Social Capital and Economic Cooperation

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Abstract

The socioeconomic movement is an effort to better explain human behavior by combining insights of economists and sociologists. This paper contributes to the socioeconomic literature by including the influence of relationships, values, and social bonds in the neoclassical economic model by introducing social capital coefficients. The usefulness of the resulting social capital model is demonstrated theoretically in a two-firm cooperative model and tested empirically using data from a survey of students who allocate their time between individual and joint projects.

Key Words: social capital, social capital coefficients, total revenue-equity frontier

Introduction

According to socioeconomists, individual choices are shaped by values, emotions, social bonds, and judgments, rather than by a precise calculation of self-interest (Coughlin). The socioeconomic movement may be traced to Weber who popularized the term in the 1890s. He intended to reconcile two conflicting schools of economists: the historical school led by the German economist Gustav von Schmoller and the neoclassical school led by Carl Menger.

Weber believed that real progress in economics depended on the contributions of both historical and theoretical economics. Despite Weber's effort, the synthesis failed and economics moved away from the study of social bonds and networks. Afterwards, neoclassical economic theory increasingly described economic agents as connected to each other through monetary exchanges (Swedberg).

Economists have expressed increasing confidence that their approach can be used to solve problems previously considered to be the domain of other social sciences. Indicative of economists' expansive agenda is Becker's (1976b) claim that: "...the economic approach is applicable to 'all human behavior'" and Hirshleifer's (1985) view that "... social sciences will soon become increasingly indistinguishable from economics."

As economic inquiry has been extended into areas previously examined by sociologists, the differences between the underlying assumptions of economists and sociologists have become more focused. Swedberg characterized these differences as follows. Economists focus on individual actors with freedom of action who make rational self-interested calculations in the market. Sociologists view actions as collective, constrained by social structures, motivated by irrational feelings, traditions, and values, occurring everywhere but in the market.

Economists and sociologists have important insights that can be combined to better explain and predict economic behavior. In what follows, we review the literature supporting economists' emphasis on self-interest and that supporting the view that relationships modify agents' pursuit of self-interest. Next, relationships are introduced into the neoclassical utility-maximizing model using social capital coefficients and the resulting model is used to demonstrate that important economic outcomes may depend on social capital. Then, we report on a study conducted among students who were asked how they would allocate their time between individual projects and joint projects depending on who was their teammate. Finally, this paper concludes with a summary.

The Assumption of Self-Interest

Edgeworth, a famous 19th century economist, wrote that: "The first principle of Economics is that every agent is actuated only by self-interest" (Rescher). Supporting this view, Mueller wrote:

> "And, I submit, the only assumption essential to a descriptive and predictive science of human behavior is egoism."

Tullock, convinced of the importance of self-interest wrote: "...the average human being is about 95 percent selfish in the narrow sense of the term" (as quoted by Mansbridge, 1990, p. 12). Adam Smith (1776) declared: "It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest" (p. 25).

Quirk and Saposnik defended the assumption of selfish preferences because alternative assumptions precluded the deduction of interesting theorems:

> "...the specification of assuming rankings defined with respect to own commodity bundles turns out to be virtually impossible to avoid if any interesting theorems concerning the operation of the economy are to be formulated. This extremely important

restriction on the preferences of consumers is referred to as the condition of selfishness of preferences."

Commenting on the neoclassical paradigm and its focus on self-interest, Etzioni wrote:

> "The neoclassical paradigm, we have seen, attempts to show not merely that there is an element of pleasure (self-interest) in all seemingly altruistic behavior, but that self-interest can explain it all."

While some in society lament increasing selfishness, most neoclassical economists are not alarmed. Instead, they believe Adam Smith's invisible and selfish hand promotes society's best interest. Arrow and Hahn wrote:

> "There is by now a long and fairly imposing line of economists from Adam Smith to the present who have sought to show that a decentralized economy motivated by self-interest...would be compatible with a coherent disposition of economic resources that could be regarded, in a well-defined sense, as superior to a large class of possible alternative dispositions..."

Criticism of Self-Interest

The assumption that economic agents act selfishly is rarely tested by economists. Instead, tastes, expectations, and preferences are defined in such a way that whatever behavior is observed can be explained by a self-interested pursuit. Sen complained: "It is possible to define a person's interest in such a way that no matter what he does can be seen as furthering his own interests in every isolated act of choice."

Cross observed:

> "...we often overlook the fact that the empirical 'success' of many economic models is principally

derived from accommodating adjustments in complementary hypotheses...Market data are used to make inferences about the nature of preferences, expectations, and production functions through the mediating assumption of maximizing behavior, and unless these inferences are independently validated, it is impossible to uncover violations of the intermediary hypothesis..."

Economic analysis that begins with the tautology "that whatever we do is motivated by self-interest" precludes the examination of other reasonable assumptions about behavior. One such alternative assumption generally accepted by sociologists is that relationships matter. In the next section, evidence supporting the assumption that relationships matter is presented.

Evidence That Relationships Matter

The mainstream neoclassical view is that the identity of participants in an organized market does not affect market outcomes (Telser and Higinbotham). Schmid and Robison discuss recent experiments that reject this view. Other evidence that relationships matter follows.

When farmland sales are recorded, a distinction is made between land sales between family members and "arms-length" sales made between non-related individuals. The distinction is made because realtors recognize that the sale prices of land depend on the relationship between the seller and buyer (Gilliland).

Nepotism laws impose restrictions on close relatives being hired by the government in the same agency. These laws recognize the tendency of government employers to grant advantages to their relatives. Civil rights laws preclude employment being denied when the basis of the discrimination is race. These laws recognize that race, a special kind of relationship, sometimes influences employment decisions.

Our judicial system emphasizes the role of relationships by placing a blindfold on our symbol of the court, Lady Justice. The blindfold helps her make impartial judgments free from the bias created by her knowing who is to be judged. Those who frequent restaurants nearly always leave tips, even when they do not expect to be waited on again by the same server. Finally, reviews of articles submitted to many professional journals are conducted anonymously. Unless relationships influenced reviews, anonymity in the review process would be unnecessary. Anonymity, however, appears to be justified since the evidence indicates relationships do influence the outcomes of the review process (Blank).

Etzioni wrote that a considerable body of experimental data is not consistent with the assumption of selfish preferences. For example, several experiments show that many people mail back "lost" wallets to strangers, cash intact (Hornstein, Fisch, and Holmes, 1968). In one study, 64 percent of the subjects returned a lost contribution to an "Institute for Research in Medicine" (Hornstein et al., 1971, p. 110; Hornstein, 1976, pp. 95-96). In another study, 59 percent of those surveyed said they would donate bone marrow for strangers (Schwartz). An additional 24 percent indicated at least an even chance that they would donate bone marrow if called upon.

Frank summarizes the conflict between the assumption of selfish preferences in economics and observed preferences:

"...Economists, for their part, point with pride to the power of self-interest to explain and predict behavior, not only in the world of commerce but in networks of personal relationships as well. And yet, the plain fact is that many people do not fit the me-first caricature. They give anonymously to public television stations and private charities. They donate bone marrow to strangers with leukemia. They endure great trouble and expense to see justice done, even when it will not undo the original injury. At great risk to themselves, they pull people from burning

buildings, and jump into icy rivers to rescue people who are about to drown.   Soldiers throw their bodies atop live grenades to save their comrades. Seen through the lens of modern self-interest theory, such behavior is the human equivalent of planets traveling in square orbits."

In contrast to the evidence that relationships and values matter, one recent study confirms that economists practice what they teach about selfishness. In a study designed to test willingness to contribute to a social versus a private account, Maxwell and Ames found that economics students contributed an average of only 20 percent of their endowments to the public account, significantly less than the 49 percent average for all other subjects.[1]

Perhaps supported by observations of their own behavior, some economists continue to reject the view that relationships matter.   Hirshleifer's (1994) recent Presidential Address to the Western Economics Association reaffirmed his faith in selfish preferences:

> "...I am among those who remain skeptical about the significance of self-reported contributions to charity, or about behavior in hypothetical or small-stakes Prisoners' Dilemma experiments. My guess is that economists are not more selfish, but only more acceptant of human selfishness as a fact of life."

Hirshleifer may be justified in his skepticism of self-reported experimental results; at least when the subjects are students of economics. Three professors at George Washington University recently set out to test if, in fact, economics students are as selfish as they reported. They dropped stamped, addressed envelopes containing $10 in cash in different classrooms. Of the envelopes dropped in the economics classrooms, 56 percent were returned with the money. Only 31 percent of the envelopes dropped in history, psychology, and business classes were returned. It

appears that economics students aren't any more selfish than other students—they just claim to be (Bennett).

The Altruism Literature

Some important work has extended the neoclassical model beyond its traditional focus on selfishness. One extension of the neoclassical model assumes an altruistic agent has a taste for philanthropy.   Characteristic of this work is Schwartz (1970) and Feldstein and Taylor (1976).

A second extension of the self-interested neoclassical model treats the ith person's utility as dependent on own consumption of good x_i and the jth person's utility function U_j. Hence, the ith person maximizes $U_i=f(x_i,U_j)$. In this model, the utility of the jth person is treated as a consumer good that person i consumes in an effort to increase his or her self-interest (Bernheim and Stark).

A third approach that goes beyond self-interested motivations is the club model. At the heart of this approach is the assumption that the desire to belong to the club leads to behavior consistent with the objectives of the club.

Still other extensions of the neoclassical model recognize relationships among family members as affecting economic behavior. These efforts recognize that family members may act in each other's interest. Becker's (1981) famous work formalizes some interesting conclusion for agents whose well-being depends on the well-being of other family members. Consistent with the focus on the family are studies linking altruism to genetic fitness (Samuelson, Dawkins, and Becker (1976a)).

Social Capital Theory

The essence of the neoclassical paradigm is the assumption of rational decision makers with stable preferences who maximize own utility usually defined over own consumption bundles.   In addition, most applications of the neoclassical model assume selfishness of preferences. In this paper, the assumptions that decision makers are rational and maximize own utility are accepted. Rejected in this paper, however, is the assumption of selfishness of preferences. Instead, we accept the assumption of

socioeconomists that relationships matter. By recognizing that relationships matter we intend to extend the traditional altruism models by identifying what relationships matter and how relationships influence the attainment of socially desirable goals.

The intellectual foundation for the social capital approach adopted in this study can be traced to Adam Smith (1759) who recognized that we are influenced by the well-being of others. He wrote:

> "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it" (p. 3).

Smith (1759) described the link between relationships and vicarious sensing of well-being as follows:

> "Every man feels his own pleasures and his own pains more sensibly than those of other people...After himself, the members of his own family, those who usually live in the same house with him, his parents, his children, his brothers and sisters, are naturally the objects of his warmest affection" (p. 321).

Social capital is used in this paper to model the important insights of Smith. The concept of social capital has been introduced to agricultural economists by Robison and Schmid (1989, 1994), Robison and Hanson, and Schmid and Robison. Coleman introduced social capital to sociologists and Hyden discussed it in a political science setting. Putnam suggested recently that its supply in the United States has decreased.

The underlying assumption of social capital theory is that relationships matter. Relationships are represented by social capital coefficients K_{ij} which model the degree to which person i's well-being is influenced by the well-being of person, place, or thing j. Person i may develop a relationship toward person, place, or thing j of sympathy ($K_{ij}>0$), antipathy ($K_{ij}<0$), or neutrality ($K_{ij}=0$) (Bogardus). However, the reverse is not always true. Places and things are not usually assumed to be capable of a relationship with person i. That is, i must be a person capable of vicarious sensing to have a relationship with person, place, or thing j.

The object of i's social capital j may include not only persons, but pets, one's country, community, or favorite sports team. Much that has been written about endowment effects suggests social capital can also develop toward inanimate objects such as coffee mugs and pens (Kahneman, Knetsch, and Thaler (1986) and (1990)).

The magnitude and sign of the social capital coefficient K_{ij} is assumed to depend on i's preferences and values compared to important characteristics of person, place, or thing j as perceived by i. If j is a person who likes the same things and holds the same values as i, the relationship is expected to be sympathetic. On the other hand, if i views j as a competitor in a zero sum game, the relationship is likely to be antipathetic even when the competitors are family members. Because of its negative effect on relationships, i and j often create institutions designed to reduce personalized competition.

Social capital coefficients also depend on social distance or awareness (Park). Relationships between i and j can develop only if i is aware of j. An infinite social distance implies that i is not aware of j's existence and K_{ij} is zero.

Social capital may also be measured toward oneself. One's own social capital coefficient K_{ii} reflects the results of a self-evaluation process that monitors and compares one's own behavior to an internalized and accepted set of values. Actions consistent with one's internalized set of values may increase one's own social capital. Thus, an economic agent may increase his or her sense of well-being without an increase in his or her income, wealth, or profits. In fact, one may reduce one's material well-being to maintain or improve one's self-relationship measured. This occurs when one donates to charities, returns lost or stolen items, and donates blood (Stark).

The interaction between one's own utility and one's own social capital may explain much of what we have come to view as moral or philanthropic behavior. That is, the source of one's revenue may affect one's own social capital. For example, most avoid stealing. The motivation for honesty is less out of fear of being caught than a desire to maintain a positive self-relationship. It is this self-relationship that captures much of what Etzioni has described as the relationship between the valuative self and the self-interest seeking self.

Positive relationships between persons i and j, represented by the social capital coefficient K_{ij} is a resource for both i and j. It may permit j to extract favors and concessions from i not available otherwise. For person i, it represents an opportunity for an increased sense of well-being resulting from improvement in j's condition.

Social, physical, and human capital have similar properties. For example, social capital can be depreciated over time and by use. Investments in social capital occur through positive interactions between i and j that may include the exchange of gifts and price concessions. The similarities between social, physical, and human capital suggest that social capital can be studied using the standard economic tools. That is, investing and disinvesting in social capital may be viewed as an economic problem of resource allocation.

Opportunities to invest in social capital may often lead to utility-maximizing solutions inconsistent with the assumption of selfishness of preferences. Consequently, investments in social capital may lead to transactions that may occur at nonmarket prices and outside of formal markets. These exchanges outside of formal markets at nonmarket prices may not be examples of market failures but instead represent investments in social capital.

The social capital model accounts for relationships and values in the following way. The ith person is assumed to maximize the function:

$$Max_r \ U_i = U_i\left(K_{ii}(x)\pi_i(x), \ \sum_{j=1}^{n} K_{ij}(x)\pi_j(x)\right) \quad (1)$$

subject to x being less than or equal to an upper limit on i's time and resources available for building social capital. Variables π_i and π_j represent income or other measures of i and j's well-being.

The social capital model in equation (1) suggests several utility-maximizing opportunities that are ignored in most neoclassical models. These have been described recently by Robison and Schmid (1994). For example, consider the case where i cannot influence π_j significantly. This may be the case when j is one's alma mater, public radio, or favorite charity. In this case, person i may still contribute some of his or her resources to j because it increases K_{ij} and thus increases i's utility. In other cases, efforts to increase π_i may reduce K_{ii} and K_{ij}. When increasing revenue conflicts with maintaining or increasing social capital, trade-offs are made between revenue and social capital.

Social Capital and Cooperation

Social capital may be important when firms and persons known to each other agree to share the costs and benefits of a joint venture. Examples of cooperative groups include landlord and tenants, parent-teacher organizations, producer groups, buying clubs, and formal cooperatives. The social capital that exists between persons representing their respective firms influences the agreement to share benefits and costs and the willingness to divert resources away from the production of a private good to the production of a joint good. What follows demonstrates important effects of social capital on total output and distribution of output of firms that produce independently and jointly produced products.

Assume two firms i and j have resource endowments x_0 and y_0, respectively. With their endowments, firms i and j can produce a product alone or they can cooperate and invest part of their endowments to produce a joint product. Assume firm i invests x and firm j invests y of their endowments to produce a joint product $\pi^{ij}(x,y)$. Furthermore, assume that $\pi^{ij}(x,0) = \pi^{ij}(0,y) = 0$ and $\partial^2\pi^{ij}/\partial x\partial y > 0$. After investing in the joint product, firms i and j invest the remainder of their endowments to produce private goods, from which they will earn revenue $\pi^i(x_0-x)$ and $\pi^j(y_0-y)$,

respectively. Finally, assume the prices of the individually and jointly produced outputs are 1. Thus, no distinction is made between revenue and output.

Joint production agreements require firms to determine how to share output. In this case, assume the agreement is for firms i and j to share equally the jointly produced good.[2]

Then, i's revenue or outputs equals:

$$\pi_i = \pi^x(x_0 - x) + \pi^{xy}(x,y)/2 \qquad (2)$$

Similarly, firm j's revenue is:

$$\pi_j = \pi^y(y_0 - y) + \pi^{xy}(x,y)/2 \qquad (3)$$

Finally, properties are assumed for π_i and π_j that permit a unique maximum. These properties include increasing and concave functions for π_i and π_j.

Next, consider how social capital influences i and j's resource allocations of x and y. Consider two persons, i and j, whose social capital coefficients toward each other are K_{ij} and K_{ji}, respectively. Persons i and j seek to maximize their utility functions described next in equations (4) and (5):

$$\max_x \ U_i(\pi_i + K_{ij}\pi_j) = \pi^x + \left(\frac{1+K_{ij}}{2}\right)\pi^{xy} + K_{ij}\pi^y \qquad (4)$$

$$\max_y \ U_j(\pi_j + K_{ji}\pi_i) = \pi^y + \left(\frac{1+K_{ji}}{2}\right)\pi^{xy} + K_{ji}\pi^x \qquad (5)$$

Note that equations (4) and (5) are specific representations of the general social capital utility model described in equation (1) where $K_{ii} = K_{jj} = 1$ and choices of x are assumed not to alter significantly existing levels of social capital.[3]

In equations (4) and (5), it is assumed that the relationship between own social capital weighted revenue and other social capital weighted revenue is linear. The justification for this approach is that an additive utility form reduces the object of

maximization to a single term and keeps the focus on social capital rather than complex mathematical forms. We further assume that U_i and U_j are increasing and concave in x and y, respectively, so that second-order conditions hold.

First-order conditions for i's and j's utility functions can be written as:

$$\frac{dU_i}{dx} = \left[\frac{\partial \pi^x}{\partial x} + \frac{(1+K_{ij})}{2}\frac{\partial \pi^{xy}}{\partial x}\right] = 0 \qquad (6)$$

and:

$$\frac{dU_j}{dy} = \left[\frac{\partial \pi^y}{\partial y} + \frac{(1+K_{ji})}{2}\frac{\partial \pi^{xy}}{\partial y}\right] = 0 \qquad (7)$$

Society's Interest in Cooperation Between Firms

The well-being of society is described by its societal welfare function assumed here to be the sum of the utility functions of its members i and j.[4] It is described below:

$$\max_{x,y} \ U^S(K_{ii}\pi_i, K_{ij}\pi_j) = (1+K_{ji})\pi_i + (1+K_{ij})\pi_j \qquad (8)$$

The implications of the societal welfare function described in equation (8) are considered next. Society prefers more income to less—primarily because the more that is produced the more society has available for its citizens. Society also has an interest in i's revenue relative to j's. History has taught that support for societal laws and institutions depends on economic rewards being perceived as fair; and what is considered fair is related to the distribution of revenue. Thus, other things equal, society prefers a more equal distribution of revenue. On the other hand, controlled economies have demonstrated that redistributive efforts to equalize revenue often discourage efforts that would increase total output if a greater portion of the reward were returned to the producer.

As a result of these conflicting goals for equality and individual incentives, each society chooses a trade-off between the two competing goals.[5] To describe society's choices, we introduce

the revenue possibility curve in figure 1. On the vertical axis is firm i's revenue, π_i. On the horizontal axis is j's revenue, π_j. At the origin in figure 1 $\pi_i, \pi_j \neq 0$. The curved line, AB, represents all efficient resource allocations for individual and joint production possible for firms i and j. The intercepts on the horizontal and vertical axes for curved line AB represent the maximum values for π_i and π_j.

Total revenue in figure 1, $(\pi_i + \pi_j)$, is measured by the intercept of lines drawn to points on the frontier with slope of negative one. Differences in revenue $(\pi_i - \pi_j)$ are measured horizontally or vertically from the frontier to the 45° line originating at the origin. So at point C, total output is measured as the value of the horizontal or vertical intercept of the line with slope of negative one passing through point C and difference in revenue between i and j is measured as $C'C$, the vertical distance from C to the 45° line originating from the origin.

Inefficient combinations of resources in figure 1 are interior to solutions described by AB and less desired from society's perspective for the following reason. For every point interior to AB, there is a point on the frontier that provides a higher level of total revenue $(\pi_i + \pi_j)$ for a given difference in revenue $(\pi_i - \pi_j)$ or $(\pi_j - \pi_i)$. To illustrate, note that beginning at interior point, D' in figure 1, total revenue can be increased without increasing difference in revenue by moving to point D the frontier on a 45° ray.

Total revenue and the difference in revenue measured at all points on the frontier in figure 1 can be mapped to figure 2 as total revenue-equity frontier AB. All points interior to AB in figure 1 are also interior to AB in figure 2. In figure 2, the movement from D' to D involves moving vertically from point D' to point D. Alternatively, moving from C' to C in figures 1 and 2 increases both total revenue and difference in revenue. In figure 2, this movement is in the northeast direction.

If maximum total revenue occurred where the difference in revenue between i and j was zero,

society could achieve both its goals of maximizing revenue while minimizing differences in revenue. This fortunate result occurs only when π_i and π_j are identical functions. When the functions are not identical, it is still possible that increasing total revenue and decreasing differences in revenue can be achieved simultaneously. Only when moving from C to E in figure 2 must society choose between increasing total revenue or reducing differences in revenues.

Maximization of the arguments of the societal welfare function can be shown to always lead to a solution on the frontier in figures 1 and 2. That solutions to societal's welfare function always lead to solutions on the total revenue-equity frontier are obvious. For any point interior to the frontier, increasing π_i or π_j will always increase society's welfare. Thus, all societal solutions are on the total revenue-equity frontier as long as social capital coefficients are not strongly negative.

First-order conditions for equation (8) are:

$$\frac{dU^s}{dx} = \frac{\partial \pi^x}{\partial x}(1 + K_{ji}) + \frac{\partial \pi^{xi}}{\partial x}\left[1 + \frac{(K_{ji} + K_{ij})}{2}\right] = 0 \tag{9}$$

and:

$$\frac{dU^s}{dy} = \frac{\partial \pi^i}{\partial y}(1 + K_{ij}) + \frac{\partial \pi^{xi}}{\partial y}\left[1 + \frac{(K_{ij} + K_{ji})}{2}\right] = 0 \tag{10}$$

It is useful to compare society's first-order conditions for x and y with i and j's first-order conditions. First-order conditions for x in equations (6) and (9) and y in equations (7) and (10) solve for the same values of x and y when:

$$K_{ij} = \frac{1}{K_{ji}} \tag{11}$$

Private solutions for x and y when the relationship between K_{ij} and K_{ji} is different than expressed in equation (11) will result in solutions

Figure 1. A Revenue Possibility Frontier for Firm i (π_i) and Firm j (π_j)
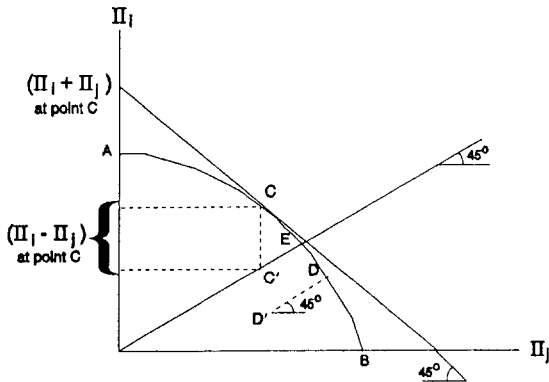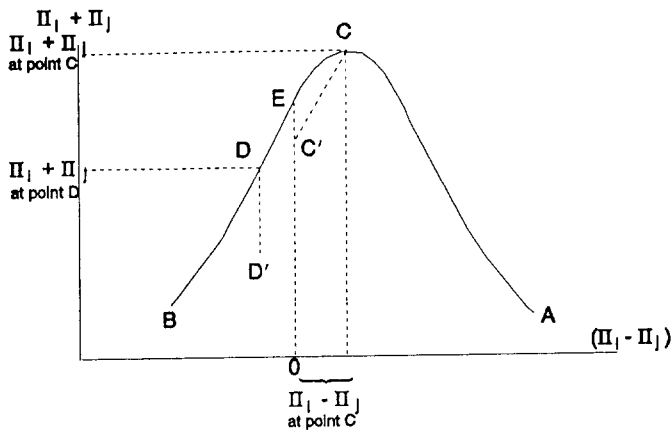

Figure 2. A Societal Efficiency Frontier Measured as Maximum Total Revenue for Given Differences in Revenue

considered inefficient by society. Included in the set of inefficient solutions are those interior to the frontier in figures 1 and 2.

It is demonstrated in the Appendix that if K_{ij} and K_{ji} both increase in response to an event α, then total revenue increases. What happens to the difference in revenue in response to increases in social capital depends on the location of the initial solution and the location of the maximum of total revenue relative to the difference in revenue in figure 2.

Empirical Results

To empirically test the main conclusions deduced for cooperating firms from the social capital model, the following test was conducted. Senior-level students in the College of Agricultural and Natural Resources at Michigan State University take a capstone course on team building. The teams are assigned arbitrarily. Students must decide how to allocate their time between preparing for exams and team efforts to prepare case studies. Grades are based on the combined total of points earned by students on their individual exams and joint projects. The decisions students actually faced matched those of the economic cooperation model described in this paper.

The survey asked students to indicate the portion of their time they would allocate to the joint project knowing in advance the portion of time their partners allocated to the joint project. To help

students make their time allocation decision, they were provided a table indicating the points possible for themselves and their partner depending on their choice and the decision already made by their partner. If students acted selfishly, they would select a time allocation that would maximize their total points independent of their team member's score. This was rarely the selection made by the students.

The empirical test resulted from maximizing x in equation (6) where π_i and π_j were defined to be total points earned on individual and joint projects by agents i and j after allocating $0<x,y<1$ portion of their time to the joint project. Since y was already chosen by agent j, agent i solves equation (6) for his or her utility-maximizing solution for x rewritten here as:

$$\frac{\partial \pi_i}{\partial x} = -K_{ij}\frac{\partial \pi_j}{\partial x} \qquad (12)$$

Students taking the survey were asked to consider three possible teammates: a friend, a stranger, and an obnoxious cheat. The students were then asked to record the least amount they would sell to their teammates a used computer valued at $600. We assumed that the premium or discount P_{ij} offered by the students to each of their three possible partners was related to the student's social capital toward their partners.

A second factor used to predict the students' time allocation was the difference between the maximum points possible for i, π_i^M, and the points j would earn if i selected π_i^M, $\pi_j(\pi_i^M)$. We defined this difference as $M_{ij} = \pi_i^M - \pi_j(\pi_i^M)$. In an earlier study, Robison and Schmid (1989) found that when important relationships existed, differences in wealth were significant influences in economic exchanges. Differences in points were assumed to produce a similar effect. Thus, K_{ij} was expressed as:

$$K_{ij} = \beta_1 + \beta_2 P_{ij} + \beta_3 M_{ij} \qquad (13)$$

To estimate equation (12) required observations for $\partial \pi_i/\partial x$ and $\partial \pi_j/\partial y$. Values used for $\partial \pi_i/\partial x$ were the difference between the point maximizing value for i, π_i^M, and the actual points selected by i, π_i^A. The difference in corresponding point values for j that depended on i's choices, $\pi_j(\pi_i^M)$ and $\pi_j(\pi_i^A)$, was used to estimate $\partial \pi_j/\partial x$. Call the estimates of $\partial \pi_i/\partial x$ and $\partial \pi_j/\partial x$, $\Delta \pi_i/\Delta x$ and $\Delta \pi_j/\Delta x$, respectively. Then, in equation (12), we substitute $\Delta \pi_i/\Delta x$, $\Delta \pi_j/\Delta x$, and the right-hand side of equation (13). The resulting equation to be estimated after adding a constant β_0 to account for omitted variables was written as:

$$\Delta \pi_i/\Delta x = \beta_0 + \beta_1 \Delta \pi_j/\Delta x + \beta_2 \left[P_{ij} \Delta \pi_j/\Delta x\right]$$
$$+ \beta_3 M_{ij} \Delta \pi_j/\Delta x \qquad (14)$$

Estimated values of β_0, β_1, β_2, and β_3 with their t statistics in parentheses are:

$$\Delta \pi_i/\Delta x = 1.21 + .14\ \Delta \pi_j/\Delta x + .00073\ P_{ij}\ \Delta \pi_j/\Delta x$$
$$\quad (3.69)\quad (6.59)\qquad\qquad (3.57)$$

$$+ .025\ M_{ij}\ \Delta \pi_j/\Delta x$$
$$(25.31) \qquad\qquad\qquad (15)$$

with $\bar{R}^2 = .87$.

The coefficients in equation (14) should not have been significant if students maximized their total points. The significance of β_2 suggests relationships measured by the subsidy or premium associated with the sale of the used computer was significant in predicting the point subsidy or premium of points agent i gave to agent j. The significance of β_3 suggests that differences in points or viewing oneself as having more than one's partner was also significant. This variable may also be related to the concept of fairness.

The empirical outcomes of this study based on mind experiments are supported by the results of numerous other studies using dollar outcomes. These studies take the following form. Agent i is given a certain dollar amount a part of which i must allocate to agent j. If j agrees with the allocation, the transaction is completed. If j rejects i's

proposed allocation, *i* and *j* receive nothing. Regardless of *j*'s acceptance or rejection of *i*'s offer, the game is not repeated.

Selfishness of preferences would suggest that since the game is not repeated, *i* would propose an allocation favorable to himself and that agent *j* would accept any positive allocation. In fact, most allocations are nearly equal. Moreover, when allocations do reflect selfishness of preferences, agent *j* often rejects the allocation (Guth, Sdhmittberger, and Schwarze).

The results of this study and those played with dollar outcomes support the hypothesis that social capital coefficients are not zero. The results also suggest that as social capital between students *i* and *j* increases, students are willing to contribute more to the joint project.

Social Capital and Policy Recommendations

When social capital increases between firms, cooperation and total revenue increase. Moreover, increased levels of social capital may increase the likelihood that firms will adopt more nearly equal revenue distribution plans. Institutions most likely to have levels of social capital needed to achieve desirable levels of output and revenue distribution are families. Thus, we might expect that family-based firms have certain social capital advantages not often available to other firms.

Nelton wrote that an Oregon survey showed that 76 percent of the state's small companies, those that have fewer than 50 employees, are exclusively family-owned. An additional 19 percent of small companies in Oregon are privately owned and include non-family owners.

Calonius provided other evidence of the importance of family businesses. He wrote:

"...some 75 percent of U.S. companies are family owned or controlled. They produce 60 percent of the gross national product. They grew faster than non-family firms did in the 1980s. And they're expected to continue as the backbone of the economy

well into the 21st century. One-third of the Fortune 500 companies are family firms. Family businesses employ more than 40 million people. The bad news about family business is that most don't survive into the second generation."

Another implication of this study is that inadequate or negative social capital may lead some firms to fail. If some firms fail economically for lack of social capital, economists may not be the ones best equipped to help them solve their problems. Recognizing that sociologists and other social scientists may have more expertise in building social capital suggests the need for economists and other social scientists to cooperate. Furthermore, recognizing that families may have comparative advantages for building social capital, it may be that wise economic policies should include policies that tend to strengthen families.

Conclusions and Recommendations

An increasing amount of evidence suggests that relationships matter. This paper demonstrated how the influence of relationships can be incorporated in the neoclassical utility-maximizing model by using social capital coefficients. This paper has also shown how important new policy insights may be deduced from the social capital model. One important conclusion is that the success of a society's economic plan may be limited by its social capital. While there is obviously much more work to be done, early empirical work reported in this study and elsewhere support the conclusion that relationships may influence in important ways, our efforts to cooperate.

Perhaps the most important conclusion from this work is the following. If relationships are important and influence the level and distribution of revenue, then our economic recommendations must include recommendations for building and maintaining social capital. Recommendations that alter social capital investments will require much additional work to measure social capital and its costs of formation. Clearly, economists have much to learn about what determines social capital and

suggests the need to study its influence in economics in cooperation with sociologists or other social scientists.

       If social capital is an important economic variable, as the results of this study suggest, ignoring social capital will sterilize many of the remedies prescribed by economists based on selfishness of preferences. On the other hand, accounting for social capital in our prescriptions may lead us to cooperate more with other social sciences including sociologists, to develop new and improved solutions to very old problems.

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Appendix

Define $\dfrac{(1 + K_{ij})}{2} = K_i(\alpha)$ and $\dfrac{(1 + K_{ji})}{2} = K_j(\alpha)$ and assume that $\dfrac{\partial K_i}{\partial \alpha}$, $\dfrac{\partial K_j}{\partial \alpha} > 0$. Then, beginning with first-order conditions (6) and (7) we differentiate x and y with respect to α. The results are:

$$\frac{dx}{d\alpha} = \left\{ K_i \frac{\partial \pi^{xi}}{\partial y} \frac{\partial^2 \pi^{ri}}{\partial x \partial y} \frac{\partial K_i}{\partial \alpha} - \frac{\partial \pi^{xv}}{\partial x} \frac{\partial K_i}{\partial \alpha} \left[\frac{\partial^2 \pi^i}{\partial y^2} + K_j \frac{\partial^2 \pi^{ii}}{\partial y^2} \right] \right\} / D > 0 \qquad (A.1)$$

$$\frac{dy}{d\alpha} = \left\{ K_j \frac{\partial \pi^{xi}}{\partial x} \frac{\partial^2 \pi^{ri}}{\partial x \partial y} \frac{\partial K_i}{\partial \alpha} - \frac{\partial \pi^{xi}}{\partial y} \frac{\partial K_i}{\partial \alpha} \left[\frac{\partial^2 \pi^i}{\partial x^2} + K_i \frac{\partial^2 \pi^{iv}}{\partial x^2} \right] \right\} / D > 0 \qquad (A.2)$$

where:

$$D = \left[\frac{\partial^2 \pi^r}{\partial x^2} + K_i \frac{\partial^2 \pi^{rv}}{\partial x^2} \right] \left[\frac{\partial^2 \pi^v}{\partial y^2} + K_j \frac{\partial^2 \pi^{rv}}{\partial y^2} \right] - K_i K_j \left(\frac{\partial^2 \pi^{ri}}{\partial x \partial y} \right)^2 > 0$$

Next, it is demonstrated that $(\pi_i + \pi_j)$ increase with increases in K_i and K_j resulting from an increase in α. The derivative of $(\pi_i + \pi_j)$ with respect to α can be written as:

$$\frac{d(\pi_i + \pi_j)}{d\alpha} = \left[\frac{\partial \pi^i}{\partial x} + \frac{\partial \pi^{ri}}{\partial x} \right] \frac{\partial x}{\partial K_i} \frac{\partial K_i}{\partial \alpha} + \left[\frac{\partial \pi^i}{\partial y} + \frac{\partial \pi^{iv}}{\partial y} \right] \frac{\partial y}{\partial K_i} \frac{\partial K_i}{\partial \alpha} > 0 \qquad (A.3)$$

It can be determined that the bracketed expressions are positive when x and y in equation (A.3) are evaluated at their solutions found in equations (6) and (7). Then, since $dx/d\alpha$ and $dy/d\alpha > 0$, it follows that $d(\pi_i + \pi_j)/d\alpha > 0$. Furthermore, as K_i and K_j increase toward one, the private solutions will approach the solution represented by the maximum of the societal welfare function.

Endnotes

1. See also Frank, Gilovich, and Regan.

2. To simplify the analysis, the assumption is made that output shares are fixed and agents adjust inputs based on their anticipated share of the output. This is a common practice in leasing where most agents agree to share the output equally.

3. Obviously, the development of social capital models requires that the influence of investments in social capital coefficients be examined carefully. Current research by the authors is focused on investments in social capital. However, the intent here is to describe in an elementary way how social capital coefficients can be used to extend altruism models developed in a neoclassical framework.

4. Society is not assumed to have redistributive powers except those achieved through its choice of x and y.

5   Political commentator, G.F. Will, reflects this conflict when he wrote: "Democrats may ride to victory over the rubble of Reagan's reputation, but in doing so they will reacquire the bad habit of subordinating economic growth to shifting considerations of "fairness." Okun also addresses the issues of efficiency versus equity.