norms and coordinate with others, for example to employ coordinating behaviour and to follow norms, falls within this category of cultural capital.

The potential complementarity of production of different forms of capital is exemplified in the process of obtaining a degree from a distinguished institution of higher education. It can be assumed that human capital is created on the way to obtaining such a degree. Social capital may be created because classmates may keep up their networks of friendship and reciprocity. Cultural capital may be accumulated in two forms: institutional and embodied. Institutional cultural capital is accumulated because some status or benefit is bestowed on an individual by matriculating at such a distinguished institution. Embodied cultural capital, the ability to participate in society with regard to social or cultural institutions, may be gleaned through repeated interaction with other individuals while in the university environment.

This potential complementarity of production of the various forms of capital is a source for confusion. As stated earlier, interaction is key to the accumulation of all forms of capital. In traditional economic analysis, the role of human interaction in the creation of physical and human capital has long ago been assumed away. The concepts of social and cultural capital are abstract, intangible, and oftentimes non-transferable as assets. It is understandable that these two abstract concepts of assets would be muddled. They both share the necessity for social interaction in their creation and use. However they are fundamentally different in that social capital resides in other people and the embodied state of cultural capital resides within a person, much like human capital.

¹Two other states of cultural capital not defined here are institutional (for example, status, degrees, and titles) and physical (objects that have value as cultural objects, for example paintings).

Many assets created by social interaction and societal characteristics are now inappropriately labeled as social capital. Bowles (1999) advocates abandoning the term in favor of something more precise: “‘Community’ better captures the aspects of good governance that explain the popularity of social capital, because it focuses attention on what *groups do* rather than what *individuals have*” (p. 6). For the Community Employment Innovation Project (CEIP), the term “community” is used to refer to the characteristics of large groups while social capital refers to the social assets of an individual relative to their network of contacts.² This is in line with Hall and Jones (1999), Koo and Perkins (1995), and Temple and Johnson (1998) who also advocate referring to macro-institutional issues under a separate term.

The next section examines the sources of social capital.

²Specifically, the CEIP individual participant surveys and community surveys inquire about each respondent’s network of contacts as well as societal characteristics concerning attributes of community living such as trust, community efficacy, and volunteerism.

Sources of Social Capital

The intangible character of social capital is emphasized by everyone who attempts to define social capital. Social capital is inherent in relationships with others. To possess social capital, a person must be related to others. The motivation for others to make resources available to those to whom they are linked is not uniform. Portes (1998) suggests four reasons: *value introjection*, *bounded solidarity*, *reciprocity exchange*, and *enforceable trust*. (pp. 7–9).

As examples of *value introjection*, people may give to charity, return favours, and obey social rules because they feel an obligation to behave in this manner. The internalized norms that make such behaviours possible are then appropriated by others as a resource. *Bounded solidarity* is the term used in the recent literature to refer to the mechanism whereby people in a common situation learn to identify with each other and support each other's initiatives. Portes (1998) states that other members of the same community can then appropriate such dispositions and the actions that follow as their source of social capital.

Reciprocity exchange sees social capital as primarily the accumulation of obligations from others according to the norm of reciprocity. In this version, donors provide privileged access to resources with the expectation that there will be compensation in the future. These social exchanges differ from economic exchanges in two ways: the timing of repayment is unspecified and the currency with which obligations are repaid may be different from that with which they were incurred. Portes (1998) reports that for the final source of social capital, *enforceable trust*, the expectation of repayment is not based on knowledge of the recipient, but on the presence of both individuals in a social structure. As an example, a member of a group may give generously to the group's philanthropy, thereby expecting approval and status as repayment.

Consequences of Social Capital

According to the literature, there are two basic functions of social capital: (1) as a source of social control, and (2) as a source of benefits through networks. The source of benefits through networks is the emphasis taken here.

There are series of studies that focus on rule enforcement. The social control created by tight community networks is useful to authority figures as they seek to promote discipline. When social control is considered a function of social capital, sources of this type of social capital are often found in bounded solidarity and enforceable trust. This function of social capital is often the focus when it is defined as a property of groups such as communities, cities, or nations. This approach is associated mainly with the writing of political scientists and economists.

Coleman's writing is clear in the second function of social capital, specifically as a source of parental and kin support. Families with two parents possess more of this form of social capital than do single-parent families (Coleman, 1988). The children whose education and personal development are furthered are the recipients of this function of social capital. With this contribution, Coleman gives a perfect illustration whereby a function of social capital may be a source of cultural capital.

The most common function of social capital is acting as a source of network-mediated benefits beyond the immediate family. This definition comes closest to that of Bourdieu (1986). Interestingly, many authors in the sociological field of stratification, whose research projects shed light on this function of social capital, do not conceptualize it explicitly as social capital. This definition is frequently used to explain access to employment, mobility, and entrepreneurial success (for example, Allen (2000), Anheier, Gerhards, and Romo (1995), Bertrand, Luttmer, and Mullainathan (2000), Davern (1999), Hagan, MacMillan, and Wheaton (1996), Ingram and Roberts (2000), Light (1984), Montgomery (1991), Reingold (1999), and Wegener (1991)). Many writers and researchers have explicitly made the link between network-mediated benefits and social capital (for example, Fernandez-Kelly (1995), Gittel and Vidal (2000), Rice and Prince (2000), Stanton-Salazaret and Dornbusch (1995), and Temkin and Rohe (1998)).

Granovetter, Burt, and Lin have written extensively on the power of network relations. Granovetter (1973) developed a widely adopted model which advocates the strength of "weak ties," that is, those ties outside of close family and friends. Before this work, strong ties were seen as socially valuable. Granovetter shows that weak ties, allowing access to different or new information, are valuable as well. Burt (1992), on the other hand, argues that the crucial element is not the strength or weakness of the ties, but rather the density of the network. Burt names these profitable openings in the network "structural holes." The two concepts are not contradictory. Granovetter's conclusions are based on his declaration that a strong link must also be a redundant link. Burt makes no such assumption, instead he focuses on the network as a whole rather than the characteristics of single links. In work published around the same time, Lin (1982, 1999) develops a theory of social resources. He concludes that social

resources exert effect on the outcome of an action, that social resources, in turn, are affected by the original position in the social structure of the individual, and lastly that social resources are affected by the use of weaker rather than strong ties (1999, p. 470).

The work of Granovetter, Burt, and Lin is the foundation for the recent popular literature where strong and weak ties have come to be called “bonding” and “bridging” ties (Gittell & Vidal, 1998). Intra-community or intra-familial ties are referred to as “bonding” ties and extra-community or extra-familial ties are referred to as “bridging” ties. To simplify the discussion around network links, a more abstract concept could be used to describe the types of links. The network concepts of density and homogeneity could be used to characterize the links in a network. For example, a tie from a dense and homogenous network could be assumed to be strong or “bonding.”

Portes (1998) stresses that the different functions of social capital may clash with one another and Woolcock and Narayan (2000) warn that social capital can be a double-edged sword. Woolcock and Narayan’s characterization can describe the range of outcomes associated with social capital. The capacity of authorities to enforce rules can, for example, be jeopardized by the existence of tight networks whose function is to facilitate violation of those rules for network members’ benefit. The system of organized crime has been offered as a more extreme example of tight networks that thwart the authorities function to enforce rules. These types of outcomes point to the need for a closer look at social capital transactions because the use of social capital does not always lead to a beneficial outcome. Much of the research on social capital has been criticized because of the emphasis on the positive effects of social capital.

Social capital can have a range of negative effects. Durlauf (1999), Portes and Landolt (1996), and Woolcock and Narayan (2000) cite many examples of negative effects of social capital. The first is *exclusion*. When an individual wants to gain access to a group, he or she may find that the strong ties between the members of this group may be the same ties that keep him or her out. Waldinger (1995) describes the tight control exercised by white ethnics over the construction trades and the fire and police unions of New York. Many other cases have been documented. Evidence that group identification can lead to intergroup hostility is plentiful in psychology.

The second negative effect of social capital is that membership in a group can *prevent the success* of the business initiatives of their members. Geertz (1963) observes in his study of the development of commercial enterprises in Bali how entrepreneurs were constantly bothered by job- and money-seeking relatives. These demands were backed by the strong system of norms to assist family members. The result was that the development of any successful enterprise was delayed by network members.

Third, the level of social control in a community can be overwhelming, *restricting individual freedom*. Social control in a small town or village can cause the young and more independent-minded to leave.

Fourth, Portes (1998) notes that group solidarity may be founded in opposition to mainstream society with the result of *downward leveling of norms*. In this case, individuals are

not allowed to participate in mainstream society because they belong to such a group. Portes (1998) cites Bourgois (1995) who calls attention to an example of this process, which singles out for attack individuals who seek to join the middle-class mainstream. Portes concludes that a lengthy period of time in which upward mobility of a group has been blocked by outside discrimination typically precedes the emergence of this downward leveling of norms.

A Model of Social Capital Formation

A better understanding of the determinants of social capital may imply policy remedies that can generate some of the benefits of social capital, without the adverse effects outlined in the previous section.

Before now, social capital has been the subject of much discussion but it has not been formally modelled using individual incentives to create or sever network links. Glaeser et al. (2000) use an economic approach to investment to model the formation of social capital. Glaeser summarizes this approach in a shorter policy piece (2001) where he argues for an understanding of social capital formation that begins with the individual because the decision “to invest in social capital is made by individuals, not communities” (p. 35). The model summarized here is similar in that it begins with individuals. Here, a model of social network evolution is considered. This model includes the mutual influence of the social structure on social capital accumulation and the social capital accumulation on the social structure. In addition, given the unusual nature of the returns to the asset of social capital — the timing of repayment is unspecified and the currency with which obligations are repaid may be different from that with which they were incurred — it seems preferable here to allow individuals to be boundedly rational rather than the perfect foresighted individuals in Glaser et al. (2000). The following model uses as its foundation Bourdieu’s definition of social capital. Admittedly, it is a narrow interpretation of the concept, but it may provide a good starting point. Bourdieu (1986) supplies the intuition for this modelling approach by describing the dynamics of social capital formation:

In other words, the network of relationships is the product of investment strategies, individual or collective, consciously or unconsciously aimed at establishing or reproducing social relationships that are directly usable in the short or long term, i.e., at transforming contingent relations, such as those of neighborhood, the workplace, or even kinship, into relationships that are at once necessary and elective, implying durable obligations subjectively felt (feelings of gratitude, respect, friendship, etc.) or institutionally guaranteed (rights). This is done through . . . the symbolic constitution produced by social institutions (institution as a relative — brother, sister, cousin, etc. — or as a knight, an heir, and elder, etc.) and endlessly reproduced in and through the exchange (of gifts, words, women, etc.) which it encourages and which presupposes and produces mutual knowledge and recognition. (p. 243)

The following model also includes a little-used tool in the literature on networks by applying a metric to the network (Johnson & Gilles, 2000). In this way, individuals are characterized by the space they occupy. Individuals are located along a real line³ as in Akerlof’s (1997) model of social distance, and the distance between two individuals

³Individuals are actually located around a joined line to minimize the complications of end point calculations in the simulations.

determines the cost of establishing a direct link between them. Thus, the main hypotheses from Debreu (1969) are incorporated — that players located closer to one another incur less cost to establish communication.

Even though the mechanism of the accumulation of social capital is instrumental, other aspects of the sources of social capital can be inferred from the model. For example, coordinating behaviour and bounded solidarity can be interpreted as the rules of transaction. In other words, the hypothesized sources of social capital — bounded solidarity, value introjection, reciprocity exchange and enforceable trust — are the environments in which the network functions.

Agents rationally form and sever relationships according to the cost and benefit of those relationships. The cost and benefit are dependent on the pre-existing cultural system of norms and values. The benefit of accumulated social capital may allow a relationship to persist over time that would otherwise be severed. In society this may have negative or positive consequences. One could imagine a relationship where a favour is extended from one person to another, not because of the explicit promise of future income or a future favour, but because there is a history of a profitable relationship. If the favour is made because of past performance (and perhaps this past performance creates an expectation that it will be repaid), from an economic perspective it may seem irrational for the donating agent to offer the favor. But if the donating agent receives a positive benefit from the history of the past relationship, it may be rational for the donating agent to continue to participate in the relationship without any explicit guarantee.⁴

The Myopic formation of links between individuals is used as the foundation for an investigative model of the accumulation of social capital. Social networks form as individuals establish and maintain relationships. Being “connected” greatly benefits an individual. Yet, maintaining relationships is costly. As a consequence individuals limit the number of their active relationships. A network link is the current investment in a relationship. As links are formed and maintained over time they begin to accumulate social capital. It is necessary for links to be present to *create* social capital. Links need not be present to *use* social capital, but the model demonstrates that social capital diminishes when it is not maintained through links. This section ends with the results of two examples, or simulated models, of social capital formation.

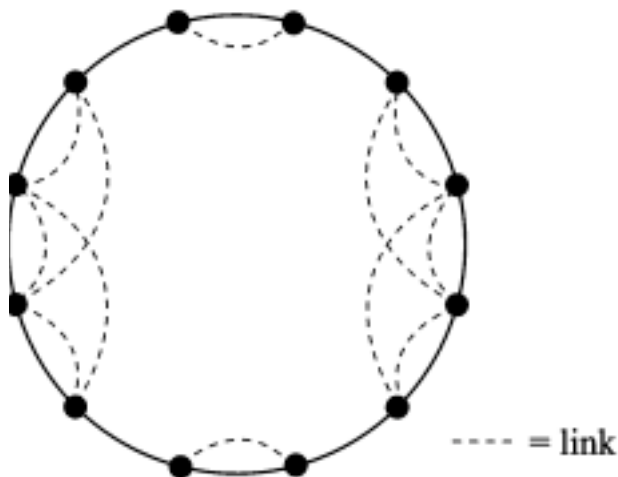
SOCIAL NETWORKS

In formal network analysis (e.g. Wilson (1985)), relationships among players are represented by graphs where the nodes are identified with the players and in which the edges capture the pairwise relations between these players. These relationships are interpreted as *social* links

⁴For example, two recent publications in economics explore explanations for behaviour that depend on the history of actions of the players. Gjerstad and Dickhaut (1998) present a model of information processing and strategy choice for participants in double auctions. Participants form beliefs based on observed market data and choose strategies that maximize their expected payoffs. Laslier, Topol, and Walliser (2001) study a cumulative proportional reinforcement rule where agents play a strategy with a probability proportionate to the cumulative utility that the agent had obtained with that action.

that lead to benefits for the communicating parties. An example of a simple graph is illustrated in Figure 1. The people are dots and the relationships are dotted lines. Given a set of players N , a *link* ij is the subset $\{i, j\}$ of N containing i and j . The complete network is defined as the collection of all links on N , or simply, $g^N = \{ij \mid i, j \in N\}$. g^N is often referred to as the complete network or graph. An arbitrary collection of links, that is any graph or network g , is called an (undirected) *network* on N . Any possible network must be a subset of the complete network, or $g \subset g^N$. g is called an undirected network because every link is a two-way link. If i is connected to j , then it can be assumed that j is connected to i . The degree of a player is simply the number of links a player has.

Figure 1: Twelve-Player Network With 12 Links



DYNAMICS OF SOCIAL CAPITAL FORMATION

Consider a large but finite population of players $N = \{1, \dots, n\}$ who are spatially distributed around a circle. Players are distributed around the circle in an equidistant fashion. Figure 1 illustrates this concept with 12 players. Time begins at Period 0 and continues with the index of the set of natural numbers. Each discrete-time period $t \in \mathbb{N}_0 = \{0, 1, 2, 3, \dots\}$ the players form or sever links connecting themselves to other players. Each player's utility depends on net benefits derived from relationships in each period. Net benefits depend on the history of links with their associated maintenance costs and benefits. In the context of this model, relationships that are maintained over time pay b_{ij} each period, the net utility or *net benefit* that agent i receives from agent j .

Suppose player i and player j are not linked and therefore have to decide whether to establish a mutual link. Player i and j consider the net benefit of connecting to each other. If $b_{ij} \geq 0$ and $b_{ji} \geq 0$, then both players will consent to the link formation. If either player would be worse off from forming the link, that is either $b_{ij} < 0$ or $b_{ji} < 0$, then the link will not be formed. The total benefit for each player i is maximized by choosing to link with all players j that offer a positive net benefit b_{ij} . Each linking decision is independent.

The net benefit, b_{ij} , to player i of maintaining a relationship over time with player j is a function of six factors: (1) whether the link is present or not in the current period, (2) the value of the link ij in the current period, (3) the social capital for player i based on the relationship between i and j , (4) how well player j interacts with other players (indirect benefits of connecting to player j), (5) the number of players that player j is connected to, and (6) the cost of connecting to player j . Each of these six factors is labeled and described in greater detail below. All the definitions are with $i, j \in N$, and $i \neq j$.

$I_{ij,t}$ indicates if link ij is present at time t . If the link ij is present at time t ($ij \in g_t$), then $I_{ij,t} = 1$. If, on the other hand, the link ij is not present, then $I_{ij,t} = 0$.

$v_{ij,t}$ is the value of the link in the current period for player i linking to player j *attributable to current interaction*. $v_{ij,t}$ could be a “gift” or “words.” It is Bourdieu’s “acknowledgment” referred to at the beginning of this section. It occurs in the current period only and can be gained only if the link is present. This value is exogenous to the model. There is a cost of linking, and this value is given to be at least slightly higher than the lowest cost of connecting. This guarantees that every player can form at least one link. Additionally, the simplifying assumption is made that the value received from player i is the same as the value received from player j , in other words, $v_{ij,t} = v_{ji,t}$.

$S_{ij,t}$ is the social capital for player i based on the entire relationship between i and j . It may have a positive value if players i and j have been connected at least one period in the past. Social capital is depreciated at the rate δ or accumulated at the rate $(1 - \delta)$. s is merely an index for the summation.

$$S_{ij,t} = \sum_{s=1}^{t-1} I_{ij,s} (1 - \delta)^{t-s} b_{ij,s}.$$

Written in an alternative way, it may be easier to see that the social capital for player i with player j is simply the depreciation of the sum of the social capital held in the previous period and the net benefit of connection in the previous period (given that the link ij was present in the previous period).

$$S_{ij,t} = (1 - \delta) [S_{ij,(t-1)} + b_{ij,(t-1)}].$$

$R_{j,t}$ is the measure of how well agent j interacts with others. It can be interpreted as a reputation variable or a reliability indicator. The higher this value, the more benefit

received by player i because of the increased opportunity for indirect benefits. Also, if agent j does well linking with others, then it may be reasonable for agent i to believe that linking with agent j may be personally profitable.

$$R_{j,t} = \sum_{s=0}^{t-1} (1 - \delta)^{t-s} b_{j,s}$$

where $b_{j,t} = \sum_k b_{kj,t}$. $b_{j,t}$ is simply the sum of all the benefits that player j received from every link j participated in in period t . Reputations also depreciate over time at the rate δ . Written in an alternative way, it may be easier to see that the reputation for player j , from the perspective of player i , is simply the depreciation of the sum of the reputation held in the previous period and the net benefit of player j 's connection in the previous period (given that the link ij was present in the previous period).

$$R_{j,t} = (1 - \delta) [R_{j,(t-1)} + b_{j,(t-1)}].$$

$d_{j,t}$ is a congestion factor. $d_{j,t}$ is number of people that player j is connected to at time t . Technically, this is called the *degree* of j in graph g_t at time t for all $ij \in g$. If j is connected to three other players at time t , then $d_{j,t} = 3$. As far as i is concerned, if j is connected to too many people, this will cause *congestion* and i may not get as much benefit from j as anticipated.

$$d_{j,t} = \sum_{i=1}^n I_{ij,t}.$$

c_{ij} Each period, the presence of a link between players i and j results in a maintenance cost c_{ij} to both players. The costs c_{ij} are determined by the distance between the two players on the circle. For example if players i and j are Player 5 and Player 2, then it is known that there are two players, Player 3 and Player 4, between them. There are 3 spaces between these two players. It is less expensive for Player 5 to connect to Player 3 or Player 4 because both of those players are closer. The cost of connection, c_{ij} (in this case $c_{ij} = c_{25}$), is linear in the distance between the players. Formally, it is assumed that

$$c_{ij} = \min \{ \gamma |j - i|, \gamma(n - |j - i|) \},$$

where n is the number of players and $\gamma \geq 0$ are the so-called unit link costs.

The model is further simplified to calculate two examples by assuming a functional form for the net benefit of a link to a player as the simple combination of all the factors:

$$b_{ij,t} = \kappa_1 I_{ij,t} v_{ij,t} + \kappa_2 S_{ij,t} + \kappa_3 R_{j,t} - I_{ij,t} h(d_{j,t}) - I_{ij,t} c_{ij} \quad (1)$$

where $\kappa_1, \kappa_2, \kappa_3$ are constants and $h(d_{j,t})$ is some function on the degree of player j . These examples are calculated to get some insights into the formation of social capital.

At this point it is useful to discuss the difference between depreciation of social capital and the maintenance cost of a link. They both have a negative impact on net benefit. Social capital is a form of capital, an asset. Social assets depreciate or lose value over time. There are at least two reasons for this. The first is that as substitutes are developed, assets — whether social or physical — lose their value. It is not difficult to find an example of a relationship that no longer meets the needs of one of the participants. The second reason is that as time passes, the value of past benefits may not be remembered fully by the beneficiary, therefore these past benefits lose some of their value over time. On the other hand, maintenance costs are the explicit costs of forming and maintaining a relationship and are specific to two players determined by their social distance. The depreciation rate δ is uniform over all links and the maintenance cost c_{ij} is specific to a particular link.

DISCUSSION OF SIMULATION RESULTS

Simulations begin with the empty network. Initially, social capital and reputation are zero because there has been no history of links, $S_{ij,t=0} = 0$ and $R_{i,t=0} = 0$ for all $i, j \in N$. Players are distributed around the circle in an equidistant fashion. Each discrete-time period $t \in \mathbb{N}_0 = \{0, 1, 2, 3, \dots\}$ one pair is chosen at random and asked if they would like to form a link, all other linked players are asked if they would like to sever. Players choose to add a link if the benefit of adding a link is positive, $b_{ij,t} \geq 0$, and will sever if a link if the benefit of keeping the link is negative, $b_{ij,t} < 0$. Players who continue to maintain links for more than one period accumulate social capital and reputation.

For $i, j \in N$, $v_{ij,t} = v$ is exogenously given and constant. This means that for any given pair of players forming a link, the value from current interaction $v_{ij,t}$ is simply some pre-defined value every period. Other given parameters are $\kappa_1, \kappa_2, \kappa_3$, the weights of current benefit (v), social capital ($S_{ij,t}$), and reputation ($R_{j,t}$), respectively, γ , the per unit cost of connection, and δ , the depreciation rate. The congestion function $h(d_{j,t})$ will have different functional forms. In the first example $h(d_{j,t})$ is linear and in the second example it is quadratic.

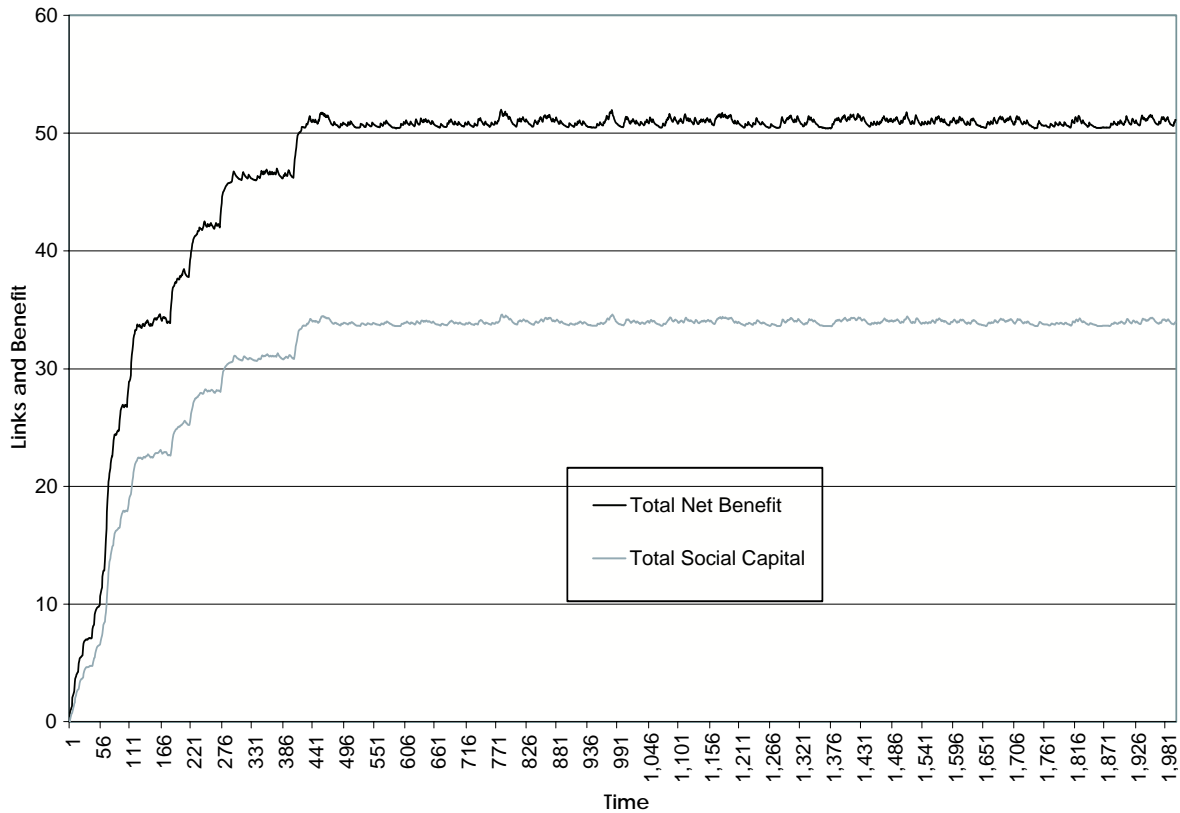
In the first model, the linear model,⁵ social capital forms as the relationships are maintained. Then social capital is maintained to a constant level. The simulations were run for 10,000 periods with 20 players. The remaining 8,000 periods (not pictured) look very much like a continuation of Figure 2.

This particular system is based on rules that allow social capital to form and continue to be maintained, but not to the level that would encourage players to maintain links that are farther away than their direct neighbours. In the linear model, players link only to their nearest neighbour. Social capital is maintained to a near constant level since the resulting network is stable. In turn, this is because the given parameters were manipulated to create this outcome. This example shows that even though social capital is an asset, it may not necessarily be accumulated to a level that allows individuals to make costly distant connections. These

⁵ $b_{ij,t} = I_{ij,t} + 0.35S_{ij,t} + 0.2R_{j,t} - I_{ij,t} \cdot 0.05d_{j,t} - I_{ij,t}c_{ij}$

distant connections are very important because they represent Granovetter’s (1973) “weak link.” They represent “linkages” that can assist in an individual’s mobility. As in this simulation, transaction costs to “outsiders” may be too high for individuals to bear.

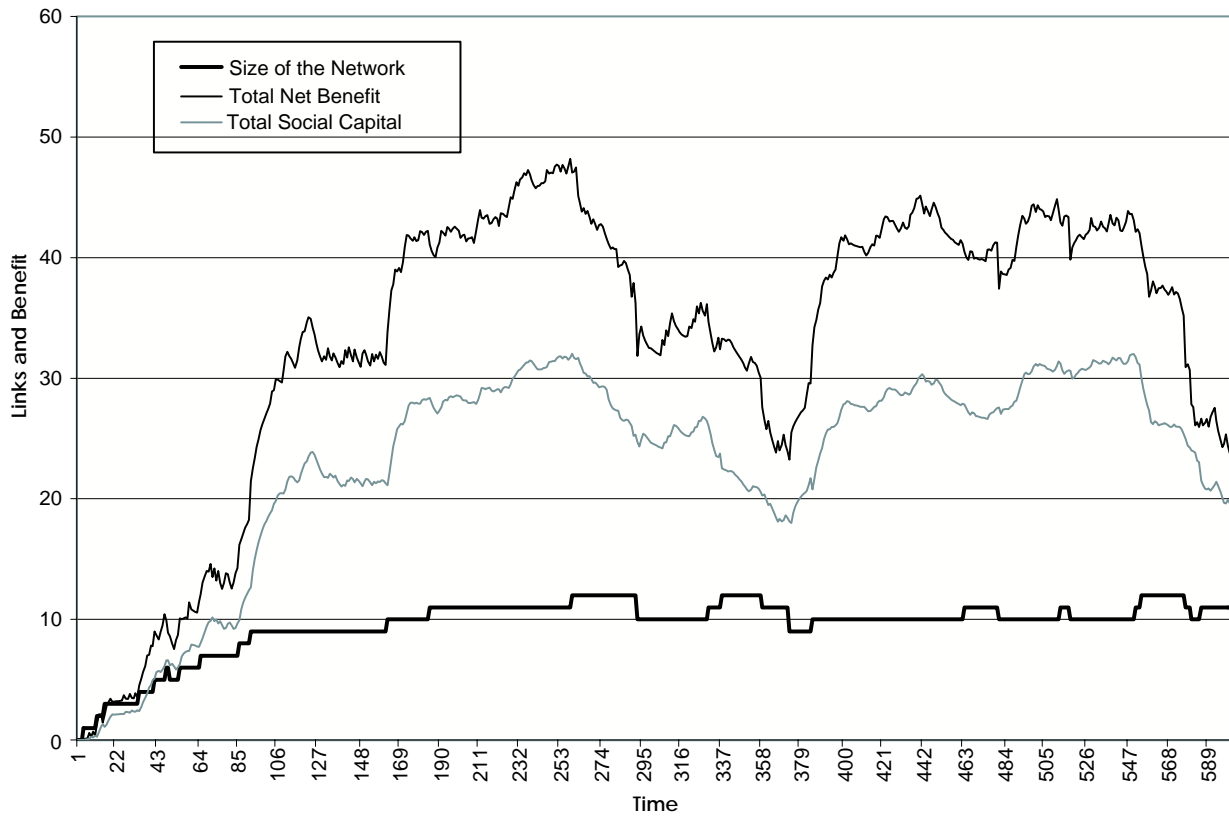
Figure 2: Total Net Benefit and Total Social Capital, 2,000 Periods, Linear Model



The second model, referred to as the quadratic model,⁶ starts with an empty network, 10 players, and runs for 10,000 periods. There is no stable state resulting. Hence the system remains in permanent volatility. As with the linear model, players are not able to afford a long link without some historical benefit. In this model, however, as the social capital of each player accumulates, this in turn enhances the each player’s reputation. Eventually this allows each to afford a more expensive, distant link. Agents were able to build up enough social capital to make links beyond their direct neighbours. The size of the network formed is depicted by the bold straight lines of Figure 3. The size of the graph mostly increases from 1 player to 12 and then it continues to vary in size from 9 to 12 players. If the network size is greater than 10, then it must be that at least 2 of the 10 players are connecting to players farther away than their direct neighbours.

⁶For all $i, j \in N$ and $t \in \mathbb{N}_0$, let $v_{ij,t} = v = 1$, $\delta = 0.6$, $\gamma = 0.51$, $\kappa_1 = 1$, $\kappa_2 = 0.4$, $\kappa_3 = 0.2$ and $h(d_{j,t}) = 0.45(d_{j,t} - 2)^2$. Equation (1) now becomes $b_{ij,t} = I_{ij,t} + 0.4S_{ij,t} + 0.2R_{j,t} - I_{ij,t} \cdot 0.45(d_{j,t} - 2)^2 - I_{ij,t}c_{ij}$.

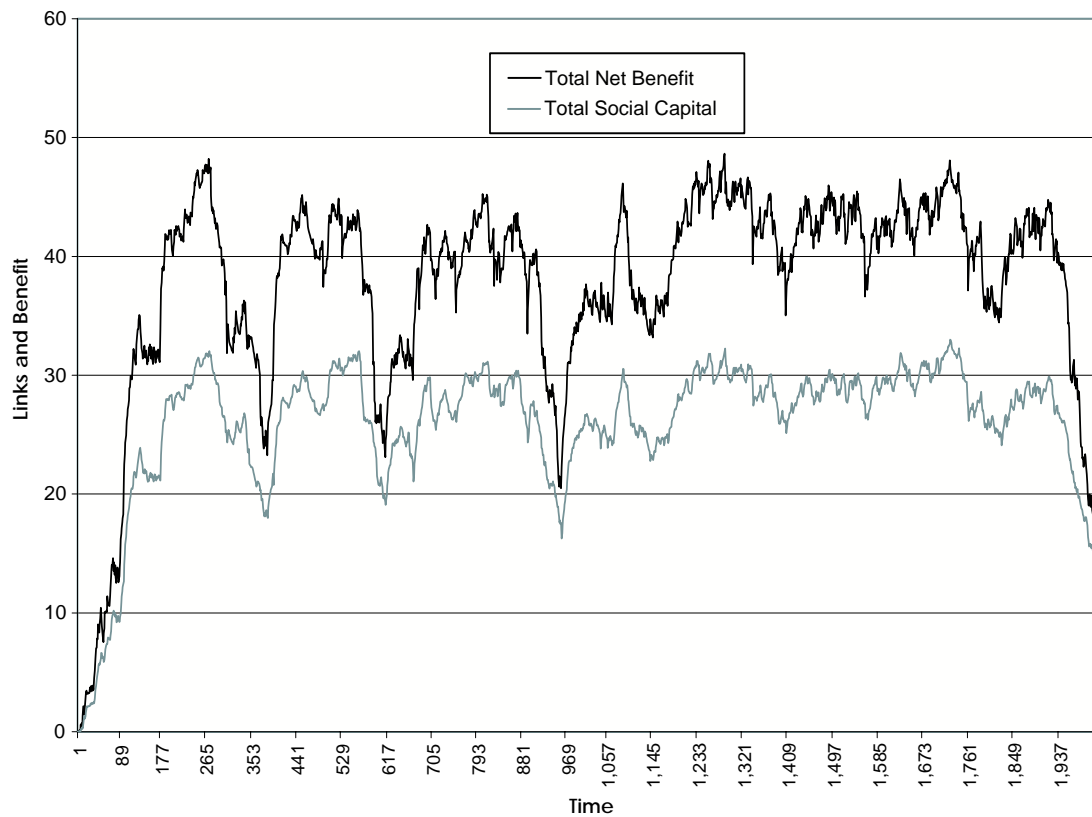
Figure 3: Comparison of Size of Network, Total Social Capital, and Total Net Benefits; Quadratic Model



As the network builds in size sometimes to 10 players, other times to 11 players, it is able to accumulate more capital (see Figure 3). When one more link is formed, it has the effect of causing other connected members of the network to lose social capital due to *increased congestion*. This congestion effect is illustrated in the literature with the discussion of some of the negative effects of social capital. Once a group is sufficiently networked, it may be optimal to restrict access to the members of the group.

In this model, social capital per link changes quite dramatically over time. The major downward dips in social capital follow periods of congestion in the network. Figure 4 illustrates the turbulent level of social capital for several hundred periods. The remaining 8,000 periods (not pictured) look very much like a continuation of Figure 4.

Figure 4: Total Net Benefit and Total Social Capital, 2,000 Periods; Quadratic Model



Both models of social capital accumulation show that social capital can be built without creating the incentive for all players to be connected. That is, benefits do not have to be increased to the point of making all connections affordable. The primary difference between the set-up of the two simulation models is how congestion is handled. In the first model it is a simple, linear function of the degree of connectedness of a player. This has a minor role in limiting the amount of social capital accumulated. In this model the coefficients on $S_{ij,t}$ and $R_{j,t}$ play a central role in keeping the state of net benefits nearly steady. To observe a system that builds social capital, maintains more distant links, and does not create the complete network, then some combination of a quadratic congestion function and a quadratic cost function is needed.

One important and needed extension to the deterministic model is the addition of imperfect agents, people who do not always give the benefit v_{ij} consistently. Given the uncertain nature of the returns to social capital, players would be imperfect in the realization of $v_{ij,t}$. The population of players could be distributed into two groups, players who give the current benefit $v_{ij,t}$ with probability $1 - \varepsilon_1$ and players who give the current benefit $v_{ij,t}$ with probability $1 - \varepsilon_2$, where $\varepsilon_1 < \varepsilon_2$. Basically, the players differ in the probability that they will give the current benefit. The net benefit for player i for a relationship with player j in the deterministic system represented by Equation (1) would become

$$b_{ij,t} = \kappa_1 I_{ij,t} E(v_{ij,t}) + \kappa_2 S_{ij,t} + \kappa_3 R_{j,t} - I_{ij,t} h(d_{j,t}) - I_{ij,t} c_{ij}, \quad (2)$$

for the system with imperfect agents. $E(v_{ij,t}) = (1 - \varepsilon_1)v_{ij,t}$ if player j was of Type 1 and $E(v_{ij,t}) = (1 - \varepsilon_2)v_{ij,t}$ if player j was of Type 2. The players could make choices on the reliability of links as well as the duration. For simplicity, players of Type 1 can be called consistent and players of Type 2 can be called inconsistent. It would be expected that social capital would be used to maintain relationships with both types of agents. The goal of this extension is that it can be safely assumed that the poor, given that they have fewer assets than the non-poor, may be less consistent with their abilities to meet commitments ($E(v_{ij,t})$) in their social network. It is not necessarily true that less consistent agents maintain less social capital than the consistent agents, but it may be that they are *restricted* to maintaining the connections of low cost connections — those in their immediate neighbourhood, family, and close friends — and cannot maintain distant, perhaps beneficial, links.

In these simulations, every player has an equal chance of meeting another player. This is indeed a heavy assumption. If it is assumed that there are such large differences between people (social or geographic) that the likelihood of meeting for some pairs is very close to zero, then it would not matter how much social capital a person had; there would be some links that would never form. In terms of the model presented, the circle could be split into two and there would be no links allowed between the two halves. A real world example of this phenomenon would be an isolated community. A representative community member could know everyone in his or her village and could maintain a lot of social capital in his or her village. Because opportunity for interaction external to his or her village is impossible, he or she has no outside links. This is an extreme example, but nevertheless an interesting one. If it is assumed there is some limit to the social capital that can be generated in a village, then the only way to increase social capital is to lift the barrier between the villagers and outsiders.

Implications for CEIP Research

Woolcock and Narayan (2000) place social capital on the list of key resources that communities can use to “take advantage of new opportunities” (p. 3). In the same sense that social capital may be key for communities to take advantage of new opportunities, it may also be essential to an individual. For the communities and the individuals invited to participate, the Community Employment Innovation Project (CEIP) is an opportunity. It is an opportunity for residents to develop their communities and it is an opportunity for the individuals invited to participate to develop themselves. Perhaps even more importantly, it is an opportunity to see whether policy can change social networks in a way that enhances the benefits from social capital.

CEIP has the capacity to affect social networks, and therefore social capital, in regard to two different populations. The first population is the community members. CEIP requires that selected communities establish a volunteer community board to mobilize community support, and to plan and set priorities for the kinds of projects the community wants to see undertaken. Boards must seek support from community members and consult in various ways. In other words, CEIP is expected to bring people together in new ways, some of whom may not normally meet at all.

The second population is the individual participants. CEIP participants are recruited from the Cape Breton Regional Municipality and are assigned to work in the selected communities on a number of projects over a maximum of three years. During this three-year period, participants are expected to develop human and social capital. They work in teams with CEIP and non-CEIP co-workers they may not have met before. The opportunity for participants to learn skills is created through varying work assignments. The creation of social capital, through network connections, should also be an outcome of the CEIP.

THE THEORETICAL IMPACT OF CEIP ON SOCIAL RELATIONSHIPS IN CAPE BRETON

In terms of the model presented in the last section, the CEIP can affect the accumulation of social capital. The six factors described in the subsection entitled “Dynamics of Social Capital Formation” can be put into context in the CEIP experience for both populations of interest. Below, the discussion will focus on the individual participants in CEIP, as the comparison for the community members is largely the same. The repeated interaction by individuals over the term of CEIP should enhance each participant’s social network. This means that for two individuals, i and j , it will be more likely that $I_{ij} = 1$, and that link will have the opportunity (first meeting) to form. Because CEIP guarantees an income to participants over three years, this project stabilizes income and would mean that individuals become more reliable in the maintenance of their relationships. In terms of the model extension, this means that the value of linking to a program participant is positive ($v_{ij} > 0$) and more reliable than if they were not a participant ($\varepsilon_{CEIP} < \varepsilon_{-CEIP}$). The rates of depreciation and functional accumulation of

social capital (S_{ij}) and reputation (R_j) are not within the realm of influence for CEIP. However, the magnitude of social capital (S_{ij}) and reputation (R_j) should increase over the span of CEIP. Additionally, perhaps CEIP can affect the congestion (d_j) of networks. If a network is congested, the only way to create a new link is to sever an existing link. This substitution is of course up to the participants, but if they have the opportunity to form new links and do so by severing some existing links, the logical conclusion is that these new links are more valuable to them. Finally, the most important effect on the creation of social networks is that CEIP reduces the cost of connecting for all participants for the duration of the project. This means that the cost of connection (c_{ij}) is lower for participants. Project sponsors, voluntary project managers employing CEIP participants, may be individuals that participants would not otherwise meet if not for the CEIP experience.

CEIP participants are often assigned to projects outside of their community of residence. This practice will help those participants to meet others outside of their local community, thus decreasing the cost of connection to individuals outside of their local network. Theoretically, if costs can be decreased enough, the distance between individuals can be decreased enough that relationships have a chance to form and persist. The expectation is that this type of activity will create social links where there were none and increase social capital where there was some.

MEASURING THE IMPACT IN CAPE BRETON

Network size, density, and homogeneity are all factors that affect the benefits of connections. By simply decreasing the cost of connecting for community members and individual participants, CEIP should have a positive effect on network size. The participant baseline survey and the follow-up surveys ask a series of questions designed to elicit a list of contacts in relation to help with household activities, specialized advice, emotional support, and help with finding a job. The number of non-redundant relations listed is used to approximate the size of each participant's network. This list is not exhaustive and typically will not be a complete accounting of an individual's network of contacts. However, it is expected that comparison of the lists from experimental and control group members will generate a consistent and reliable estimate of the impact of CEIP on the relative size of the network of contacts for each CEIP participant.

Network density and homogeneity may increase or decrease with the social opportunities presented in CEIP. Once each participant in the baseline survey has recorded the list of contacts, they are queried as to how well their contacts know one another. The level of interconnectivity reported is used as a measurement of density of network connections.

To assess the homogeneity of a respondent's network, the CEIP surveys ask a number of questions about the characteristics of each contact. In a homogeneous network, the contacts share quite similar characteristics. Respondents are asked to identify how many contacts are family members, friends, acquaintances, or work colleagues. In addition, respondents are asked to indicate the age range, gender, education level, area of residence, common religious

beliefs, and political affiliation for each contact. These answers will indicate a measure for the homogeneity of an individual's network.

All of the questions in regard to size, density, and homogeneity are repeated in the follow-up surveys. If, as Woolcock and Narayan (2000) hypothesize, the expectation is that less dense and less homogeneous networks lead to the types of social capital that help individuals “confront poverty and vulnerability, resolve disputes, and/or take advantage of new opportunities” (p. 226), then it is hoped that the progressive intervention of CEIP can help build more diverse and less dense networks in addition to larger networks to help the people of Cape Breton. The CEIP evaluation will look for evidence of increasing network size, diversity of networks, and the additional resources participants and community members can access through their networks.

References

- Akerlof, G. (1997). Social distance and social decisions. *Econometrica*, 65, 1005–1027.
- Allen, D. W. (2000). Social networks and self-employment. *The Journal of Socio-Economics*, 29, 487–501.
- Anheier, H. K., Gerhards, J., & Romo, F. P. (1995). Forms of capital and social structure in cultural fields: Examining Bourdieu's social topography. *American Journal of Sociology*, 100, 859–903.
- Bates, R. (1999). *Ethnicity, capital formation and conflict* (Social Capital Initiative Working Paper No. 12). Washington, DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Bertrand, M., Luttmer, E. F. P., & Mullainathan, S. (2000). Network effects and welfare cultures. *The Quarterly Journal of Economics*, 115, 1019–1055.
- Bornstein, D. (1996). *The price of a dream: The story of the Grameen Bank and the idea that is helping the poor to change their lives*. New York: Simon and Schuster.
- Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 239–258). New York: Greenwood Press.
- Bourgois, P. (1995). *In search of respect: Selling crack in El Barrio*. New York: Cambridge University Press.
- Bowles, S. (1999). Social capital and community governance. *Focus*, 20(3), 6–11.
- Brown, T. F. (2000). *Theoretical perspectives on social capital*. Retrieved June 20, 2000, from the World Wide Web: <http://jhunix.hcf.jhu.edu/~tombrown/Econsoc/soccap.html>.
- Burt, R. S. (1992). *Structural holes, the social structure of competition*. Cambridge, MA: Harvard University Press.
- Coleman, J. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.
- Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 95, S95–S120.
- Davern, M. (1999). Social networks and prestige attainment: New empirical findings. *American Journal of Economics and Sociology*, 58, 843–864.
- Debreu, G. (1969). Neighboring economic agents. *La Decision*, 171, 85–90.
- Durlauf, S. N. (1999). The case “against” social capital. *Focus*, 20(3), 1–5.
- Fernandez-Kelly, M. P. (1995). Social and cultural capital in the urban ghetto: implications for the economic sociology of immigration. In A. Portes (Ed.), *The economic sociology of immigration* (pp. 213–247). New York: Russell Sage.

- Geertz, C. (1963). *Peddlers and princes*. Chicago: University of Chicago Press.
- Glaeser, E. L. (2001). The formation of social capital. *Isuma: Canadian Journal of Policy Research*, 2 (1), 34–40.
- Glaeser, E. L., Laibson, D. & Sacerdote, B. (2000). *The economic approach to social capital* (Working Paper 7728). Cambridge, MA.: National Bureau of Economic Research.
- Gittell, R., & Vidal, V. (1998). *Community organizing: Building social capital as a development strategy*. Thousand Oaks, CA: Sage Publications.
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.
- Grootaert, C. (1998). *Social capital: The missing link?* (Social Capital Initiative Working Paper No. 3). Washington, DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Gjerstad, S., & Dickhaut, J. (1998). Price formation in double auctions. *Games and Economic Behavior*, 22, 1–29.
- Hagan, J., MacMillan, R., & Wheaton, B. (1996). New kid in town: Social capital and the life course effects of family migration in children. *American Sociological Review*, 61, 368–385.
- Hall, R., & Jones, C. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics*, 114, 83–116.
- Ingram, P., & Roberts, P. W. (2000). Friendships among competitors in the Sydney hotel industry. *American Journal of Sociology*, 106, 387–423.
- Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.
- Johnson, C., & Gilles, R. P. (2000). Spatial social networks. *Review of Economic Design*, 5, 273–299.
- Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *Quarterly Journal of Economics*, 112, 1251–1288.
- Koo, B. H., & Perkins, D. (Eds.). (1995). *Social capability and long-term economic growth*. New York: St. Martin's Press.
- Laslier, J.-F., Topol, R., & Walliser, B. (2001). A behavioral learning process in games. *Games and Economic Behavior*, 37, 340–366.
- Light, I. (1984). Immigrant and ethnic enterprise in North America. *Ethnic and Racial Studies*, 7, 195–216.
- Lin, N. (1999). Social networks and status attainment. *Annual Review of Sociology*, 25, 467–487.
- Lin, N. (1982). Social resources and instrumental action. In P. V. Marsden & N. Lin (Eds.), *Social structure and network analysis*, (pp. 131–145). Beverly Hills, CA: Sage Publications.

- Lowry, G. (1977). A dynamic theory of racial income differences. In P. Wallace & A. LaMond (Eds.), *Women, minorities and unemployment discrimination* (pp. 153–186). Lexington, MA: Lexington Books.
- Montgomery, J. D. (1991). Social networks and labor-market outcomes: Toward an economic analysis. *American Economic Review*, *81*, 1408–1418.
- Paldam, M., & Tinggaard Svendsen, G. (2000). An essay on social capital: Looking for the fire behind the smoke. *European Journal of Political Economy*, *16*, 339–366.
- Pantoja, E. (2000). *Exploring the concept of social capital and its relevance for community based development: The case of coal mining areas in Orissa, India* (Social Capital Initiative Working Paper No. 18). Washington, DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, *24*, 1–24.
- Portes, A., & Landolt, P. (1996). The downside of social capital. *The American Prospect*, *7*(26), 18–21, 94.
- Putnam, R. D. (1993). The prosperous community: Social capital and public life. *The American Prospect*, *4*(13) 35–42.
- Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon & Schuster.
- Reingold, D. A. (1999). Social networks and the employment problem of the urban poor. *Urban Studies*, *36*, 1907–1932.
- Rice, J., & Prince, M. (2000). Civil society and community capacity: Links between social policy and social capital. In *Changing politics of Canadian social policy* (pp. 207–231). Toronto: University of Toronto Press Inc.
- Rose, R. (1998). *Getting things done in an anti-modern society: Social capital network in Russia* (Social Capital Initiative Working Paper No. 6). Washington DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Rose, R. (1999). *What does social capital add to individual welfare? An empirical analysis of Russia* (Social Capital Initiative Working Paper No. 15). Washington, DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Serageldin, I. (1998). *The initiative on defining, monitoring and measuring social capital* (Social Capital Initiative Working Paper No. 1). Washington DC: The World Bank Social Development Family Environmentally and Socially Sustainable Development Network.
- Stanton-Salazar, R. D., & Dornbusch, S. M. (1995). Social capital and the reproduction of inequality: Information networks among Mexican-origin high school students. *Sociology of Education*, *68*, 116–135.

- Temkin, K., & Rohe, W. (1998). Social capital and neighborhood stability: An empirical investigation. *Housing Policy Debate*, 9(1): 61–88.
- Temple, J., & Johnson, P. (1998). Social capability and economic growth. *Quarterly Journal of Economics*, 113, 965–990.
- van Bastelaer, T. (1999). *Does social capital facilitate the poor's access to credit? A review of the microeconomic literature* (Social Capital Initiative Working Paper 8). Washington, DC: The World Bank Development Family Environmentally and Socially Sustainable Development Network.
- Waldinger, R. (1995). The “other side” of embeddedness: A case study of the interplay between economy and ethnicity. *Ethnic and Racial Studies*, 18, 555–580.
- Wegener, B. (1991). Job mobility and social ties: Social resources, prior job, and status attainment. *American Sociological Review*, 56, 60–71.
- Wilson, R. (1985). *Introduction to graph theory*. New York: John Wiley & Sons Inc.
- Woolcock, M. (2000). *The place of social capital in understanding social and economic outcomes*. Paper prepared for an international symposium on The Contribution of Human and Social Capital to Sustained Economic Growth and Well-Being. Quebec City, March 19–21, 2000.
- Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research and policy. *World Bank Research Observer*, 15, 225–249.