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Preferences, cooperation, and Institutions

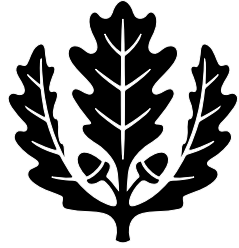
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Preferences, cooperation, and Institutions

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Abstract

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Journal of Economic Literature Classification: A13

Keywords: Non-material, endogenous preferences; cooperation; institutions.

Preferences, Cooperation, and Institutions

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I. Introduction

Since economists emphasize rationality and self-interest, it is easy to explain free-riding, shirking, and just nasty behavior in general. People certainly do act selfishly, but motivations are more complex than that. People also cooperate, behave altruistically, and violate the principle of self-interest -- narrowly conceived as the sole pursuit of *material* well-being. We tip, vote, contribute to public causes, and honor agreements even in the absence of material sanctions. Sometimes we are "good Samaritans," "do the right thing," or are trustworthy even when we know that we will not be rewarded. We also take revenge and fight in wars at great personal cost. These important behaviors emerge even in one-shot settings (e.g., tip in a restaurant we will never visit again) and when the situation is certain. As such, they do not fit neatly into the conception of rational economic man. The question is, where do these cooperative type behaviors come from?

Our explanation hinges on the recognition that preferences (1) cover the non-material, and (2) are at least partly endogenous, and, as such, can be influenced by institutions and culture. While economists have held to the assumption of exogenous preferences in order to avoid tautological explanations of behavior as arising from (any) taste, the assumption is no longer tenable. Preferences are both exogenous and endogenous. Some preferences are given to us by our families, caregivers, and later, social groups. It is also unnecessarily restrictive to confine preferences to mappings over only material goods. People have preferences over truth-telling and honesty, for instance, which may sometimes be at odds with material well-being. Actions contrary to these preferences result in internal costs, quite apart from any external sanctions.

By incorporating a "conscience" in at least some individuals, and to varying degrees, we can begin to examine the effect of certain institutions on cooperation. This is an important endeavor because while there is a good deal of cooperation in society, its existence may largely depend on non-material preferences. If preferences are at least partly endogenous, then institutions affect the degree of cooperation in society.

In this paper we examine the link between social institutions and individuals' propensity to cooperate in a simple game theoretic framework. To begin, we transform the usual prisoner's dilemma game over material payoffs into one with utility payoffs by including non-material preferences. By introducing a continuum of types, three distinct behaviors (not otherwise imposed) emerge: 1) pure defection, (2) pure cooperation, and (3) behavior contingent on expected partner behavior. All three behaviors emerge in equilibrium and in a static analysis. As such our model represents a synthesis of previous, disparate efforts. Exogenous social policy can affect cooperation rates by changing the size of the three groups exhibiting these behaviors if preferences are endogenous. Repeated play results in "switching" behavior, where formerly cooperative players now defect (i.e., become cynical), and former defectors cooperate (reform). We suggest how such switching creates further roles for institutions. Finally, continuing the effort to analyze community, we add the possibility of interaction with a new "low cost" player who, it is known, does not make social investments.

II. Preferences, Culture, and Institutions

In this section we examine the origins of non-material, endogenous preferences and their relationship to economic institutions.

Many scholars recognize that preferences and motivations are subject to social forces. To the extent that behaviors are learned, they are transmitted by culture and society through our families and social groups. When we are young, we learn (often by imitation) from our parents and caregivers. As adults we learn more from direct experience and our social groups. Summarizing the process of cultural transmission, Boyd and Richerson (1990), p.114) write:

Humans acquire attitudes, beliefs, and other kinds of information from others by social learning, and these items of cultural information affect individual behavior. Cultural transmission leads to patterns of heritable variation within and among human societies. While individual decisions are important in determining behavior, these decisions depend on individuals' beliefs, often learned from others, about what is important and valuable, and how the world works. Human decision-makers are enmeshed in a web of tradition; individuals acquire ideas from their culture, and in turn make modifications of what they learn, which modifications become part of the cumulative change of the tradition.

These authors suggest that "human behavior represents a compromise between genetically inherited selfish impulses and more cooperative, culturally acquired values." The notion of endogenous preferences has its roots at least as far back to the Classical economists like Smith and Marx, and has become a center piece of newer schools like Feminist economic thought [see

Nelson (1995) who argues that people do not spring up like fully formed mushrooms]. And the list goes on. In contrast, mainstream economists have not embraced endogenous preferences for fear that behavioral scientists might attempt to trivially explain behavior by simply positing a taste for it [see Stigler and Becker (1977)]. We acknowledge that hazard but adopt the position that realism in behavior assumptions is preferred if they can be carefully identified and if they can generate non-trivial and insightful implications.

Preferences also cannot be confined to just material goods and/or pleasurable activities. We possess notions of fairness and right and wrong. Sen (1978) notes we may perform an altruistic act out of internally motivated sympathy or out of a sense of duty bound commitment. Etzioni (1988) suggests simply that we are moral creatures and that this fact often eludes economists. So, while entire literatures like the theory of the firm are built on the notion that people are opportunistic shirkers, preferences and motivations are more complex than that. The existence of a conscience suggests that, at the very least, some people possess conflicting preferences over doing what's right and what's pleasurable. And to the extent that a conscience reflects certain preferences, endogeneity suggests that they can sometimes be affected by society.

Among other things, culture embodies social institutions, where institutions constrain human behavior. Constraints tell us what we can and cannot do. North (1990) differentiates between informal and formal constraints. Informal constraints include norms, customs, and codes of behavior reflecting social values. These social values, in turn, may affect individuals' preferences and hence propensity to cooperate, trust, and act self-interestedly. In contrast, formal constraints emerge from purposeful human action. Institutions like laws, schools, religion, government and other organizations are formal constraints that both reinforce and reflect values inherent in informal constraints. For instance, most religions teach truth-telling as opposed to lying. If truth-telling becomes a social value, then an individual decision-maker must consider the ill effects of violating that value in, say, renegeing on a contract. The penalty can be an external social sanction, which could be modeled in the constraint of an individual's utility maximization problem. Or, if the value is internalized by the individual, then truth-telling has become a preference and lying would result in disutility. This latter scenario reflects Sen's notion of sympathy. Note that if the individual internalized the value as a preference, the individual would tend to tell the truth even in the absence of external social sanction (that is, even if the constraint were relaxed).

Economists have long recognized the importance of institutions like religion and schooling in the economy. For example, Adam Smith (1776) in The Theory of Moral Sentiments noted that religion and religious beliefs could instill values that people would follow irrespective of external sanctions:

The idea that, however we may escape the observation of man or be placed above the reach of human punishment, yet we are always acting under the eye, and exposed to the punishment of God, ... is a motive capable of restraining the most headstrong passions, with those at least, who by constant reflection, have rendered it familiar to them. (p. 281)

More recently, Reder (1979) argued that values (ethics and morality) are instilled in the "formative years" of human development, and that society benefits from more moral behavior because less resources have to be devoted to safeguarding promises. Since society benefits from more moral behavior, he concludes that the church and state have intentionally played a role in instilling moral values. Lipford, McCormick and Tollison (1993) found that religious involvement is negatively correlated with crime and illegitimate births. Again, we may interpret these findings as formal constraints influencing informal constraints in the culture. While religion may have emerged to offer "meaning," or ease fears about the Unknown, it also instills certain values that have economic significance. Thus, it may serve a functional role for society apart from the reason for its existence.

Schools also instill values, as noted, for example, by Lott (1990) and Bowles and Gintis (1976). Bowles and Gintis argue that public schooling instills values such as acquiescence to authority and to hierarchy, both valued by employers. Lott argues that public schooling reduces the cost of government transfers because its recipients are more willing to view government as properly serving that purpose. But schools also attempt to teach children fairness and honesty. In school children learn a social identity and social rules of interaction. Children learn that their actions have consequences upon others and that hurting others can sometimes hurt one's self.

We have tried to establish the link between non-material, endogenous preferences and social institutions. We now need a model to capture these relationships in a non-trivial way. First, we introduce non-material preferences into a one period prisoner's dilemma framework in order to examine their affects on social interaction. Three separate "types" endogenously emerge. Next we examine the effects of institutions, like education and religion, on endogenous preferences. Then repeated play, or interaction, is considered. Somewhat surprisingly, we find "switching" behavior which suggests different roles for social institutions. Finally, we add a new player to see the affects on community.

III. Model

We assume that agent i 's utility, U_i , includes wealth, W_i , and the disutility associated with the non-material preference over defecting or cheating, x_i . That is

$$U_i = \begin{cases} W_i & \text{if cooperate} \\ W_i - x_i & \text{if defect.} \end{cases} \quad (1)$$

x_i is the internal cost of not "doing the right thing," which is contextual. In one instance it may be violating the principle of honesty, in another it may be violating a "code of honor," as in the original prisoner's dilemma game. As a concrete example, one may think of x as the guilt associated with defecting in a prisoner's dilemma type interaction. Suppose the context is one where lying yields a higher material payoff, and x is the associated internal cost of dishonesty. We assume x differs across agents, reflecting, for example, different degrees of (endogenous) indoctrination of social values and/or (exogenous) genetic predisposition to feelings of guilt. [For the first part of the analysis it does not matter if x is determined exogenously or endogenously]. Thus this formulation includes the possibility that players are only concerned with material payoffs if $x=0$, *but is more general* because it allows other, perhaps moral, motivations. Specifically, in the model we will assume that x_i is distributed uniformly across the population of agents (which is normalized to be one) on the interval $[0, \underline{x}]$.

A player's wealth emerges from a single play of a prisoner's dilemma game with another randomly chosen member of the population. The payoff matrix of the game is given by

		Player I	
		Cooperate	Defect
Player II	Cooperate	5, 5	0, 6
	Defect	6, 0	2, 2

Matrix 1.

where the first entry in each cell is player II's payoff and the second is player I's. Of course, if players are concerned only with wealth, the equilibrium of a one-shot play of the game is (Defect, Defect). As the previous discussion suggests, however, cooperation can emerge if players maximize utility rather than simply wealth, provided that disutility exists with defecting. This is the role of x .

Specifically, if x_i and x_{ii} are the monetized disutilities of defecting for players I and II, then matrix 1 becomes

		Player I	
		Cooperate	Defect
Player II	Cooperate	5, 5	0, 6-x _I
	Defect	6-x _{II} , 0	2-x _{II} , 2-x _I

Matrix 2.

Although the players cannot observe the value of their opponent's x , Matrix 2 is no longer necessarily a prisoner's dilemma and (Defect, Defect) is not necessarily the equilibrium. In what follows, we derive the equilibrium given a random pairing of players, assuming that x is uniformly distributed on $[0,3]$ (i.e., $\underline{x}=3$).

In deriving this equilibrium, define p as the fraction of agents who cooperate and $1-p$ as the fraction who defect. p therefore represents a rational player's best assessment of the probability that a randomly chosen partner will cooperate. Given p , consider a representative agent's decision to cooperate or defect. Cooperating yields an expected utility of

$$U^C = 5p + 0(1-p) = 5p,$$

and defecting yields an expected utility of

$$U^D = 6p + (1-p)2 - x = 2 + 4p - x.$$

The player cooperates if

$$x \geq 2 - p. \tag{2}$$

In equilibrium, the players' beliefs about p must be fulfilled. Thus,

$$p = \Pr(x \geq 2-p). \tag{3}$$

Given that x is distributed uniformly on $[0,3]$, (3) becomes

$$p = 1 - (2-p) / 3,$$

which implies that

$$p = 1/2.$$

If we substitute $p=1/2$ into (2) we find that players with $x \geq 1.5$ cooperate, and players with $x < 1.5$ defect.

Special insight emerges by examining the behavior of agents at the extremes of $p=0$ and $p=1$. When $p=0$, then $U^C=0$ and $U^D=2-x$. Thus, players with $x \geq 2$ always cooperate, even if their opponent is a known defector. Similarly, when $p=1$, $U^C=5$ and $U^D=6-x$. Thus, players with $x < 1$ never cooperate, even with a known cooperator. For this reason, we refer to players with $x \geq 2$ as *pure* cooperators (C's) and players with $x < 1$ as *pure* defectors (D's). As for players with $1 \leq x < 2$, they prefer to cooperate if their opponent is a known cooperator, but prefer to defect if their opponent is a known defector. Specifically, if $p=1$, $U^C > U^D$ if $5 > 6-x$, or $x > 1$; and if $p=0$, $U^D > U^C$ if $x < 2$. We refer to these agents as "conditional players" (CP's). Note that in the equilibrium described by (2) and (3), all D's and half of the CP's defect; and all C's and half of the CP's cooperate (See Figure 1).

By introducing a continuum of types, the analysis shows that three different modes of purposeful behavior emerge. Those adopting the first mode, D's, are not concerned with others' welfare and thus seek to maximize their own material payoffs. This behavior, which is that typically postulated by economists for all individuals, reflects that found in usual analyses of prisoner dilemma games. In contrast, members of second group, C's, never defect and are never distrustful. Its members cooperate with both the trustworthy and the non-trustworthy, perhaps because of religious beliefs. Thus, in contrast with the purely selfish types, these types "turn the other cheek." The third group, CP's, are something of a mixture between the first two. Its members may be influenced by social values in that they cooperate with cooperators, but their preferences are sufficiently material that they dislike being "suckers." Thus, they defect with known defectors rather than turning the other cheek. This behavior is not the result of any imposed strategy; instead, it arises endogenously. This third group is of special interest because it can be influenced.

i. The Role of Institutions

So far the endogeneity of preferences has not played a crucial role in the analysis. The affect of social institutions on preferences can be illustrated by supposing that resources can be devoted to increasing the average x in society in an effort to increase the amount of cooperation (and hence, social wealth). Given a uniform distribution, the average x can be increased, for example, by increasing the upper bound \underline{x} . However, suppose that this involves a resource cost of $C(\underline{x})$, where $C' > 0$ and $C'' \geq 0$. The benefit of increasing \underline{x} is that cooperation, and hence wealth, increases. In particular, it is easy to show that the equilibrium fraction of cooperation as a function of \underline{x} is given by

$$p = (\underline{x}-2) / (\underline{x}-1),$$

which is increasing in \underline{x} . Some CP's who previously would have defected now cooperate to avoid the increased disutility associated with a higher x . Further, recall that cooperator's wealth is $5p$, and the wealth of defectors is $2+4p$. Cooperators' total wealth is therefore $5p^2$ (i.e., the "number" of cooperators, p , times wealth per cooperator), while the total wealth of defectors is $(2+4p)(1-p)$. Adding these expressions yields total wealth of p^2+2p+2 , which, given the above expression for p , is also an increasing function of \underline{x} . The "optimal" \underline{x} maximizes total wealth minus $C(\underline{x})$. [For example, if $C(\underline{x})=.1\underline{x}^2$, then the optimal \underline{x} is 3.2].

It could be questioned whether \underline{x} is really a choice variable in the sense that society can consciously select it to maximize net wealth (or welfare). \underline{x} is a policy variable in the sense that much of education is either publicly provided or subsidized, religion is subsidized through its tax exempt status, and families are variously subsidized and taxed as a matter of government policy. Since all of these institutions contribute to the indoctrination of individuals in a manner we have discussed, the average x can be manipulated by adjusting these implicit subsidies. While policy makers may not possess the requisite information to optimally adjust \underline{x} , our analysis simply suggests that an optimal \underline{x} may exist and that policy makers can manipulate \underline{x} , however imperfectly, to influence cooperation rates, wealth, and welfare.

Discussion

Our model mirrors other recent efforts in some respects. Frank (1987) formulates a model with two groups, pure cooperators and pure defectors (our first two groups). If a cost to detection about partner type exists (a cost that can be reduced by signals of emotion), then an evolutionary stable equilibrium can include both types. Witt (1986) also uses the dynamic framework of evolutionary stability, but includes social learning in a threat game to produce cooperative behavior. Other costs can induce cooperation. Guttman (1996) shows that cooperation can result if it is costly for rational players to calculate population characteristics and/or optimal strategies. Sethi (1996) shows that a penalty associated with defection could induce cooperation among rational types. The penalty could be a function of the chances of playing with a genetic "bully," one who punishes defecting partners. Rabin (1993) postulates a notion of fairness in which players wish to cooperate with cooperators and defect with defectors in one-shot games. This form of preferences induces what he calls "fairness equilibria." Finally, our analysis is most similar to Casson's (1991) effort in the important way that it also introduces a non-material, internal cost to cheating. Contextually, Casson focuses on a leader's ability to instill the preference of trustworthiness in his followers. Our discussion of the ability of institutions to create cooperation is qualitatively similar.

So far our model differs from all the previous approaches because by introducing a continuum of types we show that: (1) three separate behaviors arise endogenously, all of which are included in our analysis, and (2) exogenous changes in social institutions can affect cooperation rates. Our model also differs from Frank's because group behavior is both exogenously (by social institutions) and endogenously (by continuous types) determined. Our results are consistent with the results of the experimental literature, but different from Frank, Witt, Guttman, and Sethi because cooperative behavior emerges in a one shot-game. Guttman and Sethi find cooperation because of external costs of interaction, we find it because of the "internal" costs associated with ones own preferences. Our model is similar to Rabin's in that he also includes an adjustment to material payoffs (a "kindness function") which potentially changes the players' strategies (and hence, the equilibrium of the game). However, his adjustment factor is based on beliefs about what the other players are doing, whereas our adjustment is internal to each player depending, for example, on the degree of his or her indoctrination. As a result, players in our model can be single-minded cooperators or defectors (as in Frank), or "conditional players", whereas Rabin only considers the latter.

We next consider the effects of repeated interaction. It turns out that some agents who cooperated in the first period now defect, and some who previously defected now cooperate. This "switching" behavior implies different roles for institutions.

ii. Repeated Play

Consider now what happens if we add a second period to the model in which all agents randomly pair with a new partner. All agents remain uncertain about other agents' types, but when a new pairing occurs, each agent can observe what strategy his partner adopted in the first period. This information allows them to update their estimates of their new partners' x , which in turn allows them to update the probability that their partners will cooperate. Therefore, in modelling behavior, we employ Bayesian updating -- an adaptive strategy. This strategy not only keeps the analysis tractable, but also seems empirically realistic. The question is whether this updating induces a change in the behavior of any of the agents. Once again the agents of interest are the CP's (i.e. those whose x falls between 1 and 2) because, as noted, the C's ($x > 2$) and D's ($x < 1$) will continue to pursue their preferred strategies regardless of the anticipated behavior of their partner.

In terms of the model, the condition for a party to choose cooperation continues to be given by (2); but now the calculation of p is different. Specifically, this probability is now conditional on the observed behavior of both agents in the previous period. Thus, we define p^{ij} to be the conditional probability one's partner will cooperate, conditional on the the fact that the

partner played strategy i in the first period, and the party forming the estimate played strategy j , where $i, j = C, D$. The actual calculation of p^{ij} will depend on which of the following pairings is relevant: (1) both agents played C in the first period, (2) both agents played D, and (3) one agent played C and one played D. We consider each scenario in turn.

When both agents cooperated in period one, it follows that each has $x \geq 1.5$ (see Figure 1). This is important because it means that each agent's preferences are such that he would prefer to cooperate if his partner cooperates. Thus, by analogy to (3), we define p^{CC} as follows:

$$p^{CC} = \Pr(x \geq 1 - p^{CC} \mid x > 1.5). \quad (4)$$

Given that x is uniform on $[0, 3]$, and the constraint that $p^{CC} \leq 1$, (4) becomes

$$p^{CC} = \max\{1, [3 - (2 - p^{CC})]/1.5\},$$

or

$$p^{CC} = \max\{1, (1 + p^{CC})/1.5\}. \quad (5)$$

Equating p^{CC} to the second term and solving yields $p^{CC} = 2$. Thus, $p^{CC} = 1$, or both parties cooperate with certainty in this case.

In scenario 2, both agents defected in the first period. Thus both have $x < 1.5$. As a result, $p^{DD} = \Pr(x \geq 2 - p^{DD} \mid x < 1.5)$, or

$$p^{DD} = \max\{0, (p^{DD} - .5)/1.5\}. \quad (6)$$

Solving for p^{DD} yields $p^{DD} = -1$, which implies that $p^{DD} = 0$, or both agents defect with certainty in this case.

The final scenario pairs a first period cooperator and a first period (FP) defector. In this case, the two agents calculate different probabilities that their partner will cooperate. Specifically, the FP cooperator calculates the probability p^{DC} that a FP defector (one with $x < 1.5$) will cooperate with a FP cooperator (one with $x \geq 1.5$), and the FP defector calculates the probability p^{CD} that a FP cooperator will cooperate with a FP defector. The mutual dependence of their decisions implies that each agent's calculation depends on the other's calculation. In particular,

$$p^{DC} = \Pr(x \geq 2 - p^{CD} \mid x \geq 1.5) \quad (7)$$

$$p^{CD} = \Pr(x \geq 2 - p^{DC} \mid x < 1.5). \quad (8)$$

Invoking the uniform distribution yields

$$p^{DC} = (p^{CD} - .5) / 1.5 \quad (9)$$

$$p^{CD} = (1 + p^{DC}) / 1.5. \quad (10)$$

Finally, solving these simultaneous equations yields the equilibrium probabilities: $p^{DC} = .2$ and $p^{CD} = .8$. That is, a CP who cooperated in the first period cooperates with a FP defector with probability .2, and a CP who defected in the first period cooperates with a FP cooperator with probability .8

The implied thresholds for cooperation can be found by substituting these probabilities into (2). The results are that a FP cooperator will cooperate with a FP defector if $x \geq 1.8$, and a FP defector will cooperate with a FP cooperator if $x \leq 1.2$. The implications of these results can be found by comparing these thresholds with those established in the first period. This comparison is shown in figure 2. As noted above, the region of interest is between $x=1$ and $x=2$, where the conditional players reside. Among these players, those with x between $x=1.2$ and $x=1.8$ *change* their behavior when combined with a partner who adopted an opposite strategy in the first period. Specifically, agents with x between 1.2 and 1.5 who defected in the first period choose to cooperate when paired with a first period cooperator, and agents with x between 1.5 and 1.8 who cooperated in the first period choose to defect when paired with a first period defector.

Switching behavior is notable for three reasons. First, it seems to correspond to real-life behavior. Sometimes, if agents who cooperate are cheated (say, in the first period), they will defect in the next period, especially with a previous defector, no matter what the new partner's intentions are. The CP player has become "cynical." Similarly, sometimes a former defector can be induced to cooperate in the next period, especially if coupled with a known cooperator. This CP player has "reformed" because he has revised his assessment about his partner's behavior, becoming more optimistic.

Second, switching in our model is conceptually distinct from other explanations. "Rational" (material based) explanations for someone going from C to D might center on mimicking a C (rational deception) in the first period in order to profit by defecting in the second period. In our model the switch occurs because a CP player becomes cynical about his partner. Or it might be supposed that a player is following a tit-for-tat strategy. In our model no strategy is imposed; if CPs switch it is because of their preferences and revised expectations of partner behavior, not an imposed behavioral rule. Finally, the switch from D to C has not been widely considered. One could conceive that external social sanctions could induce the change, maybe by changing the player's payoffs. In our model the switch occurs because a CP who defects in the

first period updates his beliefs and becomes more optimistic about his partner's behavior. No external sanctions are necessary.

Finally, the switching behavior found in the analysis hints at important roles for "community" and institutions. We have already found one important role for some formal institutions in the one period model, namely their ability to instill or reinforce preferences for honesty. Of course that role carries over to the two period model as well. But additionally, institutions could increase cooperation, even if preferences are exogenous, by reducing the randomness of second period interactions, or, by assisting *intentional* interactions. This possibility occurs if certain institutions allow CP players to increase the chances of interacting with first period cooperators. Note that a move from random interaction to intentional interaction would not affect the behavior of pure Cs or pure Ds. In contrast, it was shown that cynical CPs switched from cooperate to defect because their updated belief of first period defector has been pessimistically revised. The history is such that the first period partnership with a defector was inevitable because it was random, x s could not be observed, and no choice to cooperate or defect had yet been made. But if randomness can be reduced in the second period, and CPs allowed to intentionally couple with first period cooperators, then they would also cooperate and increase the overall level of cooperation. Overall cooperation could also increase if otherwise cynical CPs could better assess the x of a partner who defected in the first period. Specifically, if the partner's x was between 1.2 and 1.5 and he played with a first period cooperator, the (otherwise) cynical player could now be assured that his partner would cooperate in the second period, and he would follow that strategy himself.

These induced roles for institutions suggest that intentional, repeated interaction is important. A similar point has been made more casually by social commentators like Putnam (1995) who suggest that if membership in social groups and clubs declines, we might expect to see overall cooperation and trust decline. Such an advent may lead to diminished community, a concept that's admittedly difficult to grapple with. But the effort is important. As an example, Daly and Cobb (1989, p.170) use the term "community" because they "want a term that suggests that people are bound up with one another, sharing despite differences, a common identity. We want to emphasize that people participate together in shaping the larger grouping of which all are members." Clearly cooperative behavior is crucial in a proper understanding of community, but the exact relationship is difficult to specify. We simply suggest that the analysis so far goes some way in describing a necessary element for community, but by no means is it sufficient.

It may be that community depends not only upon trust (people doing what they say they will do), but also on extra efforts -- both tangible and intangible. Even if a person pays their local tax bills, they may not be contributing to community in the sense that they don't volunteer, join a civic organization, coach a little league team, or even just greet and help their neighbors. If these

kinds of "investments" are important in developing and sustaining community, it is easy to see how increased mobility and technology-based seclusion could contribute to its decline.

We now employ the model to see if we can gain any insights on how economic interactions can affect investments in community. Specifically, a new low cost player is added to the analysis.

iii. The Addition of a New "Low Cost" Defector

Technological advances and investments in transportation and communications have made it possible for any one person to interact with a larger set of people. In an economic context this might mean that any buyer can choose from a larger set of sellers because capital is more mobile, thereby enhancing any one person's consumption possibilities. Accordingly we extend the model to include a new player, a seller, who is a known "low cost" defector. To capture the notion of community, the model needs a slightly different contextual interpretation. Now we suppose that both buyers and sellers can be counted on to pay their bills (for instance). What they cannot be counted on doing is making an additional investment (tangible or not) in community. As cooperation is now interpreted to mean that the person does make a social investment, defection means they do not. So, for example, a pure cooperator would make the promised investment because to not do so would result in a high internal cost. Both C's and D's alike materially benefit from cooperator investments. Assume that an investment by a cooperator results from any interaction and benefits not only the players but also has external benefits for the community at large. As before, CP's only want to make an investment if their partners do.

We assume that the addition of a new (second period) low cost player refers only to sellers; we focus on capital mobility. This assumption seeks to capture, for example, the trend in the U.S. of large discount retailers entering markets formerly inhabited only by smaller ones. Large retailers are increasingly able to penetrate markets because of their low distribution costs. These low distribution costs, in turn, are to some degree the result of government investments in transportation and communications.

Usually, economists consider the provision of goods at a lower price to be only welfare enhancing. But the addition of new trading partners like discount retailers may also impose costs, in the sense of reduced community investments. Note buyers cannot intentionally interact with the owner of a large discount retailer because the owner does not live in the community. So, somewhat simplistically, we assume the low cost seller is also a known defector because, by virtue of his absence, he cannot make investments in the community that require his presence. In our model community breakdown can result if members of our third group (CP's) switch from cooperating with cooperators to defecting with the new player.

Return to the case where $\underline{x}=3$, and suppose that, as the result of investments in transportation and communications technologies, the agents are allowed to interact with a new player, a known defector, who offers partners the following payoff matrix (in wealth):

		Player I	
		Cooperate	Defect
Player II	Cooperate	5+ λ , 5+ λ	λ , 6+ λ
	Defect	6+ λ , λ	2+ λ , 2+ λ

Matrix 3.

That is, the new player offers a "bonus" of λ , but is also a known defector. Thus, if Player I is the new player (seller), then Player II will receive λ if he or she cooperates, and $2+\lambda$ if he or she defects -- i.e., only the payoffs in column 2 are available.

Given the presence of this new player, which agents from the one-shot equilibrium (if any) in section i will prefer switching to the new player and which will stay with the original group, given various values of λ ? To answer this question, we assume that if a player stays with the original group, he again pairs randomly with another of the remaining players, but that the probability of meeting a cooperator adjusts appropriately to reflect any "switchers." Also, we assume that the new player can accommodate any number of switchers without affecting the payoffs in matrix 3 (i.e., there are no scale effects).

To derive the equilibrium, we conjecture three ranges of players in the original set, as illustrated in figure 3. Players with x between 0 and x_1 switch to the new player and play defect, players with x between x_1 and x_2 stay with the original group and play defect, and players with x between x_2 and 3 stay and play cooperate. Define p_λ as the fraction of cooperators among those who stay in this new equilibrium, where, by figure 3

$$p_\lambda = (3-x_2)/(3-x_1). \tag{11}$$

To determine the equilibrium values of x_1 and x_2 , note first that for those who stay, $U^C=5p_\lambda$ and $U^D=2+4p_\lambda-x$. Since x_2 is defined by $U^C=U^D$, we have

$$x_2 = 2 - p_\lambda . \tag{12}$$

Substituting (12) into (11) yields

$$p_\lambda = (1+x_1)/2. \quad (13)$$

Similarly, x_1 is defined to be the point of indifference between switching, which yields a payoff of $2+\lambda-x$, and staying and playing defect, which yields U^D . Equating these yields

$$\lambda = 4p_\lambda. \quad (14)$$

Solving (12), (13), and (14) simultaneously yields

$$\xi_2 = 2 - (\lambda/4) \quad (15)$$

$$x_1 = (\lambda/2) - 1 \quad (16)$$

$$p_\lambda = \lambda/4. \quad (17)$$

Note the following features of this equilibrium. First, when $\lambda=2$, $x_1=0$, $x_2=1.5$, and $p_\lambda=.5$; that is, the equilibrium is identical to that in the absence of the new player. Thus, for $\lambda \leq 2$, the newcomer has no impact. However, when $\lambda > 2$, x_1 becomes positive, so some D players start switching. Note also that the new equilibrium is such that, when λ is between 2 and 4, all players who were playing D in the original equilibrium (without the newcomer) are in fact indifferent between switching, and staying and playing D (i.e., given p_λ , both strategies yield utility of $2+\lambda-x$). The outcome depicted in figure 3 therefore assumes that players with lower x 's switch first. This is the basis for the designation of $[0, x_1]$ as the set of players who switch and $[x_1, x_2]$ as the set who stay and play D. Finally, note that when $\lambda \geq 5$, all players find it desirable to switch, including the pure C's. In that case, pure C's will cooperate and receive a payoff of λ , and everyone else will defect and receive a payoff of $2+\lambda-x$.

Now consider in more detail what happens when λ is between 2 and 5. Notice that as λ increases, x_1 and p_λ increase, and x_2 decreases. Thus, the number of players who switch increases, the number who stay and play D decreases, and the number who stay and play C increases. In figure 3, x_1 moves to the right and x_2 moves left. Intuitively, as defectors start to leave, the environment becomes more favorable for mutual cooperation among remaining players.

When $\lambda=4$, note that $x_1=x_2=1$ and $p_\lambda=1$. At this point, all D's have switched, leaving only CP's and C's, all of whom are cooperating. The payoff for cooperators is $U^C=5$, whereas the

payoff from switching and defecting is $U_{\lambda D} = 2 + \lambda - x$. The marginal CP player, for whom $x=1$, is thus indifferent between staying and switching. If λ increases further, however, he will be induced to switch and play defect with the newcomer. This point of indifference, $x = \lambda - 3$ (found by equating $U_{\lambda D}$ and U_C), will continue to rise with λ until it equals 2 at $\lambda=5$. At this point, only C's are left. When $\lambda > 5$, as noted above, even the C's will find it beneficial to switch to the newcomer, though they will continue to play C since their payoff from doing so is λ , which exceeds their payoff from cooperation with each other (12).

Figure 4 summarizes the impact of increasing λ . The solid curve, p_{λ} , shows the fraction of remaining players who cooperate, and the dashed curve shows the fraction of the original population who switch. Note that for λ between zero and 2, the original equilibrium is unaffected; that is, no players switch and half of the population cooperates. As λ increases from 2 to 4, the number of players who switch increases and the fraction of cooperators increases. As noted, this is due to the fact that all switchers over this range are D's (i.e., $x < 1$), so remaining CP players are more willing to cooperate because they are less concerned about cooperating with defectors. Indeed, at $\lambda=4$, only CP's and C's remain, and all cooperate. As λ rises further, however, the M's begin to switch as well (and play D) until all have done so at $\lambda=5$. Finally, as λ rises above 5, even the C's switch, although they continue to play C despite the fact that the newcomer is a known defector.

Figure 4 shows that the newcomer's impact on community is initially favorable because it attracts away freeriding defectors. The incidence of cooperation increases even though the size of the community declines. However, if the newcomer offers sufficient surplus ($\lambda > 4$), CP's are induced to switch and defect, ultimately reducing the total level of cooperation. When the surplus is very large ($\lambda \geq 5$), the community diminishes to its minimal because all remaining cooperators switch and interact with the defecting newcomer. Only pure cooperators are making community investments.

It is possible, however, that the community will reach this minimal level, or even dissolve altogether, even if the newcomer offers low surplus. Complete dissolution could occur if a critical mass is necessary for a community to survive, due to fixed costs and economies of scale for instance. The case of shopping malls driving out independent, "downtown" merchants is an obvious example. Thus at some point, after a critical number of defectors and/or CP's have switched, all other remaining players are forced to switch -- causing an early dissolution of community if the threshold of pure C's investment in community is insufficient. Interestingly, while this "participation constraint" lowers total welfare when measured as the sum of utilities, it increases aggregate wealth because it forces cooperators and CP's to interact with the low cost newcomer in situations they would not have otherwise (i.e., without the constraint).

In summary, this extension to the model has tried to capture the perhaps unintended effects of investments in transportation and communication technologies. To the extent

community depends upon cooperative investments, the advent of "defecting" newcomers may diminish community even if they offer other benefits.

IV. Conclusion

Our analysis has sought to more fully capture real human behavior. While some people do not have strong preferences over honesty, others do. This point seems to have eluded many economists. The analysis offered here shows that a fuller characterization of behavior need not lead to trivial results. We did not impose a preference for cooperation. Instead, non-material and endogenous preferences were employed to (1) generate three types of (equilibrium) behavior, (2) show the importance of social institutions like education and religion on cooperation levels, (3) illustrate "switching" behavior in repeated interactions, which implies a different role for social institutions, and (4) begin to assess the adverse affects on community from technology induced increases in consumption possibilities.

While we think the analysis offered here is a good starting point, much work remains. In particular we need to see more precisely how social institutions can affect preferences. The simple characterization showing that social institutions can generate values, thereby affecting preferences and cooperation rates does not invite confidence in policy prescriptions. More precise relationships will have to be identified before policy recommendations could be made.

Second, while we think we have captured an important phenomenon of cynical behavior in repeated interactions, we need to better specify how institutions can aid intentional interactions to reduce cynicism. The same goes for how institutions might aid in giving (first period) defectors a second chance. Theoretically, the possibility of switching behavior needs to be investigated when agents are unboundedly rational to determine if our results are robust.

Finally, much more work needs to be done on the elusive idea of community. We have suggested that community diminishes with cynical behavior and increases in capital mobility. But that is only a starting point. Other factors that have been mentioned are increased work hours, increased T.V. watching hours, and just a general increase in the sense of alienation in society. These too may be important factors. While we have offered a start, the complexity of the problem necessitates much more work, both theoretical and empirical. We can only hope that economists do not continue to shy away from it, as the importance surely outweighs the difficulty.

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