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**THE MECHANISM AND CONSEQUENCES OF REFERENTIAL  
COMPARISON**

**by**

**Nobuyuki Takahashi**

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**A Dissertation Submitted to the Faculty of the**

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**SIGNED:** 

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**Dedicated to my mother Emiko Takahashi.**

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## ABSTRACT

This study sheds new light on social psychological research on fairness by borrowing insights from social networks research and by incorporating the evolutionary approach. First, I propose the distinction between fairness in exchange based on local comparisons (e-fairness) and fairness in allocation based on referential comparisons (a-fairness). Early studies on fairness by social exchange theorists primarily considered exchange situations, but later on distributive justice researchers, considered allocation situations only. As a result, there is a certain discrepancy between the theories and the actual settings that researchers use (Cook and Hegtvéd 1983). Using the evolutionary approach resolves this confusion. The validity of this argument is explored by use of computer simulation.

Second, I propose that there is a relationship between two comparison processes, local comparison and referential comparison. Because most of the empirical research focuses on either local comparison or referential comparison (Hegtvéd and Johnson 2000), this research is the first attempt to address the potential influence of referential comparison on local comparison. Specifically, I argue that referential comparison has a dampening effect on local comparison, and that this effect is stronger for across-group referential comparison than for within-group referential comparison. This argument is tested experimentally.

By borrowing insights from social networks research, the macro-level implication of this study is drawn. According to Nakane (1970), patterns of cross-cutting ties characterize societies. One extreme is a vertical society (in which there are no cross-

cutting ties between members of sub-groups), and the other extreme is a horizontal society (in which there are many cross-cutting ties). Since across-group referential comparison is more likely to occur in horizontal societies, given the same degree of objective inequality, we can expect that the degree of perceived unfairness will be higher in vertical societies than in horizontal societies. Thus, behavioral attempts to achieve fairness will also be higher in vertical societies. As a result, we can expect that social inequality is higher in horizontal societies than in vertical societies. This seems to be the case when we consider the United States and Japan.

## CHAPTER 1: META-THEORETICAL POSITION<sup>1</sup>

### 1.1 Introduction

I have long thought that America is a society characterized by a concern with fairness. For example, many legal cases try to determine what is fair. Ordinary people often say, "it's not fair!" In experimental situations in which subjects have to accept "unfair" offers in order to earn money, many people reject those offers (see, for example, Binnmore 1998; Frank 1988; Kahneman, Knetsch, and Thaler 1986; Guth, Schmittberger, and Schwarz 1982; Guth and Tietz 1990; Thaler 1988). Americans consider fairness to be more important than do the Japanese (Yamagishi and Yamagishi 1994).

However, American society has another characteristic -- a very high level of social inequality. There are many homeless people while there also are many rich executives. For example, Bill Gates earns a huge amount of money. Currently he has about \$80 billion. This number is roughly equal to the amount necessary to provide basic education to children, water and sanitation facilities, reproductive health services for women, basic health care, and nutrition to people all over the world for two years (Meeks 2000). I assume that he accumulated those assets through his position as the CEO of Microsoft. But how could this happen? I expect him to be a rich person because he is the top of a big company, but is not this amount too extreme? How do the other people at Microsoft allow him to receive that much? Do they really think that his job is that valuable to the company? Do they not think that this is unfair?

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<sup>1</sup> Research presented in this paper was supported by a grant from the Matsushita International Foundation.

Therefore, it seems that one could argue that America is simultaneously a fair and an unfair society. But is that so, really? This question was the impetus for my study on fairness. In developing an argument to address this question, I gained several unexpected insights. First, we should distinguish exchange (in which two individuals exchange valued resources) and allocation (in which a certain entity distributes resources among recipients). Each of these situations calls for a different sense of fairness. These two types of fairness will be called e-fairness and a-fairness. E-fairness judgment is based on local comparisons in which people compare themselves to their exchange partner. A-fairness judgment is based on referential comparisons in which they compare themselves with other similar recipients. Second, when both exchange and allocation are present in one situation, fairness judgments based on referential comparison affect fairness judgments based on local comparison. This will be called the dampening effect in later chapters. Third, the evaluation process of referential comparison affects the strength of the dampening effect. The dampening effect is stronger when people compare themselves to similar others across groups (across-group referential comparison) than when they compare themselves to similar others within a group (within-group referential comparison). Because social structure affects the likelihood that people use across-group referential comparison, my argument suggests at least a plausible answer to the original question: A society that emphasizes fairness can be at the same time an unequal society.

Before proceeding to the next chapter, I would like to make clear my meta-theoretical position. This meta-theoretical position follows naturally from the original

question, but it is not yet prevalent in the social sciences. I will try to illustrate my position and the new contributions that it might give us.

## **1.2 Meta-theoretical position**

My original question is about societal or cultural differences. I assume that each society is characterized by people's cognitions and behaviors. We might call these cognitions and behaviors "culture." For example, we often say that Japanese culture is different from American culture. Or, Amish culture is different from the rest of American culture. What we mean by these statements is that people in different societies think and behave differently. Then, the natural question to ask is why they are different.

Many studies suggest that people in different societies think and behave differently because they have different cultures. This is not a sufficient explanation, however. It just creates another thing to explain: why do they have different cultures? The most prevalent answer is that social structures vary across societies. Each person is born into a set of social environments. How he thinks and behaves is shaped by these environments -- parents, mass media, schools, books, and so on. His position in these social environments affects how he is nurtured. He learns to think and behave in certain ways to adapt to the environments. Therefore, we can conclude that thinking and behavioral patterns are relatively stable over time. This argument corresponds to the position that the third face of sociological social psychology, "social structure and personality," adopts (House 1977, 1981).

But how, exactly, does social structure lead to certain ways of thinking and behaving? According to learning theory, some thinking and behavioral patterns bring more benefits than others. On this view, social structure determines opportunity structures that, in turn, determine thinking and behavioral patterns. Thus for both learning theory and social structure and personality research, people's thinking and behavioral patterns are adaptive to the environments in which they are embedded.

This idea that thoughts and behaviors are adaptive led an evolutionary approach that began to emerge in an interdisciplinary area including sociology, evolutionary biology, psychology, and economics. This evolutionary approach focuses on the interplay of minds and societies. It sees mutual dependency between people's minds and behaviors and societies. Thus, the primary goal is to specify an equilibrium among minds, behaviors, and social structure.

Let me start the description of the evolutionary approach by clarifying a confusing issue -- the target of adaptation. When we think that society A is characterized by people's thinking and behavioral pattern X while society B is not, we need to do two things to explain why such a difference exists. Based on the logic described above, we think that X is adaptive in society A. **The first thing that we should do is to specify what we mean by adaptation.** There are three types of answers.

(1) X exists because X is good for society A. Society A develops institutions, norms, or organizations to foster X. That is why people in society A have X. This is essentially the argument of structural-functionalism (Parsons, 1937, 1958; Merton 1963). But we can see the flaw in this answer. Unless there is collective consciousness in

society A, this logic is the same as group selection. What is good for society is not necessarily good for each individual. We should seek what is good for each individual when we study adaptation.

(2) X exists because it saves cognitive capacity of individuals. This is called the "cognitive miser approach" (Orbell and Dawes 1991, 1993). Much research on individual decision making finds that people cannot and do not process all pieces of information available when making a decision about a behavior. There is an upper limit on the amount of information that human brains can process. Therefore, humans use "heuristics." Heuristics are in a sense an automatic response system. They cannot make us behave perfectly all the time, but most of the time they work well. Because we have so many things to think about, it is better to save cognitive capacity and time for important issues.

This approach is certainly plausible, and I do not argue that it is wrong. However, there is a third answer. I adopt it because it fits better with the spirit of sociology that emphasizes social interaction. (3) Having X is beneficial for each individual (Frank 1988). In other words, having X helps people make profits. This is the essence of evolutionary approach that I adopt here. It assumes that there is a situation in which the person who has X will be better off than the person who does not have X. This assumption implies that we should look for a situation in which X brings profit. For example, we are certain that Mongolians can ride horses better than Hawaiians, and that Hawaiians are better swimmers than Mongolians. The skill of riding is adaptive in Mongolia but not in Hawaii, while the skill of swimming is adaptive in Hawaii but not in

Mongolia. This is, of course, because most Mongolians are nomads while most Hawaiians are fishermen.

This third approach does not deny the first two approaches. Rather, it is a different level of explanation. It assumes that when having X is beneficial in a certain environment, people will acquire X. Personality researchers would call this process “internalization.” Cognitive social psychologists would call this an “heuristic.” Learning theorists would call this “conditioning.” I do not specify which label is most appropriate. What is important is that X is adaptive to the environment. Also, all three approaches imply that X is relatively stable over time.

Although the environment in the above example is external to human behaviors, often environments are composed of behaviors of individuals. Each person is a part of the environment in which each other person is embedded. In other words, people are interdependent. Such a situation is best represented by analyzing incentive structures. An incentive structure is a set of choices and consequences available to multiple actors. For each behavior, there can be multiple consequences. Because multiple behaviors are usually possible, there can be many combinations of choices and consequences. This entire combination is called an incentive structure. Analyzing incentive structures and determining the best course of action for each person is what game theory is designed to do. If we know what behavior produces the best outcomes in a given incentive structure, we can assert that people will choose that behavior. If an incentive structure exists for a while, then we can assert that people will learn to do that behavior without thinking. In this sense, this third answer assumes that people will acquire heuristics if the environment

is relatively stable. It differs from the second answer in that it assumes that having heuristics creates a profit that is more than saved cognitive capacity. The third answer assumes that profit is also created through social interaction.

This logic implies two things that should be noted. (a) For each type of incentive structure, a particular pattern of behavior is adaptive. For example, Cosmides (1989) argues that cheater detection mechanisms may develop in social exchange situations<sup>2</sup>. She argues that there is a specific module in human brains that is designed for detecting cheaters. A cheater is a person who takes a benefit without paying the cost. Being sensitive to cheaters is adaptive in human society. A sense of fairness may also develop in ultimatum games (Frank 1988), and “cultures of honor” may develop in pastoral societies in which stealing assets (for example, livestock) is relatively easy (Nisbett and Cohen 1996). So, as a research strategy, when we wonder why a certain thinking and behavioral pattern exists, we should look for a situation that has the incentive structure that favors the person who has that pattern.

(b) The second important point to note is that this evolutionary logic emphasizes behaviors. In other words, it excludes psychological elements that are not reflected in behaviors. There may be many patterns of beliefs, thinking, feeling, and so on. However, if they do not have any effect on behaviors, they have no observable consequence. Thus, there can be no adaptation. Adaptation or learning occurs only when behaviors are associated with rewards or punishments. According to this logic, how people feel and think is the same as how people behave. Of course this conceptualization

leaves out many elements of how people feel and think, but those things that do not affect behaviors are left for study in pure psychology. I intentionally choose this conceptualization because only the psychological elements that affect behaviors are expected to have social implications.

Now, we have a means of analyzing adaptation within a society. However, we need another logic to explain societal differences. If we are interested in the existence of a particular cognitive and behavioral pattern, and if we identify a situation in which that pattern produces a profit, how should we proceed? One approach is to see if this situation exists in a society in which people have the particular behavioral pattern and does not exist in a society in which people do not have that behavioral pattern. Because the behavioral pattern is associated with the situation, if there is no situation, there will be no behavioral pattern. However, this research strategy is usually not useful. For example, it is often said that American people are good at discussion and debating, while Japanese people are not. This is simply because the situation in which discussion and debating is beneficial does not exist in Japan. So, usually this strategy does not provide us much insight. It works only for problems that are too simple to be interesting.

The second way to proceed is more useful when we know that a situation that brings profit to a person who has the particular behavioral pattern exists both in a society in which people usually have this pattern and in a society in which people usually do not have this pattern. Then, what explains the difference in behavior across these two types of societies? The content of the incentive structures is responsible. Although I have not

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<sup>2</sup> Although Cosmides (1989) uses the term "social exchange," she is not referring to social exchange theory

made this clear, let me emphasize the distinction between the form and content of incentive structures. "Form" is the relationship between behaviors and outcomes. For each behavior, there is a corresponding outcome. By "form," I mean these patterns of relationships. "Content" is the relative weight of outcomes. For example, Tables 1.1 and 1.2 both describe a two-person prisoner's dilemma situation. Each player has two choices and there are four possible combinations of outcomes. The numbers represent payoffs. For example, when player 1 chooses D and player 2 chooses C in Table 1.1, player 1 gets three points (or dollars or whatever) and player 2 gets zero points. The form of incentive structure is the same for Tables 1.1 and 1.2. What is different is the content. The temptation to defect is huge in Table 1.2 compared to Table 1.1.

If there is no situation like Table 1.1 or 1.2 in a society and people do not have a behavioral pattern that is adaptive to this situation, that is the end of the story. However, if the same forms of incentive structure (for example, a prisoner's dilemma) exist in both societies, if the contents are different (as in Table 1.1 and 1.2), it is quite possible that the adaptive behavioral patterns would be different. Perhaps the behavioral pattern in a society whose content is like Table 1.2 is more likely to be defection than in a society whose content is like Table 1.1. For instance, according to Yamagishi and Yamagishi (1994), having general trust helps people to seek out better social relationships. This is true in both Japan and America. What is different across the two countries is the extent to which a person who has general trust is advantaged compared to a person who does not have general trust. In America, high trusters expect to get far more than what low trusters

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in sociology.

expect to get, while in Japan the difference between what high trusters get and what low trusters get is small, and may even run in the opposite direction. This is why people are more trusting in America than in Japan. Please note that in this example the situation that brings profit to high trusters is the same in both America and Japan. Thus, the form of incentive structure itself is the same. What is different is the content of the incentive structure. Because of the opportunity costs and transaction costs, in Japan, high trusters cannot get much compared to low trusters.

This is the end of the brief description of the evolutionary approach. I believe that this is a very useful approach in sociology because it incorporates theoretical logic into sociological insights such as social structure and social interaction. Before I move on to the next chapter, however, I describe a byproduct of this approach -- full awareness of micro-macro linkages.

The content of incentive structures is determined by other social structures. Or, incentive structures can be seen as one way of describing social structures. Either way, the logic of the evolutionary approach dictates that social structure determines people's behavioral and cognitive patterns. Then, what happens? Because this approach focuses only on psychological elements that affect behaviors, there is a chance that something at the macro-level can be affected by people's behavior. This is particularly important because people's behaviors and outcomes depend on one another. From each person's viewpoint, the other people are the environment that he is embedded in. Thus, if what is adaptive is relatively stable, thus means that there is equilibrium between people's behaviors. Therefore, it is possible that once external social structure changes, what is

adaptive would change, and how people behave would change. That means a total transformation of “culture.” Therefore, this evolutionary approach fits the category of micro-macro sociology discussed by Coleman (1990). There is a cycle: social structure affects how people behave, which in turn affects social structure. The changed social structure then changes how people behave, and so on.

One last note is the difference between this evolutionary approach and pure structuralism in sociology. I believe that pure structuralism is a sub-category of the evolutionary approach. After all, it is external social structures that determine people’s behaviors which, in turn, affect social structures. However, there are two differences. One is that in evolutionary approaches, certain social structures at the macro-level are not completely external. Sometimes macro-level phenomena can be influenced by people’s behaviors. The classic example is a self-fulfilling prophecy. Second, evolutionary approaches argue that we need to go to the micro-level to study people’s minds and behaviors. Although this is not always necessary, I believe that sometimes it is important. The reason is that people’s thinking and behavioral patterns are considered to be relatively stable over time because people learn to adapt to their environment. In other words, there is a certain amount of carry-over across situations. There is a certain inertia. If there is no inertia and people’s minds and behaviors can change instantly when the environment changes, then the need to go to the micro-level would be reduced. However, in most cases, I believe that it is useful to think about micro level phenomena.

### **1.3 Organization of the chapters**

Four chapters follow this one. In the next chapter, Chapter 2, I develop the theoretical argument. First, I apply the meta-theoretical position described in this chapter to the research on fairness. I propose a linear model of fairness judgment. Then, I argue that we need to distinguish between two types of fairness, fairness in exchange based on local comparison (e-fairness) and fairness in allocation based on referential comparison (a-fairness). Then, I predict what will happen if both are present in one situation. I argue that a-fairness affects e-fairness (“the dampening effect”). Examining how referential comparison occurs, I argue that there can be two types of referential comparison -- within-group referential comparison and across-group referential comparison. The extent to which people use across-group referential comparison is determined by social structures, especially the ways in which social associations are formed. Using Nakane’s (1967) terms, across-group referential comparison is more likely to occur in horizontal societies than in vertical societies. And, the dampening effect is stronger in across-group referential comparison than in within-group referential comparison. Since Japan is a vertical society and America is a horizontal society (Nakane 1967), it logically follows that people will care about e-fairness more in Japan than in America. In other words, people will have a greater tolerance to inequality in America than in Japan.

In Chapter 3, I examine the first part of my theoretical argument that distinguishes e-fairness and a-fairness. I conduct a series of simulations to see if there is enough reason to believe that e-fairness and a-fairness are the same. In Chapter 4, I examine the latter part of my theoretical argument that predicts a dampening effect, and a differential

effect of across-group referential comparison and within-group referential comparison. I conduct a laboratory experiment to test these predictions. Chapter 5 is the last chapter. I devote this chapter to remaining problems and future directions.

**TABLE 1.1, An example of a prisoner's dilemma game (1)**

Player 1's choice	Player 2's choice	
	C	D
C	2, 2	0, 3
D	3, 0	1, 1

**TABLE 1.2, An example of a prisoner's dilemma game (2)**

Player 1's choice	Player 2's choice	
	C	D
C	2, 2	0, 30
D	30, 0	1, 1

## CHAPTER 2: THEORY

Based on the meta-theoretical position in Chapter 1, I develop my conceptualization of fairness judgment -- "the linear model of fairness." There are 5 sections in this chapter. First, I review the previous research on fairness in sociology, psychology and economics, and propose a new conceptualization. I contrast existing conceptualizations of fairness with my conceptualization. Second, based on my conceptualization, I argue that we need to consider two types of fairness, fairness in exchange (e-fairness) and fairness in allocation (a-fairness), separately. This argument is further explored in Chapter 3. Third, I argue that one type of comparison process (referential comparison) by which a-fairness is produced affects the other type of comparison process (local comparison) by which e-fairness is produced when both comparison processes occur. This is called the dampening effect. It is tested by the laboratory experiment described in Chapter 4. Fourth, with regard to the process of fairness evaluation in allocation, I argue that we need to distinguish between two types of referential comparison -- across-group referential comparison and within-group referential comparison. Further, I argue that the strength of the dampening effect is stronger in across-group referential comparison than in within-group referential comparison. An empirical test of this part of the argument is described in Chapter 4. Finally, I link these two types of referential comparison with social anthropological research and speculate about a macro-level implication of this distinction.

## **2.1 Conceptualization of fairness**

In Chapter 1, I discuss my meta-theoretical position in very general terms. Now I apply meta-theoretical position to research on fairness. In this study, fairness is seen as a characteristic of a society as well as of an individual. Fairness is something that people in a society learn and develop as a means to adapt to the environments that are specific to the society. Although there are certainly individual differences, people in general in one society may have a stronger sense of fairness than those in general in another society. This is why an individual-level fairness characteristic becomes a societal-level characteristic. At the individual level, fairness is a cognitive and behavioral pattern that is relatively stable over time. This is the personality aspect of fairness. More concretely, it is a tendency for an individual to react to a situation in which he feels that he was treated unfairly. A person who has a stronger sense of fairness is more likely to try to restore fairness than a person who has a weaker sense of fairness. The other aspect of my conceptualization of fairness in this research is that fairness judgment is affected by situational factors. This is the situational aspect of fairness. Although this description seems simple, it has several features and emphases that differ from other conceptualizations. In order to highlight these differences, I briefly review previous research on fairness.

### **2.1.1 Traditional social psychology in psychology and sociology**

It is not easy to summarize the existing research on fairness in social psychology as it is not consistent or coherent (Cook and Hegtvedt 1983, 1992). Because the word

"fairness" represents a very rich concept, many things are described using this word. Because of this complexity, it is not an easy task to write a brief yet complete review. The other thing that I should mention at the beginning is that in this literature "fairness" and "justice" are often used interchangeably. In order to avoid confusion, I will try to use "fairness" as much as I can unless it is absolutely necessary to use "justice," but this does not mean that I exclude the research that uses the word "justice."

Although we can trace the notion of fairness back to Aristotle, the first person who proposed this concept in modern social sciences is Homans (1961). In his social exchange theory, he argued that there is a norm of "distributive justice" that governs social exchange behaviors. Distributive justice is a principle of proportionality which is often called the "equity principle." It means that a person's rewards in exchange with others should be proportional to his investments. Homans argued that when a reward is lower than what this principle suggests, a person is likely to feel anger and display some form of aggressive behavior in order to restore fairness.

Following Homans (1961), Adams (1965) initiated the research area that is now called distributive justice research. He argued that fairness (equity) exists when the equation below holds. O means output, I means input, A and B are individuals.

$$O_A / I_A = O_B / I_B$$

Adams also proposed six means by which people reduce the degree of unfairness. They are: (1) alter their inputs; (2) alter their outcomes; (3) cognitively distort either their

inputs or outcomes; (4) leave the situation; (5) cognitively distort either the inputs or the outcomes of the exchange partner; or (6) change the object of comparison.

Many researchers followed Adams (1965). The main focus was on specifying EXACTLY HOW PEOPLE JUDGE FAIRNESS. Walster, Walster, and Berscheid (1978) and many other researchers tried to improve Adams's equation to match as closely as possible the processes that people actually use (see, for example, Alessio 1980; Harris 1976; Moschetti 1979). They encountered many problems with coming up with a clear, general, and precise equation. There were always complications and exceptions. So far there is no consensus among researchers regarding the best equation for the equity principle.

Later studies challenged the idea of equity as a fairness principle. "Equality" (everybody receives the same amount regardless of investments) and "need" (needy people receive what they need) are the most common two alternatives (Schwartz 1975, 1977; Deutsch 1975; Lerner 1974; Leventhal 1976; Reis 1984; Sampson 1975). Although there are several more, I leave this classification to Eckhoff's (1974) admirable work.

Then the main trend shifted. The original focus of distributive justice research was lost. Only a handful of studies since have examined behavioral reactions to unfairness (see, for example, Lawler 1975; Sell and Martin 1982). The main trend became investigating the factors that influence distribution rules. Cook and Hegtvad (1983) classified these studies into four categories. First, characteristics of the relationships among group members affect distribution rule preference. For example,

perceived similarity (Greenberg 1978), anticipation of future interaction (Greenberg 1979; Shapiro 1975), and open communication (Lane and Messé 1971; Leventhal, Michaels, and Sanford 1972; Reis and Gruzen 1976) increase preference for equality over equity. Need is preferred more among friends than nonfriends (Lamm and Schwinger 1980). Second, several mediating factors affect preferences. For example, Wittig, Marks, and Jones (1981) argued that an equality rule is preferred when performance is attributed to luck rather than effort. Third, the number of relevant inputs matters. For example, Cook and Yamagishi (1983) found that when the amount of reward is not fixed, but rather is determined by member contributions, the equity principle is preferred. By contrast, multiple principles are used when the amount of reward is fixed. The fourth category includes other factors. achievement orientation, the Protestant ethic, capitalism, and individualism promote the preference for equity (Kluegel and Smith 1986; Leung and Bond 1984; Uray 1976; Greenberg 1978). The effects of gender and age are inconsistent.

In 1980s, a new line of research emerged. It is called "procedural justice research" (Thibaut and Walker 1975; Lind and Tyler 1988). Procedural justice refers to fairness in the means by which distributions are made. Researchers argued that procedures matter regardless of outcomes. For example, even if the outcomes are the same, if in one situation the outcomes are derived by an unfair procedure while in another situation they are derived by a fair procedure, people would feel unfairness in the former situation but would not in the latter situation. This line of research is now very popular in legal, organizational, and political contexts. However, it is not relevant to my study because fairness in this line of research is not (at least directly) about outcomes.

Although the above studies were conducted mainly by psychological social psychologists, there also are a small number of sociologists who have studied fairness. First, social exchange theorists conducted several studies. Because the social exchange context was somewhat lost in psychology since Adams (1965), sociological research has been more or less independent from the trends in psychological social psychology. Cook and Emerson (1978) found that power use in social exchange networks is restrained when knowledge of differential outcomes is provided. Cook and Gillmore (1984) showed that powerless actors in social exchange networks are likely to coalesce when they face unfair distribution of resources. Molm, Quist, and Wiseley (1994) found that fairness norms legitimate behavioral inequalities that favor the powerful.

Second, status value theorists made a major contribution to the field (Anderson, Berger, Zelditch, and Cohen 1969; Berger, Cohen, and Zelditch 1972). Fairness formulations make comparisons central to the analysis of distributive justice. These scholars argued that there are two basic ways to formulate comparisons. One is called local comparison. It refers to when one individual compares himself with another particular individual. The other is called referential comparison. This refers to when an individual compares himself with a generalized other. They argued that referential comparison was missing in social exchange theory and was central to fairness judgment. Since this distinction is very important, I discuss it further in later sections.

Third, in a non-experimental tradition, Jasso and others (Jasso and Rossi 1977; Jasso 1980, 1983) tried to specify how people in various social positions make judgments of fairness in the distribution of earnings. The formula they proposed is shown below.

The actual share is what a person receives. The just share is the reward a person considers to be just, and is determined by situational factors. Comparing these two numbers, a person makes a judgment. Jasso and others argued that this formula can express precisely the degree of perceived fairness. Transforming this formula, she could predict how and to what extent each person in various social positions should feel unfairness.

$$\text{Justice evaluation} = \ln (\text{actual share}/\text{just share})$$

Since "just share" is the subjective belief, what determines justice evaluation is this subjective belief. Jasso and others found that certain characteristics of individuals are perceived as more important than others, and an individual's position in society influences which factors are rated as most important in determining "just share."

Markovsky (1985, 1988) also proposed a mathematical formulation that put status value theory, equity theory, and social comparison together. He argued that, in addition to individual-level comparisons, there can be group-level comparisons which become more likely as group identification increases. I avoid explaining the details here because they are not relevant to the subsequent discussion.

The other important area of study in sociology is relative deprivation (Stouffer, Suchman, DeVinney, Star, and Williams 1949; Merton and Rossi 1968; Davis 1959, 1963). The central question is this: Why do people who are better off than others in an objective sense often still feel deprived? This occurs when an individual compares her

rewards to those of others in a "comparison group," forms expectations, and receives rewards that are lower than expected. This is one of the building blocks for status value theory. I will discuss this point later in the chapter.

### **2.1.2 Economics and evolutionary psychology**

For a long time economists ignored fairness research in sociology and psychology (see Frank (1988) for an interesting discussion). Theories in economics assume a perfectly rational person. Therefore, anything that might challenge this central assumption should be dismissed. Fairness is no exception because the attempt to restore fairness is sometimes costly. Of course, economists were aware of psychological and sociological research on fairness, but they just did not believe that fairness affects behaviors. Feelings of fairness or fairness judgments are as far as they go, but economists did not believe that feelings of unfairness make people behave irrationally (Posner 1972).

However, this situation finally began to change after a striking finding in ultimatum games was confirmed repeatedly (see, for example, Guth and Tietz 1990; Guth, Schmittberger and Schwarze 1982; Kahneman, Knetsch, and Thaler 1986). In the ultimatum game, there are two parties who are given a fixed amount of money ( $Z$ ) to divide between them. Unlike the ordinary prisoner's dilemma game or its variants, the two parties do not behave simultaneously. One party is the first mover and the other party is the second mover. First, the first mover proposes a distribution of the profit ( $Z$ ) between the two parties. For example, he proposes that he takes  $X$  and gives  $Y (=Z-X)$  to

the other party. How much the first mover wants to give to the second mover is up to him. Next, the second mover decides whether to accept this offer or not. If the second mover accepts, the first mover receives  $X$  and the second mover receives  $Y$ . If the second mover rejects, both the first mover and the second mover receive nothing. According to the prediction of classical economics, the first mover should offer the minimum unit of the pie to the second mover and take most of the pie for himself. And, because the minimum amount is better than nothing, the second mover should accept this offer. However, surprisingly to experimental economists and not surprisingly to social psychologists, the first mover usually does not propose such an egoistic distribution, and the second mover often rejects an unfair proposition and makes them both receive nothing.

Clearly, this finding contradicts the central assumption in economics. People care about fairness, and sometimes people forgo the opportunity to get profit in order to pursue fairness, even if it costs them. How can economics be saved? The economists' strategy is to incorporate evolutionary psychology. Because evolutionary psychology is not yet popular, I describe the basic idea below.

According to Cosmides and Tooby (1997), evolutionary psychology is not an area of psychology but an approach to psychology. In evolutionary psychology, knowledge and principles from evolutionary biology are put to use in research on the structure of the human mind. The mind is a set of information-processing machines that were designed by natural selection to solve adaptive problems faced by our hunter-gatherer ancestors. Costmides and Tooby (1997) identify five core principles of evolutionary psychology.

(1) The brain is a physical system. It functions as a computer. Its circuits are designed to generate behavior that is appropriate to our environmental circumstances. (2) Our neural circuits were designed by natural selection to solve problems that our ancestors faced during our evolutionary history. (3) Consciousness is just the tip of the iceberg; most of what goes on in our minds is hidden from us. As a result, our conscious experience can mislead us into thinking that our circuitry is simpler than it really is. Most problems that we experience as easy to solve are actually very difficult to solve -- they require very complicated neural circuitry. (4) Different neural circuits are specialized for solving different adaptive problems. (5) Our modern skulls house a stone age mind.

Relying on evolutionary psychology, experimental economists can develop economic theories that incorporate the sense of fairness. The sense of fairness still contradicts classical economics, but is no longer a threat because it is, in a sense, rational. More precisely, it WAS and perhaps HAS BEEN rational during our evolutionary history. So, people are not just irrational. They are irrational in a reasonable way. Thus, scientific theories can be built using the assumption of fairness. What is necessary is to find the environments or adaptive problems in which a sense of fairness can be rational. Although this line of research has just begun, during the next decade we may see significant development.

### **2.1.3 A linear model of fairness judgment**

Now, I would like to present my conceptualization of fairness and contrast it with the other conceptualizations of fairness in traditional sociological and psychological

research and in economics and evolutionary psychology. Of course none of these theories denies the others. They just focus on different aspects of fairness. I believe that reformulating fairness with this new model helps us to understand various studies on fairness more easily.

My conceptualization is called “a linear model” and is expressed by this equation:

$$Y_{ij} = a_I + b_j X_{ij} \quad \text{----- Equation 2-1}$$

This equation expresses how each individual (j) makes fairness judgments given certain level of objective inequality. “I” denotes situations, “j” denotes individuals. “X<sub>ij</sub>” denotes input, or the degree of objective inequality. “Y<sub>ij</sub>” denotes outcome, or the severity of perceived unfairness. “a<sub>I</sub>” denotes situational factors that affect fairness judgment, and “b<sub>j</sub>” denotes individual-level characteristic, or the sense of fairness as a personality trait.

This equation states that there is a linear relationship between the degree of objective inequality and feelings of unfairness (and efforts to restore fairness). Of course this is a very simple representation, but I hope that it is sufficient for the purpose of this research. I do not want to make it too complex because the purpose of proposing this new conceptualization is to highlight the relationships among various fairness studies and what I do in this research.

This model can express three conceptualizations of fairness. Let me elaborate them.

(1) Where do we see differences in fairness? There are many sources of differences. One person behaves differently from one situation to another. Different people behave differently in one situation. People in different societies behave differently. Traditional psychological and sociological research focuses on the first type of difference: within-individual differences. It focuses on the kinds of external factors that affect fairness judgments. There is an implicit assumption that people behave differently because external factors that affect them are different. Scholars who hold this view are interested in what makes one person behave differently from one situation to another. They are interested in the situational aspect of fairness judgment. In other words, they are interested in “ $a_i$ ” in Equation 2-1.

By contrast, in economics and evolutionary psychology, there is no difference in fairness evaluations. These scholars explain the existence of fairness as a characteristic that is universal because it is hardwired and produces adaptive behaviors. Thus, they are interested in the existence of Equation 2-1 itself, or the existence of “ $Y$ .”

Finally, according to the central idea that fairness is a learned adaptive behavior, each individual is considered to have a sense of fairness that is specific to them. This personality-based aspect is represented by “ $b_j$ ” in Equation 2-1.

Although Equation 2-1 can express three aspects of fairness, I am interested only in two. I am not interested in the hardwired sense of fairness. Rather, I focus on the situational and personality aspects of fairness.

Obviously, these two parameters, “ $a$ ” and “ $b$ ,” determine the graph. They indicate that there can be two types of variation in fairness judgments. As many traditional

psychological and sociological studies point out, many factors affect fairness judgments even if the degree of objective inequality is kept the same. For example, it is often said that people have ego-centric biases (see, for example, Messick and Sentice, 1979). This argument is represented by moving the line to the left while keeping the slope the same. Thus, the fact that situational factors affect fairness judgments, and that the same person behaves differently from one situation to another, is represented by the intercept, “a.”

The other variation in fairness judgments is created by individual differences. Some people are very sensitive to unfairness across situations, while others are not. Such differences are most likely produced by different adaptation strategies. For some people, being sensitive to unfairness is adaptive while for others it is not. This is the personality-based fairness that I am interested in. This sense of fairness is relatively stable over time. Such personality-based fairness is represented by the slope, “b.”

(2) How does fairness change? In economics and evolutionary psychology, the sense of fairness does not change. Even if it changes, it will take hundreds of thousands of years because the change has to be hardwired by biological evolution. In traditional psychology and sociology, fairness changes instantaneously once the external factors that affect it change. In my conceptualization, the personality-like fairness (the slope, “b”) can change – more quickly than hundreds of thousands of years but more slowly than instantaneously. People learn to behave fairly. So, they will take some time to learn to behave differently once their environments change, but they will change eventually. Regarding the situational aspect of fairness (the intercept, “a”), it can change

instantaneously. Thus, my conceptualization states that there are two kinds of influence that affect fairness judgment, one changes instantaneously and the other changes slowly.

(3) What are the macro-level implications of this conceptualization of fairness?

In traditional psychology and sociology, when external situational factors change, people's behaviors change, and it leads to social change. Therefore, there is a possibility of a macro-level implication. However, this relationship is considered to be one-way. Since fairness is not considered an adaptation strategy, it only plays the role of mediating the effects of external factors on macro-level phenomena. In economics and evolutionary psychology, there is no macro-level implication. Because fairness is universal and does not change, these scholars cannot explain societal or cultural differences. They see individual differences as errors. In my conceptualization, there is a room for macro-level implications. My argument is specifically designed to explain societal and cultural differences. It sees an equilibrium between minds and societies. These macro-level implications apply mostly to personality-based fairness.

In sum, the linear model of fairness incorporates three different conceptualizations of fairness: fairness as a hardwired entity in experimental economics and evolutionary psychology, fairness judgments as a response to situational factors in traditional psychological and sociological research, and fairness as an adaptive response to social environments (a view based on the meta-theoretical position explained in Chapter 1).

## **2.2 Two distinctions: Between exchange and allocation and between local comparison and referential comparison**

In the previous section, I develop a conceptualization of fairness that naturally stems from the meta-theoretical position that I explain in Chapter 1. It is now time to move forward. What I should do next is to look for a situation in which people develop a sense of fairness. Using evolutionary psychology's terminology, I should look for an adaptive problem to be solved by a sense of fairness. I argue that there are two adaptive problems to be solved, and each has its own sense of fairness.

I rely on the point that Cook and Hegtvedt (1983) made on distributive justice research regarding the situations in which fairness emerges. Originally, fairness was considered to be an issue for social exchange. However, somehow the situation the empirical situations that people actually investigate changed after Adams (1965). The result is a lack of correspondence between theory and research. The theory is frequently couched in exchange terms, yet the empirical tests involve primarily allocation situations. I believe that this is a very important distinction because exchange and allocation may involve two different incentive structures and, therefore, create two adaptive problems to be solved.

Exchange is a flow of resources between two parties. When party A has what party B wants, and party B has what party A wants, an exchange of resources occurs. In other words, exchange occurs between two parties when they depend on each other (Emerson 1972a, 1972b). By contrast, allocation occurs when an allocator (either a person, organization, or nature) determines the distribution of resources among

recipients. Thus, each recipient depends on the allocator, while the allocator does not depend on recipients. I believe that these two situations are completely different, and that what fairness means may vary across these two situations. In order to illustrate this point, I briefly review status value theory.

Status value theory (often called expectation states theory) was developed by sociologists at Stanford University, particularly Joseph Berger, Bernard P. Cohen, and Morris Zelditch, Jr.. The underlying idea is that external status differences among members of a task group determine the distribution of power and prestige within the group (Berger, Cohen, and Zelditch 1966). Criticizing exchange theoretical formulations of fairness, they argue that we should formulate fairness in terms of the status significance of rewards (Anderson, Berger, Zelditch, and Cohen 1969; Berger, Cohen, and Zelditch 1972). In making this argument, they identify an important distinction between two types of comparison processes that occur when people make fairness judgments.

Social comparison is one of the essential aspects of our daily life. According to Festinger (1954), knowing the situation we are in is an adaptive behavior. We must know what we can and cannot do in a given situation. Without such knowledge, we cannot live a normal life. Therefore, people have a desire to know whether their beliefs about a situation and what they can do are true. When objective truth is available, people can simply refer to it to see if their belief is correct. However, if such a truth is not immediately available or is ambiguous, individuals must to rely on what others think and how they behave. In this way people create social reality.

Exchange theories implicitly assume that this social comparison process occurs when people make fairness judgments. The concept of fairness is relative by definition. It is quite obvious that there can be no fairness judgment if there is no target of comparison. According to exchange theories, a person making a fairness judgment compares what he receives with what the exchange partner receives. However, Berger and others argued that such comparison is not sufficient. They argue that we should incorporate structural aspects of comparison process. The structural aspect is the process by which meaning is given to rewards and expectations are formed about their allocations. Without such situational cues, it may not be possible for a person to make a fairness judgment. For example, if a buyer of rubber makes \$10 per transaction, while a seller makes \$5, exchange theories would predict that the seller will judge the situation as unfair. However, this is not necessarily the case. If the seller knows that sellers of rubber typically make less money than buyers, then the seller may not feel unfairness. In other words, the seller relies on a referential structure. A referential structure is a particular frame of reference that has the following four components: (1) Generalized individuals, (2) who possess given states of given characteristics, (3) with which are associated given states of given goal-objects, and (4) where the characteristics and goal-objects are all status-valued. The term generalized individual refers to a group of individuals perceived as having certain characteristics that someone in this group would typically possess. In this example, the generalized other is the other sellers. The goal-object is the valued resource (money). In short, the comparison to a referential structure is the comparison between self and similar others in similar relationships.

Formally, Berger and others identified two kinds of comparison processes – local and referential. Comparisons in which one individual compares himself with another particular individual are called local. Comparisons in which an individual compares himself with a generalized other are called referential. Berger and his colleagues criticize exchange theories for considering local comparisons only, although it is clear that referential comparisons are also relevant.

Since the relationship between these two comparison processes and the distinction between exchange and allocation is complicated, I discuss various possibilities in the following paragraphs. I propose that two kinds of fairness result from these two comparison processes.

Originally, exchange theories formulated fairness in a two-person exchange situation. In this situation, two individuals depend on each other, and what matters is the comparison between what one individual receives and what the other individual receives. This comparison is a local comparison. However, this is not the only exchange situation that exchange theories consider. They also look at n-person exchange relations. Emerson (1972b) proposed two ways to extend his social exchange theory beyond dyads. One, corporate actors, is not relevant in the context of this research. The other is exchange networks that are composed of multiple exchange relations. This is an most important point for this research, and I discuss it later in greater detail.

Generalized exchange also involves multiple individuals (Ekeh 1974; Heath 1976; Gillmore 1987; Takahashi 2000). Three major types of generalized exchange have been identified: network-generalized exchange, group-generalized exchange, and pure-

generalized exchange (Yamagishi and Cook 1993; Takahashi 2000). In network-generalized exchange and pure-generalized exchange, there is no mutual dependency among individuals. Therefore, for this research, I do not focus on these types of exchange. However, in group-generalized exchange there is mutual dependency. Therefore, I should include this type of exchange in the research. In this situation, group members pool their resources and then receive the benefits that are generated by pooling. In other words, group members contribute to the group and receive benefits from the group. I argue that this situation is very close to the allocation situation that I describe earlier. Each person would be anxious about how much she receives from the group compared to the other people. Because this comparison is referential, I argue that group-generalized exchange creates an allocation rather than an exchange situation, and that referential comparison is the major factor that determines fairness judgments in group-generalized exchange situations.

Categorizing allocation situations is simpler. There can be a two-person allocation. If two roommates receive a bottle of wine from a friend, the issue is how to divide the bottle of wine. In this situation, the comparison between the two roommates is local. How often does such a situation occur? Is it very relevant? I doubt it. I, therefore, exclude two-person allocation from the focus of this research. This means that for purposes of this study, allocation refers to *n*-person allocation. In *n*-person allocation situations, each person compares his share with the other people's share. This is a referential comparison.

In sum, I reorganize the terminology and argue that local comparisons are the major factor in exchange situations and referential comparisons are the major factor in allocation situations. Now, I argue that there are two kinds of fairness that match this distinction.

In exchange situations, there is mutual dependency between individuals. Thus, this situation has the characteristics of a prisoner's dilemma (Molm 1994; Yamagishi and Cook 1993). In such situations, what should each player do? Should he behave fairly? Should he protest when the exchange partner is unfair? Scholars have cumulated a significant amount of knowledge on the prisoner's dilemma. For example, when two actors are locked in an exchange relation, a Tit-For-Tat (TFT) strategy is the most adaptive behavior (Axelrod 1984). When two actors are not locked in the same exchange relation, Out-For-Tat strategy is the most adaptive behavior (Yamagishi and Hayashi 1996; Hayashi and Yamagishi 1998). However, these previous studies do not incorporate the element of fairness or behavioral reaction to unfairness. In order to do so, I extend the arguments made in previous research.

Based on the previous research, I argue that, in a two-person exchange situation, the default adaptive behavioral pattern is to be fair. "To be fair" means two things in an exchange situation. First, an individual gives resources to the partner so that each person receives the same amount of profit from the transaction. Second, an individual protests if the partner is not fair. Although these two behaviors can be different, here I consider them to be one set of behavioral patterns. The validity of this consideration will be discussed in Chapter 3. This is a natural extension of the findings in prisoner's dilemma

research. Typically each player's choice is binary (cooperation or defection) in prisoner's dilemma situation. In such a situation, TFT is one of the best strategies (e.g., Axelrod 1984). TFT also can be applied to two-person exchanges in which each player's choice is continuous (that is, each player decides how much to give). "Being fair" can be seen as the application of TFT in a two-person exchange situation.<sup>3</sup> However, many other factors affect the effectiveness of "being fair." For example, there may be certain costs to being fair. If protesting incurs costs, it might not be the best thing to do. If this is so, then being unfair (or exploitative) to a tolerant person (who is not likely to protest) may produce a better outcome for the individual than being fair to a tolerant person. The probability of future interaction with the same exchange partner, reputation, choice of partner, and so on also matter. However, AS A DEFAULT, being fair is the best strategy in a two-person exchange. Let me call fairness in exchange as "e-fairness." E-fairness refers to the extent to which people's sense of fairness is strong.

The story would be quite different in allocation situations. First of all, there is no previous research exploring what each recipient should do in allocation situations. Based on the logic in Chapter 1, I argue that there is an adaptive behavior in allocation situations for which the incentive structure is different from two-person exchanges. In allocation situations, what is important is how much a person receives relative to how much others receive. Then, what should each person do? Again, "be fair" is my answer. In allocation, "to be fair" means only one thing: trying to get a fair share. If the individual receives an unfairly smaller amount of resources, she should protest to get as

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<sup>3</sup> In fact, TFT is sometimes considered a fair behavior (Trivers 1985).

much as the other recipients. Furthermore, in general, I argue that each person will try to get as much as possible. No matter what the distribution of resources is, each person should ask the allocator or some institution to give him more. If the allocator does not listen, it would not hurt. If the allocator listens, that would be lucky. Of course, if there is a cost for protest, then perhaps protesting may not always be the best action. Thus, whether protesting is adaptive or not depends on actual payoffs. But I argue that there is another set of cognitive/behavioral tendencies that determines people's reactions in allocation situations. Let me call this "a-fairness." As a default, "a-fairness" refers to trying to get as much as possible from the allocator.

Let me go back to Equation 2-1. What I argued in this section is that there can be two equations, each of which corresponds to exchange or allocation. Thus, in exchange situations,  $Y_e = a_e + b_e X_e$  holds, and in allocation situations,  $Y_a = a_a + b_a X_a$  holds. " $b_e$ " represents e-fairness and " $b_a$ " represents a-fairness. Since exchange and allocation are not simple situational factors that affect fairness judgment but fundamentally different incentive structures, and if e-fairness and a-fairness should be considered separately, then we should have a separate equation for each incentive structure.

In sum, in this section, I argue that exchange and allocation are two distinct situations, and that each may have a corresponding adaptive behavior. Thus, exchange, local comparison, and e-fairness are inextricably linked, and allocation, referential comparison, and a-fairness are also inextricably linked. Whether such formulation is appropriate is explored further in Chapter 3. I examine whether the distinction between e-fairness and a-fairness is meaningful using a computer simulation. But now, I move on

to the issue that I have left intentionally. That is the situation that involves multiple exchange relations.

### **2.3 Consequences of referential comparison**

In the previous section discussing various exchange and allocation situations, I made a distinction between exchange and allocation. Local comparison is the major determinant of fairness in exchange, while referential comparison is the major determinant in allocation. However, I left one important situation unclassified. It is the situation that involves multiple exchange relations. In such a situation, there are multiple two-person exchange relations, or in other words, there is a collection of independent dyads. One actor may have multiple exchange partners, or one actor may have only one exchange partner but there are multiple pairs of actors.

Such situations are very common in everyday life, but no previous study has explicitly identified them. When Berger et al. (1972) proposed the concept of referential comparison, they had in mind distributive justice, not social exchange. In other words, they exclusively analyzed allocation situations and did not pay attention to exchange situations. The experiments conducted by other distributive justice researchers also involved allocation only. Social exchange theories considered a two-person exchange situation a unit. Only a handful of social exchange network literature addressed the issue of fairness, but these studies typically focused on the legitimacy of power advantaged actors (Cook and Hegtvéd 1986; Molm, Quist and Wisely 1994). Therefore, they only considered local comparisons. Moreover, the target situation here does not necessarily

constitute an exchange network since a collection of independent two-person exchange relations is not considered “connected” by Emerson’s (1972b) definition. One exception that considered both local and referential comparisons is Törnblom (1977), but he did not consider the relationship between local and referential comparisons. Finally, a collection of independent exchange relations is similar to group-generalized exchange, but I argue that people perceive it differently from group-generalized exchange. Group-generalized exchange is the exchange between each actor and the group. What I am interested in here is exchange situations in which both parties are individuals.

Perhaps the reason that situations involving multiple exchange relations have not been studied is that they usually are not considered “a unit,” but a collection of dyads. Two actors exchange resources within each dyad independently, and there is no interdependency between dyads. Perhaps this is why the unit of analysis has typically been the dyad, not the collection of dyads. However, I argue that a simple collection of dyadic exchange relations may have a kind of interdependency as a result of the psychological mechanism that I describe below.

In situations that involve multiple exchange relations, people will use referential comparison in addition to local comparison. For example, each worker in a company gives labor to the CEO and receives salary in return. In a sense, this is an exchange relation. A salesperson of Company X might think that his share of the corporate profit is too little compared to that of the CEO. This salesperson is using local comparison to judge whether the situation is fair or not. If he believes that the exchange term is unfair, the target of his protest is the CEO. However, many other companies exist in which

workers also exchange labor for a salary. Therefore, the salesperson in Company X might compare his salary to other salespeople's wages in other companies. Now, he is using referential comparison, even though this is an exchange situation.

Please note that exchange relations are independent in this example. Each worker has to negotiate with the CEO in order to restore fairness if he believes that the situation is unfair. Thus local comparisons still play a major role. However, even though there is no logical reason to use referential comparisons, I believe that people cannot help using referential comparisons since the situation looks similar to allocation. Further, I argue that fairness judgments based on referential comparisons will affect fairness judgments based on local comparisons. What is the influence of fairness judgment based on referential comparisons? Below, I analyze situations that involve multiple exchange relations and in which people use referential comparisons in addition to local comparisons. I argue that using both comparisons has a rather surprising implication.

### **2.3.1 Dampening effect**

Because these two comparisons can be independent, it is possible that the fairness evaluations these two comparisons suggest do not match. Sometimes both of these comparisons indicate that the situation is fair, and sometimes both indicate that the situation is unfair. But it is possible that one indicates that the situation is fair and the other indicates that it is not fair. I believe that the more interesting situation to study is when their implications are inconsistent. When both tell the individual that the situation is unfair, then he would probably protest. When both tell the individual that the situation

is fair, then he would do nothing. No surprise. But what will the actor do if the two comparisons tell him different things?

I propose that each one either enhances or weakens the other. Although there are many possibilities, in this study I limit my focus to the situation in which local comparisons tell people that the situation is unfair and referential comparisons tell them that it is fair. The reason for this decision is that this situation is one of the most common. In a modern society that has some form of hierarchy or stratification, local comparisons usually tell people that there is inequality, thus creating a perception of unfairness. After all, what is most interesting is what people who believe that they are underrewarded will do. If referential comparisons also tell people that a situation is unfair, both comparisons are telling them the same thing and people will feel unfairness. No surprise. But if referential comparison tells them that the situation is actually fair, then there is a conflict between two comparisons. Thus, the consequence may be interesting.

In such situations, I propose that a-fairness judgments based on referential comparisons discount the severity of e-fairness judgments based on local comparisons. In other words, people feel less unfairness toward the target of a local comparison when referential comparisons suggest that similar others get similar amounts of reward than when it does not say so. This prediction is rather straight forward, but nonetheless I mention several justifications. First, using another comparison is a cognitive distraction that reduces the salience of local comparison. Second, from the original conceptualization of Berger and others, a referential comparison provides a basis for an

expectation of what one should get from the target of the local comparison (exchange partner). If an actor knows that similar others get as much as he does, then he will expect similar treatment from his exchange partner.

I call this effect the **dampening effect**. I test this argument using the experiment described in Chapter 4. But this is not the end of the story regarding referential comparison.

## **2.4 Who are similar others?**

So far, I have intentionally left the definition of "similar others" vague, even though the target of referential comparison is critical in fairness judgment. Even Berger and others have not developed a theory that addresses the question of how people define similar others. However, it is time to address this issue. What kinds of factors determine whether certain person(s) are similar to you or not? How do people choose the target of comparison when they use referential comparison? Pursuing these questions will lead us to a rather unexpected conclusion at the end of this section. But let me start with a review of Social Identity Theory and Social Categorization Theory -- the dominant theories that address these questions.

### **2.4.1 Cognitive group formation and similar others**

We often categorize other people. For example, a sociology graduate student at the University of Arizona may consider their fellow sociology graduate students, other sociologists around the world, or all students at the U of A (Wildcats) "similar others."

But exactly how does this cognitive process of categorization occur? One thing is very certain. "Similar others" means "a group of similar others." Thus, this categorization coincides with cognitive group formation. This cognitive process is one of the hottest topics in social psychology. Decades ago, researchers found that people like similar others and want to interact with them (Heider, 1958; Byrne, 1971), and that they favor members of their group (Tajfel 1978; Tajfel and Turner 1979). The question of group formation is also one of the focuses in group entitativity research (Hamilton, Sherman, and Lickel 1997). Then, how do people define and categorize groups?

Turner, Hogg, Oakes, Reicher, and Wetherell (1987) summarize numerous previous arguments on this issue in psychology, suggesting into three criteria. The first is interdependence. Members of a group depend on each other. So, interdependence is the basis for a group. The second is social structure (Sherif, 1967). Social structure (roles, statuses, and norms) constitutes the existence of a group. However, Turner and his colleagues dismiss these two arguments and adopt the third – "identity." Group members have some collective awareness of themselves as a distinct social entity. They tend to perceive and define themselves as a group, to share some common identity. Turner and his colleagues use Social Identity Theory to develop Self Categorization Theory – a theory that has had a profound influence on social psychology.

#### **2.4.2 Social Identity Theory and Self-Categorization Theory**

Social Identity Theory (SIT) is the predecessor of Self-Categorization Theory (SCT). SIT was originally developed by Tajfel and his associates in the 1970s (Tajfel

1978; Tajfel and Turner 1979). According to this theory, social identity is an aspect of an individual's self-concept that is based upon her social group or category membership together with her emotional, evaluative, and other psychological correlates. The fundamental assumption is that people are motivated to evaluate themselves positively. Because people define themselves in terms of some group membership, they are motivated to evaluate that group positively. The theory argues that this is the reason that subjects in minimal group experiment show discrimination against out-group members. In the original minimal group experiment, Tajfel, Billig, Bundy, and Claude (1971) created minimal groups by dividing subjects into two groups based on a trivial criterion. No interactions or communications were allowed, either within or across the groups. Subjects were asked to allocate money between one in-group member and one out-group member. The startling finding was that subjects gave more to the in-group member than to the out-group member, even though the grouping was completely arbitrary and no social interactions occurred. Why did such a thing happen? According to SIT, this happened because subjects wanted to have a positive self-image. And, the only thing that they could use to enhance their self-image was to give more money to in-group members so that in-group members were better off than out-group members.

While SIT emphasized motivation, SCT, its successor, focuses more on cognition. SCT is also more general than SIT. SIT is a special case of SCT. SIT is a theory specifically designed to explain intergroup behavior, whereas SCT is supposed to explain every aspect of group behavior. According to SCT, self-categorization is the cognitive grouping of oneself and some class of stimuli as the same, in contrast to some other class

of stimuli. Self-categorizations exist as a part of a hierarchical system of classification. They form at different levels of abstraction related by means of class inclusion. The more inclusive the self-category, the higher the level of abstraction. Each category is entirely included within one other category but is not exhaustive of that more inclusive category. For example, some people may categorize themselves as Arizonan and some other people categorize themselves as Texan. At the same time, they may also categorize themselves as Americans as opposed to Japanese. And yet, sometimes they all consider themselves humans. The frame of reference that becomes salient is determined by two factors. One is "accessibility." This is the relative readiness of a given frame to become activated. The more accessible the category the less input required to invoke the relevant categorization. The other one is "fit." This is the degree to which reality actually matches the criteria which define the category. These two factors depend in turn on motives, culture, norm, and so forth.

Although the above description is very brief, it suits our needs here. I argue that three problems in SCT are relevant to my research. The first is that the very foundation of SCT, that is that people show out-group discrimination in a minimal group experiment even if that behavior is against self-interest, is questionable (Rabbie, Schot, and Visser 1989; Yamagishi, Jin and Kiyonari 1999; Yamagishi and Kiyonari 2000). In other words, the so-called "self-enhancement motivation" may not be as strong as had been thought.

The second issue is the confusion of the concept of "group" and "category." In SCT, these two words are used interchangeably. However, can be quite different. For

example, a self-image as a U of A student implies that the U of A is perceived as a group. A U of A student sees other U of A people everyday. There is interdependence and direct interaction among members. Thus, the word "group" is quite adequate. However, a self-image as a male may not imply that there is a group of men. Usually there is no direct interaction among members. And, there is no interdependency. Thus, "male" is a category, but not a group. However, SCT does not distinguish these two cases.

The third problem is the most important here. It is related to the second issue. It is that SCT assumes a hierarchical system of categories. Members of the lower level categories are all included in the higher level categories. Further, the question of which frame of reference becomes salient is basically the same as which level of categorization is activated. This conceptualization might be adequate in cognitive psychology or any discipline that uses a taxonomy. However, it leads to a serious shortcoming when we think about reference groups. Consider the example shown in Figure 2.1. According to SCT, the issue is the level of categorization that is activated. Sometimes it is at the sub-nation level, sometimes it is the nation level, and sometimes the level above nation. Also, please note that each member of any category cannot have another membership in another group at the same level. However, it is very common that that is not the case. Consider the example shown in Figure 2.2. In this example, each person can be either an Arizonan or a Texan. At the same time, each person can be either a Republican or a Democrat. And, these two frames of reference exist at the same level. Neither includes the other category. SCT does not provide a theoretical explanation of which category is activated and why.

Is this a big problem? It depends on whether situations such as Figure 2.2 are common or not. I believe they are. They are very common at least in modern societies, although such situations may not exist in elementary hunting and gathering societies. Situations like Figure 2.2 mean that there are cross-cutting ties. Since Simmel (1955), social network researchers have focused on "intersections" or "cross-cutting ties." Each person can belong to multiple groups, and can be a bridge between organizations. Such paths are quite important when we think about the flow of information or ideas, and even social exchange. From a different discipline, Nakane (1967, 1970) also argued that there are two types of group formation, horizontal and vertical. Figure 2.1 matches a vertical group formation, whereas Figure 2.2 is closer to a horizontal one. She argued that this difference could influence many societal problems, such as cohesion, intergroup behavior, or even personality characteristics. Nakane's theory has a very important implication, and I will discuss it later in this chapter.

### **2.4.3 Interdependency and roles**

So far, we have discussed the limitations of SCT. Then, do we have an alternative as a mechanism of defining similar others? I believe so. I argue that a straightforward and simple extension of the arguments made by classic researchers but dismissed by Turner and others (1987) is sufficient. They are interdependence and social structure, especially roles. They are also consistent with the theoretical perspective that I present in Chapter 1.

But before going into details, there is one thing that I should mention. That is what I mean by "role." Role has been one of the most prevalent research areas in many social sciences. In sociology, the main focus has been on role theory (Turner 1962, 1968, 1985; Heise 1981; Riddle and Thomas 1966; Biddle 1979; Merton, 1963). A role is a comprehensive pattern of behaviors and attitudes that constitute a strategy for coping with a recurrent set of situations (Turner 1990). A role consists of rights and duties, expected behavior, and so on. Thus, in a sense, a role is a concept that is constructed subjectively by people's minds. However, what I mean by a role is somewhat different. A more objective definition of role is one that can be applied to nonhuman beings. For example, natural gas and ordinary gas are both fuels. They play the same role when they are in the gas tank of a car. In this sense, what I mean by role is something akin to structural status roles, like occupational, family, and recreational roles that are attached to a position, office, or status in a particular organizational setting (Turner 1990). Again, I am interested in the objective truth from the viewpoint of outsiders.

Nobody would argue against the statement that interdependency promotes the sense of being a group. When individuals interact with each other frequently, when there is interdependency between behaviors among them, and when they share a common fate, they consider themselves "a group." This sense of groupness is also associated with similarity among members. The experiments on the minimal group paradigm by Tajfel and others showed that direct interaction significantly enhances group cohesion, in-group favoritism, and perception of similarity. Research on social dilemmas found that communication and interaction among members of a group significantly increased the

cooperation rate (see, for example, Orbell, van de Kragt, and Dawes 1988; van de Kragt, Orbell, and Dawes 1983). This is a natural way to define groups in hunting and gathering societies and in small communities today. However, as societies grow, the size of groups increases, and more differentiation occurs (Blau 1970; Mayhew and Levinger 1976). People begin to see differentiation among group members when their numbers increase. What is this differentiation exactly?

It is the differentiation of roles. The jobs that people hold are differentiated. The tasks that they play in a society are differentiated. The result is a hierarchical society. This is the basic idea of mechanical and organic solidarity that Durkheim (1984) described. In a society with mechanical solidarity, every member is interchangeable. There is no differentiation within the society. If someone dies, another person just takes her place. However, in a society with organic solidarity, members' roles are differentiated. What one person does for the group is different from what another person does. Because each member's function (or role) in a society is different, it is no longer easy to replace her. Members are not interchangeable. Each person is a necessary part of the whole.<sup>4</sup> Therefore, it is reasonable to think that roles of members became differentiated as a society developed. Now, we have similar groups based on similar roles.

Interdependency and roles, are two candidates that might provide a basis of similarity when people use referential comparison. Although both are important, they differ from each other. Similarity based on interdependency and direct interaction work

primarily **WITHIN A GROUP**, while similarity based on roles works both **WITHIN AND ACROSS GROUPS**. Let us consider this example. A salesperson compares her wage to her fellow salespeople's wages in her company. As members of the same company, naturally there is an interdependency among salespeople. Now, let us consider another example. A salesperson compares his wage to that of other salespeople in other companies. In this case, there is no interdependency between him and those other salespeople because they belong to different groups. But they are still "similar" from his viewpoint because they play similar roles in their own companies.

Is this difference important? I believe so. There are two main reasons. First, I argue that these two types of referential comparison have the same dampening effect on local comparison, but that their strengths differ. Second, this distinction is critical when we consider social networks and social structure at the macro-level. But let me first define what these two types of referential comparison are. Then, I will explain why I predict differential dampening effects on local comparison. The second reason will be discussed in Part 5.

#### **2.4.4 Two types of referential comparison and the consequences**

In addition to the distinction between local and referential comparisons, this study further identifies two types of referential comparison. One is within-group referential comparison, which is the comparison between self and similar others within a group. For example, a salesperson compares her wage to her fellow salespeople's wages. The other

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<sup>4</sup> This is why Yamagishi (1992) argued that social dilemmas can be solved more easily in a society with

type is across-group referential comparison, which is the comparison between self and similar others in other groups.<sup>5</sup> For example, a salesperson compares her wage to that of other salespeople in other groups. The target of within-group referential comparison is other group members with whom a person directly interacts, whereas the target of across-group referential comparison is members of other groups who are similar. Therefore, there is no direct interaction or interdependency between an individual and the target of across-group referential comparison.

*What is the consequence of these two types of referential comparison?*

Previously, assuming a situation in which local comparison tells a person that the situation is unfair because there is inequality between him and his exchange partner, I argued that a fairness judgment (based on referential comparison that tells him that the situation is fair because he is getting as much as similar others) would decrease the perceived unfairness by e-fairness judgment (based on local comparison) and thus reduce the tendency to react to this unfairness. Let me develop this argument in more detail.

When a person can use both local and referential comparisons, by definition she has two group memberships (or targets of comparison). One is the exchange relation between her and her partner, and the other is the group of similar others (her reference group). Because of these two comparison possibilities, the salience of local comparison should decrease. Cognitive psychologists have argued that categorization makes people see homogeneity among members of the category and heterogeneity between members of

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organic solidarity than in a society with mechanical solidarity. Organic solidarity implies an assurance game structure, whereas mechanical solidarity is closer to an n-person prisoner's dilemma structure.

different categories (Bruner 1957; Campbell 1958; Rosch and Lloyd 1978; Tversky and Gati 1982). Thus, a person would be more likely to perceive that the inequality between her and the exchange partner is acceptable because she is a different kind of person than her exchange partner. This is the dampening effect. Please note that I am not arguing that she would totally think this way. It is true only relative to the other situation in which only local comparison is possible.

Then, regarding this effect, is there any difference between the two types of referential comparison? I believe there is. This cognitive process would be more significant in across-group referential comparison than in within-group referential comparison. When a person uses within-group referential comparison, by definition she is still a member of the group. She has two group memberships within a single group. The target of local comparison (the exchange partner) and the target of within-group referential comparison are both the members of the same group including her. By contrast, when she uses across-group referential comparison, by definition the target of across-group referential comparison is not a member of her group. They are outside her group. And yet, she perceives that she is a member of this reference group because their roles are similar to her role. Therefore, her attention will be less focused on her original group when she uses across-group referential comparison than when she uses within-group referential comparison. As a result, the dampening effect will be stronger in across-group referential comparison than in within-group referential comparison, and so will the reaction to unfairness based on local comparison.

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<sup>5</sup> Anderson, et al. (1969) and Berger et al.'s (1972) original concept included both within-group referential

Let me summarize my hypotheses so far. Assuming that local comparison tells an individual that a situation (what she received compared to what the target of comparison received) is unfair, and referential comparison tells her that it is fair, there will be a dampening effect. An a-fairness judgment based on referential comparison dampens perceived unfairness created by an e-fairness judgment based on local comparison. Furthermore, this dampening effect will be stronger for across-group referential comparisons than for within-group referential comparisons. I will test these hypotheses with the experiment reported in Chapter 4.

## **2.5 Two types of referential comparison and a macro-level implication**

Although I believe that the argument developed here is important by itself at the theoretical level that is tested in the laboratory, I also believe that it has a significant macro-level implication. So, let me finally turn the focus to a more macro-level.

### **2.5.1 Vertical society and horizontal society**

So far I have not discussed what determines people's use of the two types of referential comparison. In this section, I use a study in social anthropology to discuss the background factor that affects people's use of referential comparisons: the structure of social associations.

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comparison and across-group referential comparison, although many examples they used may be closer to across-group referential comparison.

Although Nakane (1967, 1970) is a classic in the area of Japanese studies, sociologists may not be less familiar with her work. Here, I provide a brief summary of her argument, and then try to relate it to sociological theories.

Nakane identified two different fundamental principles of social association in Japan and other countries. One is that groups are identified based on individuals' common "attributes" that are acquired not only by birth but by achievement, and the other is that groups are identified based on situational position in a given "frame." "Frame" may be a locality, an institution, or a particular relationship which binds a set of individuals into one group. In all cases it indicates a criterion which sets a boundary and gives a common basis to a set of individuals who are located or involved in it (Nakane 1970: 1). Taking industry as an example, 'CEO' or 'salesperson' refers to an attribute, but 'the members of X Company' refers to a frame. 'Professor' and 'student' are attributes, whereas 'men of Z University' is a frame.

Nakane argued that these two principles of social association coexist in any society. However, she also argued that in some societies one principle is dominant whereas in other societies the other principle is dominant. Thus, she divided societies into two categories: vertical and horizontal.<sup>6</sup> When "frame" plays a more important role in a society, the society is called a vertical society. In such a society, people who have different attributes are tied together. On the other hand, when "attribute" plays a more important role in a society, the society is called a horizontal society. In such a society, people who do not share a common frame are tied together. She argued that Japan is an

example of a vertical society, whereas America, China, and India are examples of horizontal societies. For example, it is common to observe that a Japanese person introduces himself as "a member of X company" rather than as "a secretary." Also, the person who is meeting someone would rather hear first about the company he belongs to. The job that he is doing in his company is of secondary importance.

### **2.5.2 The relationship between the vertical/horizontal dimension and referential comparison**

Whether people live in a vertical society or a horizontal society has a significant impact on how likely people are to use across-group referential comparisons. First, information about other comparison groups is more available in a horizontal society than in a vertical society. The reason is straightforward: group boundaries are stronger in a vertical society than in a horizontal society. In a horizontal society, people have cross-cutting ties with members of other groups. Therefore, it is much easier to have information about other groups. On the other hand, in a vertical society, each group honors other groups' privacy. Because people need to know what similar others are getting in order to use referential comparison, it logically follows that across-group referential comparison is more likely in a horizontal society than in a vertical society.

Second, in a vertical society, a group is more likely to sanction the person who wants to have a tie with a person in another group. In a horizontal society, people within

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<sup>6</sup> Following Nakane, I use a dichotomy here. However, I actually see this as a continuous dimension. Some societies are very vertical, some are very horizontal, and others are somewhere between the two extremes. Thus, I use this dichotomy for illustrative purposes.

a tie are all alike; they share a common attribute. In other words, this "group"<sup>7</sup> is inherently homogeneous. By contrast, in a vertical society, members of a group are not alike. Therefore, Nakane argued that something is required to enhance cohesion and solidarity within groups. One approach is to promote a feeling of "one-ness" among members. Here Nakane used the logic of functionalism. In order to function as a corporate group, a group must have something that binds members together. Although this logic may not be sound, as a phenomenon this strong group identity seems to exist in a vertical society.<sup>8</sup> For example, Japanese companies demand that their employees devote almost everything to the company. There is a norm that employees should work more than what the contract says, without pay. They are supposed to send their children to the company's school. When they are sick, they are supposed to go to the company's hospital. There is often a company song. People go on vacation with their colleagues to the company's facility. Thus, essentially there is no distinction between private life and public life. Of course, the return from the company is life-time employment and various other informal benefits. But, the point here is that there are various norms that facilitate group identity. If a person violates these norms, he is regarded as a defector, and will be sanctioned either formally or informally. In such a society, it is very difficult to have cross-cutting ties. It is almost impossible to belong to multiple groups. If a person does this, he is no longer considered one of "us." Because cross-cutting ties bring information about other groups that is necessary to use across-group referential comparison, it

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<sup>7</sup> I use the word "group" here, although I know this is confusing.

<sup>8</sup> Although I use the term 'group identity,' I do not intend to suggest that Japanese are collectivistic or that Japanese 'love' their companies. Here, group identity only means the distinction between 'we' and 'others.' When people consider this distinction to be very important, I say that they have a strong group identity.

logically follows that a vertical society again keeps people from using across-group referential comparison.

The above argument corresponds to what Granovetter (1973) suggested. Thus, weak ties that provide a bridging function are more likely to be formed in America than in Japan. In fact, several studies have shown that weak ties are not very useful for getting a job in Japan (see, for example, Watanabe, 1991).

The last factor is mobility. As I describe above, in a vertical society each group is a closed self-sustaining system. Members do not have contact with persons in other groups unless it is absolutely necessary. Consequently, a person identifies himself as a member of group X. This provides him with assurance: if he is treated unfairly, the entire group will back him up. However, it also means that each person cannot do anything without the identity of being a member of group X. In other words, a person can do little as an individual. Therefore, leaving a group and becoming a self-employed person incurs a serious disadvantage. Also, it is very rare that people exit their group to seek out a new group to belong to. If a person does this, he must endure a severe disadvantage. People in the new group will regard him as a heretic: "He must have done something wrong because he moved to our company." Also, because the details of the norms are different in each group, this person has to learn everything all over again while enduring cold looks from others. Therefore, in a vertical society the level of mobility is very low. In contrast, the level of mobility in a horizontal society is high, and people may naturally have cross-cutting ties. They may keep ties with the people in the old group as well as form ties with the people in the new group. However, because this is very unlikely in a

vertical society, a vertical society keeps people from forming cross-cutting ties. Thus, a vertical society again prevents people from using across-group referential comparison.

Borrowing from social anthropology and social networks research, I proposed that across-group referential comparison is more likely to be used in a horizontal society than in a vertical society. But what is the significance of this argument? Is this just another example of the meta-theoretical position that macro-level phenomena affect micro-level phenomena? It is true, but there is more. Even if the objective level of inequality is the same, people should be less likely to protest against the target of local comparison when they use across-group referential comparison than when they use within-group referential comparison. This implies that inequality based on local comparisons is more likely to remain higher in a horizontal society than in a vertical society. And, descriptively this seems to be the case. In numerous studies, Japan has been considered one of the equal countries, whereas the United States has been considered one of the unequal countries. CEOs in Japanese companies do not make as much as CEOs in American companies. And, the average wage of workers is higher in Japan than in the United States. Therefore, one implication of this research at the macro-level is that the mechanism of referential comparison is one of the potential factors that help explain societal differences in inequality.

Some people would argue that my theory is wrong because common sense suggests that Americans are concerned with fairness much more than the Japanese. There is some evidence supporting this view (see, for example, Yamagishi and Yamagishi 1994). I do not argue against this statement. This may well be the case.

However, it can coexist with my theory. First, whether a society is vertical or horizontal affects the intercept, “a.” The coefficient (“b”) may be larger in the United States than in Japan as common sense tells us, but if the intercept is affected by social structure (whether a society is horizontal or vertical), it is still possible that Americans tolerate unfairness more than the Japanese. Second, American's hyper sensitive sense of unfairness may be used only for referential comparison, not for local comparison. If it were used to restore fairness based on local comparison, the degree of inequality might decline more in the United States.

Finally, I would like to make one note. The above argument fits the meta-theoretical position that I decided to take in Chapter 1. I hope that the whole argument holds and that this research will become another example of research on micro-macro linkages.

## **2.6 Summary**

This chapter is devoted to the development of the theory. In the first part, I present “a linear model of fairness judgment.” Then, I discuss similarities and differences between my conceptualization of fairness, and those in traditional psychological and sociological research and research in experimental economics and evolutionary psychology. In experimental economics and evolutionary psychology, fairness is seen as one of the emotional, cognitive, and behavioral tendencies that every human being has. These scholars are interested in the existence of fairness. In traditional psychological and sociological research, fairness is the emotional, cognitive, and

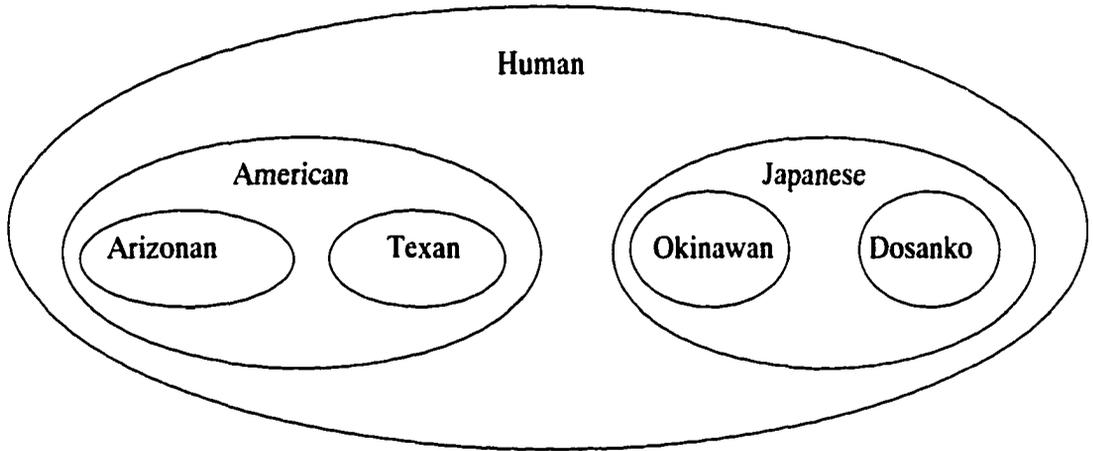
behavioral reaction to external stimuli that change from time to time and situation to situation. These researchers are interested in the external factors that affect fairness judgments. Based on the meta-theoretical position explained in Chapter 1, however, fairness is a cognitive, emotional and behavioral tendency that each person has. It is shaped throughout the lifetime of each person by the incentive structures of a society. Thus, Equation 2-1 shows that fairness judgment is affected both by a personality-based sense of fairness and by situational factors. This conceptualization allows us to explain societal differences in fairness.

Following this framework, I argue that we should make at least one distinction clear in the concept of fairness. That is the distinction between *e-fairness* and *a-fairness*. The utility and implications of this distinction is explored in Chapter 3. Chapter 3 explores the personality aspect of fairness.

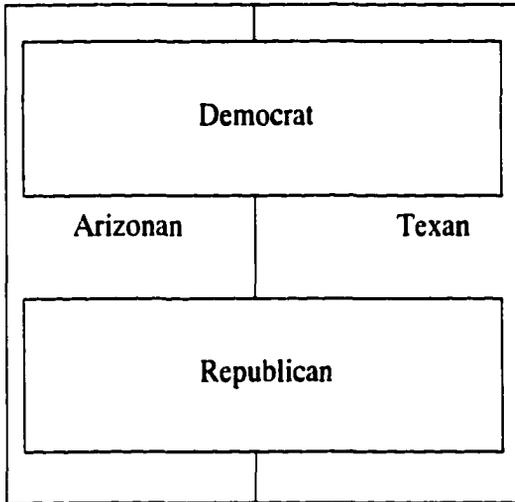
In the third part of this chapter, I develop a theory about the consequences of referential comparison when local comparison is also possible. I argue that *a-fairness* judgment based on referential comparison has a dampening effect on *e-fairness* judgment based on local comparison. This argument is tested in Chapter 4.

In the fourth part of this chapter, I make a further distinction between across-group referential comparison and within-group referential comparison, and argue that the dampening effect is stronger for across-group referential comparison than for within-group referential comparison. This prediction is also tested in Chapter 4. Thus, Chapter 4 is not about the personality aspect of fairness. Rather, it is about the situational factors that affect fairness judgments.

In the final part, I try to connect the whole argument to a macro-level phenomenon -- social inequality. It is true that behavioral reactions to unfairness at the micro-level are not necessarily linked to macro-level inequality. However, I believe that this study at least has the potential to speak to this issue. I cannot offer a concrete study to link these two levels right now, but I will discuss several possibilities in the last chapter.



**Figure 2.1, An example of categorization (1)**



**Figure 2.2, An example of categorization (2)**

## CHAPTER 3: SIMULATION

In this chapter, I describe a series of computer simulations that use an evolutionary approach. The main purpose is to see if the distinction between e-fairness and a-fairness that I introduced in Chapter 2 is meaningful or not. I will first explain why I need such simulations, and then proceed to the presentation of the simulations.

### 3.1 Purpose

As I discuss in Chapter 2, my conceptualization of fairness is represented by  $Y = a + bX$ , where  $Y$  is fairness judgment and  $X$  is the degree of objective inequality. “ $a$ ” is the default response. It is not a characteristic of an individual. Rather, it is a characteristic of a situation or society. “ $b$ ” is the personality-based fairness. Each person acquires it as he becomes an adult. This is what Chapter 3 is about. The value of “ $b$ ” is determined by the environment (payoffs in the incentive structure) in which an individual is embedded. In other words, “ $b$ ” exists as an adaptation strategy that each person has.

In Chapter 2, I argue that there can be two kinds of fairness, e-fairness (fairness in exchange) and a-fairness (fairness in allocation). If this argument is correct, it means that there are two equations,  $Y_a = a_a + b_a X_a$  and  $Y_e = a_e + b_e X_e$ . “Exchange” and “allocation” are particular environments or incentive structures. The actual payoffs in these situations determine “ $b$ ”. Previous research on fairness does not distinguish between allocation and exchange. The purpose of this chapter is to see if there are any grounds for the proposed distinction between e-fairness and a-fairness. I conduct a series of simulations using an

evolutionary approach to tackle this question. But, before going to the details, I explain why this claim is different from what traditional psychological and sociological research on fairness typically argues.

### **3.2 Differential predictions**

As I discussed in Chapter 2, previous research on fairness in psychology and sociology has been interested primarily in the situational factors that affect fairness judgments. There is an implicit assumption that the same person behaves differently from one situation to another. Therefore, if one person behaves differently in allocation and exchange, traditional researchers would argue that it is because the situation is different, and that the personal sense of fairness that exists behind these fairness judgments is the same. However, I would argue that each person has two kinds of sense of fairness -- e-fairness and a-fairness. The difference between exchange and allocation is not just another situational factor. They are two fundamentally different environments, and each has its own adaptive behavior.

Exchange situations have the incentive structure of a prisoner's dilemma. One typical difference is that a player in a prisoner's dilemma game has binary choices of behaviors (cooperation or defection) while a person in an exchange can change the amount of giving continuously. This difference, however, is not theoretical but descriptive. Therefore, I propose that we can apply TFT – a strategy that is adaptive in a

prisoner's dilemma situation -- to exchange situations.<sup>9</sup> Axelrod (1984) himself argued that TFT is a fair strategy since reciprocity leads to equality. Then, we can expect that for an individual to give as much as the exchange partner gives to him is an adaptive behavior. It is considered a fair behavior. However, such a strategy only works if two people exchange resources repeatedly over time. When the shadow of the future is short and no information about reputation is available, a person who gives as little as possible will be better off than a fair person. In such situations, each person would be wise to develop a behavior that counters unfair exchange partners. Otherwise, he will become a sucker. Here, I propose that each person has the option to protest if he feels that an exchange was unfair. Having this option, an exploited person can retaliate even without the shadow of the future. A person also can be seen as fair.

Now we have two behaviors that can be considered fair in exchange situations. Which is more important? Which is primary and which is secondary? I propose that we should focus on the second one (protest) as e-fairness in the context of this research. There are several reasons. First, it is more compatible with a-fairness in allocation. As I explain later, in allocation situations, a fair person can try to get their fair share. Such behavior is comparable with protest in exchange. Each person cannot be fair to the others as in exchange situation. Second, if we assume two behaviors, this means that we implicitly assume that the latter affects the former. In other words, people's sense of fairness in terms of protesting will shape people's giving behavior. It is hard to imagine the opposite. For example, let us suppose that protest against unfair exchange and giving

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<sup>9</sup> A person who adopts TFT starts with cooperation. After that, he does to the partner exactly what the

behavior both are fair in a society. Such a pattern exists because a person who gives unfairly cannot survive because the exchange partner would protest. People protest because a giving behavior is unfair. Therefore, in this context, I would consider the latter behavior (protesting against unfair exchange) e-fairness. Each person will acquire e-fairness as an adaptation strategy to the environment (exchange situation).

However, such a behavior is not always the best strategy. If protesting incurs costs, then it is not adaptive. For example, protesting may involve filing a law suit or physically fighting. In such cases, it is better not to protest. Then, giving less than the partner gives becomes profitable. Giving as much as the partner gives, and protesting to unfair exchange is maladaptive.

The above discussion suggests that whether fairness is an adaptive or not depends on the balance between the cost of protesting and the profit that the exchange achieves. When the cost is zero, being perfectly fair is the adaptive behavior. By contrast, when the cost is high, being unfair by giving less than the partner gives and not protesting unfair exchange is the adaptive behavior. The degree of unfairness that is adaptive depends on the actual payoffs of exchange and protest.

In allocation situations, the story is quite different. As I mentioned in Chapter 2, I only focus on recipients. Recipients receive resources from the allocator, institutions, or the earth. For them it is important to avoid receiving less than the other recipients receive. Therefore, when such a thing happens, a less privileged recipient should protest and try to get as much as the other recipients receive. This is the adaptive behavior in

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partner did to him.

allocation situation, and it also corresponds to fairness. So, I will call it a-fairness. Then, to what extent should a person protest? Infinitely. No matter how much the person receives, he should protest. There is nothing to prevent him from being hyper-sensitive to fairness. Such cases are rare, however. Usually there is a cost to protest. Therefore, again, the extent to which each person should protest depends on the balance between the payoffs of allocation and protest. When the cost of protesting is very high, enduring unfairness and not protesting may be the adaptive behavior.

So far, I have explained that e-fairness is an adaptive behavior in exchange and a-fairness is an adaptive behavior in allocation. The extent to which each person has these senses of fairness depends on the actual payoffs in a society. The argument implies quite a different story from what traditional social psychological research would imply.

Certainly, in every society both exchange and allocation situations exist. Thus, each person acquires e-fairness and a-fairness that are adaptive to the payoffs of exchange and allocation in a society. Therefore, theoretically, if in one society the cost of protesting in exchange is very high while the cost of protesting in allocation is very low, people in the society will have a higher level of e-fairness and lower level of a-fairness. These two fairness levels can be affected independently by the actual payoffs in a society.

Traditional social psychological literature implies quite a different story, however. Although they do not explicitly say so, I speculate that they assume a single sense of fairness as a default. They would treat exchange and allocation as just additional situational factors. Therefore, they assume that as a default there is one sense of fairness that affects any fairness-related behaviors. They would not admit the possibility that one

person protests unfairness in exchange but not in allocation, and at the same time another person protests unfairness in allocation but not in exchange. They would argue that there is a general tendency to react to unfairness, and that the situational difference between exchange and allocation should not produce a reversal of protesting tendency between individuals. In other words, they would argue that the difference between exchange and allocation affects “a” only. “b” stays the same within individual. By contrast, my argument implies that there are two “b”s ( $b_e$  and  $b_a$ ), and that they correspond with exchange and allocation.

In order to see whether the proposed distinction between e-fairness and a-fairness is meaningful, I conduct a series of computer simulations using the evolutionary approach. In the next section, I first briefly explain the logic behind the evolutionary approach, and then proceed to the description of the simulations.

### **3.3 Evolutionary simulation**

I chose computer simulations as the research method for several reasons. First, it is the best method for deriving consequences from initial conditions. Second, it is the best way to analyze dynamic environments in which agents interact with one another and there is interdependency between agents' behaviors and outcomes. Third, it is easier to analyze equilibrium by simulation. It is true that formal and mathematical analysis can do this as well. However, I believe that simulations appeal to wider audience because they are easier to understand.

There is another thing that I should mention. Results of simulations do not have any generalizability. We can produce almost any results that we want. Therefore, we cannot apply the results of simulations by themselves to the real world. However, I believe that this simulation has significance in the context of this study. I am trying to show that two senses of fairness (e-fairness and a-fairness) that are designed to solve two different adaptive problems can be considered separately in an absolute and theoretical sense. Since the counter hypothesis is that they are the same as most previous research implicitly suggests (I believe), if I can demonstrate that they can be different and explain why they can be different, then such a result would be meaningful.

### **3.3.1 Evolutionary approach**

I conduct a series of computer simulations based on an evolutionary approach. Such “evolutionary” simulations have gained popularity only recently in the social sciences (see, for example, Axelrod 1984, 1986; Macy 1990, 1991a, 1991b, 1993a, 1993b; Macy and Skvoretz 1998; Takagi 1996, 1999; Takahashi 2000; Yamagishi and Takahashi 1994). Although specifics vary, these studies have several common features. First, they borrow common features of evolutionary biology that have developed since 1970s (e.g., Maynard-Smith 1982). Second, they directly address micro-macro linkages by analyzing individual level behaviors and the equilibrium simultaneously. Third, they examine an adaptive behavior in a particular environment. For example, they typically analyze social dilemmas, collective action, and social exchange situations to see if any behavioral norms emerge internally. Let me take a closer look at these points.

An evolutionary approach is based on the principle that what works well for an actor is more likely to be used again, while what turns out poorly is more likely to be discarded. There are several possible interpretations of this principle. First, it reflects the purely biological argument that more effective individuals are more likely to survive and reproduce. Second, it reflects the principle of reinforcement in learning theory that the actors learn by trial and error, keeping effective strategies and altering those that turn out poorly. Third, it reflects purposive learning in that the actors observe each other, and those with poor outcomes tend to imitate the behaviors of those they see doing better. In this chapter, I adopt technical terms of the first interpretation (gene, natural selection, generation, and mutation) because it is the easiest way to illustrate the content of the simulations. However, I do not assume that these simulations are about true genetic evolution.

Usually in computer simulations an imaginary society is created that consists of members who have "gene(s)" whose values determine the behaviors of their bearers. Researchers then examine how this society evolves (how the values of genes in a society change) over generations. The result of evolution is represented by the distribution of the value of gene(s) in a society. Thus, I can see what kind of behavior is the most adaptive one in a society by looking at the distribution of the value of gene(s) at the end of simulation. Such an "end result" is considered an equilibrium. Once a simulation reaches equilibrium, no other behavioral pattern can be superior to the current behavioral pattern. Therefore, such an equilibrium state is considered to be a macro-level phenomenon. Each individual is a part of the environment of each other individual.

### **3.3.2 General setting**

In this study, I create an imaginary society of 100 individuals each of whom have "gene(s)" (an e-fairness gene and an a-fairness gene) whose values determine certain behaviors of their bearers. One simulation consists of many replications, one replication consists of many generations, and one generation consists of several trials. In each trial, the computer gives a specified number of points to each actor. Then, certain things will occur, and each actor decides what to do based on his gene(s). Each actor's behavior in relation to others determines his outcome. The same process is repeated several times within one generation. At the end of each generation, "natural selection" and "mutation" determine the members of the society in the next generation. In natural selection, each actor's cumulative profit for a generation is compared to others' cumulative profit. An actor whose performance was poor is replaced by an actor whose performance was successful. After that, mutation changes the value of each actor's gene(s) by a small probability.

### **3.3.3 The Concept of Linkage**

Before going to the details of the simulation, I should explain how I test whether the distinction between e-fairness and a-fairness is meaningful. In the simulation, each individual has both an e-fairness gene and an a-fairness gene. E-fairness genes operate in exchange situations while a-fairness genes operate in allocation situations. Furthermore, each individual has another gene called a "linkage gene." It determines whether e-

fairness and a-fairness are linked or independent. If the linkage gene evolves (so that over time most of the people's a-fairness gene and e-fairness gene become linked), then there is no reason to distinguish a-fairness from e-fairness. The idea found in traditional social psychological research would be confirmed. On the other hand, if the linkage gene does not evolve (most of the people's a-fairness gene and e-fairness gene are remain independent), then my argument has some support. But first, let me explain the background of "linkage."

"Linkage" is the term that was used in Yamagishi and Takahashi (1994).

"Linkage" can mean many things, but in this context it means that two genes are the same. That is, two behaviors are controlled by one gene. In order to illustrate this point, let me first describe their simulation very briefly.

Following Axelrod (1986), their primary interest was whether a second-order social dilemma can be solved voluntarily or not. A social dilemma is a situation in which group members' pursuit of self-interest creates collectively deficient outcomes (mutual defection). Suppose there is a group of people without a central authority. Everybody would benefit from public goods, such as police or fire department. In order to create such public goods, everybody has to pay a tax. However, from each person's viewpoint, not paying tax is more profitable than paying tax because everybody can benefit from public goods without contributing in their production. So, nobody wants to contribute to the public goods. If everybody fails to contribute, no public goods are produced. No police, no fire department. Thus, everybody suffers by such consequences. How can people solve this dilemma voluntarily?

Both Axelrod (1986) and Yamagishi and Takahashi (1994) showed a potential solution. First, using evolutionary simulations, they showed that mutual defection is inevitable if each member has a gene that determines whether to contribute to the public goods. Then they introduced a second gene that determines whether or not to punish defectors (noncontributors). If defectors who do not contribute are punished, then defection is no longer a better choice. However, punishing defectors is costly. So, from each person's viewpoint, not punishing is better than punishing. In other words, punishment is another public good that has to be established in order to solve the first, and original, social dilemma. That is why punishment is called "the second-order dilemma." So, merely introducing the punishment option is not a solution. Then, Axelrod (1986) introduced the third factor. He assumed that a person who punishes defectors (in the first-order dilemma) would also punish non-punishers (defectors in the second-order dilemma). Based on his simulation, he concluded that this third option (punishing of non-punishers) is necessary to solve social dilemmas.

Criticizing Axelrod (1986), Yamagishi and Takahashi (1994) argued that it is not the third option (punishing of non-punishers) but "linkage" that solved the social dilemma in the simulation. If we examine the third option, we find that actually there is a third-order dilemma. It is whether or not to punish non-punishers (second-order defectors). Since this is also a public good, merely introducing this option should not solve the original social dilemma. It is Axelrod's (1986) last assumption that "punishers would punish both defectors and non-punishers" that solved the original dilemma. This assumption basically means that each person has a third gene that determines whether to

punish non-punishers or not, and that the value of this third gene is identical to that of the second gene, whether to punish defectors or not. Yamagishi and Takahashi (1986) called this "linkage," and they also showed that linkage between two behaviors in different orders is the key to solving social dilemmas. In Axelrod's (1986) case, the linkage was between the second and the third gene. Yamagishi and Takahashi (1986) showed that a linkage between the first and the second gene is sufficient to solve the social dilemma.

However, the question remained: Where did this linkage come from? In order to examine the possibility that the linkage itself evolves voluntarily, they created another gene that determines whether linkage is set to "on" or "off." Unfortunately, their simulation showed that linkage did not evolve. Having the linkage gene "on" is not an advantage although it is not a disadvantage either.

Although the contexts are very different between this study and the simulations on social dilemmas, I believe that the concept of linkage is very useful here. In everyday life, often we are in both exchange and allocation situations. How do we decide what to do when we feel that we were treated unfairly? Does one decision in exchange affect the other decision in allocation? Do we make decisions jointly, or do we make decisions independently? Although no previous research has explicitly stated the answer for this question, I believe that researchers would argue that people make decisions jointly.

The correct answer depends on whether linkage evolves or not. The linkage gene is a binary gene; "1" means "on" and "0" means "off." When it is 1, a person makes decisions regarding protest based on the same gene. That is, the value of e-fairness gene and the value of a-fairness gene are the same. When the value of the linkage gene is 0,

linkage is "off." A person has two different genes to make decisions in each situation. If the simulation results show that linkage evolves, this means that people who make decisions jointly are better off than people who make decisions separately. Thus, there is a good reason to believe that e-fairness and a-fairness are inseparable. By contrast, if linkage does not evolve, then I can argue that the distinction between the two kinds of fairness is meaningful.

### **3.3.4 Algorithm -- what happens during each trial**

Now I describe the algorithm used in the simulation. Because the purpose of the simulation is to see if the distinction between e-fairness and a-fairness is meaningful, the setting of this simulation has both the element of exchange and the element of allocation. In other words, each individual experiences both exchange and allocation in each trial. Whether the distinction is meaningful is examined by the "linkage" analysis. Let me start with a description of the two incentive structures -- exchange and allocation -- and then introduce the linkage gene.

#### **3.3.4.1 Operationalization of exchange**

There has been significant cumulative research on exchange behaviors. The most common situation is a prisoner's dilemma game. However, I will not use that setting here. First, it is hard for the concept of fairness to exist in a prisoner's dilemma situation. Usually each actor's choice is binary -- whether to cooperate or defect. Cheating is usually not considered unfairness. Second, I need to create a setting that is comparable to

the one in allocation because the main purpose of this series of simulations is to examine the relationship between e-fairness and a-fairness. Third, the setting should give actors the opportunity to protest when they feel under-rewarded. This is the key element of the simulation. One of the actors first decides the terms of exchange and then the other one decides whether to protest or not.

With these considerations in mind, I came up with a situation involving productive exchange in which one person decides the distribution of profit, and the other person decides whether to protest or not. This situation is a little bit different from the traditional two-person exchange in which each person decides how much to give to the partner. I did not use the traditional situation because I wanted to make the setting as simple as possible. I also wanted to make the situation comparable to the allocation situation that is discussed below. So, in this setting, the computer gives each person a fixed amount of resources, and each person must provide all of the resources.

There is an imaginary society of 100 actors. Each member has two genes, a "self-giving gene" and an "e-fairness gene" that work in the exchange situation. On each trial, each member is matched randomly with another member. Each member receives a fixed amount of resources from the computer and engages in an exchange. Combining resources from two members produces profit that is as twice as valuable. More concretely, each member has 10 points and puts all their points on the trading. The total value of the profit in this exchange is 40 points. Thus, this situation corresponds to productive exchange.

Then, two actions take place. The first action is dividing the profit of exchange. The computer randomly chooses one actor as a decision maker and the other one as a recipient. A decision maker decides how much he takes out of the total profit and how much he gives to the recipient. This decision is determined by the value of the self-giving gene. This gene is operationalized as follows. The value in the range of 0 to 100 determines how much the decision maker keeps for himself. For example, if the value is 100, this actor keeps 100 % (40 points) for himself and leaves 0 % (0 points) for the partner. If the value is 50, this actor keeps 50% (20 points) for himself and gives 50% (20 points) to the partner. If the value is 0, this actor keeps nothing for himself and gives 100% to the partner.

The second action is taken by the partner. She decides whether to protest. She either accepts or protests the allocation. If she accepts, she receives what the partner left for her. If she protests, she and the partner split the profit equally (receiving 20 points each), but this protest creates cost for each actor. This cost is the parameter to be manipulated in the exchange setting. The cost determines the actual payoffs for exchange. Thus, this setting creates a society in which e-fairness ranges from being very favored to being less favored.

The e-fairness gene is operationalized as follows. The value of the gene determines the extent to which the individual endures inequality. The range of this gene is from 0 to 100. If the value is 100, she is not satisfied and tries to restore equality unless she receives 100% of the total profit. If the value is 50, she is not satisfied unless she receives 50% or more of the total profit. If the value is 0, she is always satisfied

regardless of the decision that the partner made. Please note that high values of the e-fairness gene do not necessarily mean that an actor is a "fair" person. Both high values and low values mean that an actor is not a "fair" person in everyday meaning. A perfectly "fair" person would have 50 for her e-fairness gene.

### **3.3.4.2 Operationalization of Allocation**

Unlike exchange situations, there has been little research focusing on adaptive behaviors in allocation situations. A rare example is Kameda and Takezawa (1999), but their focus is on whether resources are allocated or not rather than fairness in allocation. So, although there can be a number of ways to set up the situation, I make the situation as simple as possible since this simulation is the first attempt. First, I do not consider the allocator's behavior to be a variable. Let us imagine that somehow resources are distributed to members of a society, and each member decides what to do by comparing his share to the other people's share. Because I omit the allocator, the allocator may be an institution, organization, or simply nature. Each actor decides whether to accept what he was given or to protest to get a fair share despite the cost. Therefore, in contrast to exchange, there is only one gene for allocation.

The situation that the members of a society face is described as follows. It basically involves a distribution of resources. Every actor plays the role of a recipient. For simplicity, I assume no social positions or hierarchy within a society. On each trial, the computer distributes resources to all members of a society. This is a uniform distribution within a certain range. Then, the mean and the standard deviation of the

distribution are calculated. Comparing his own share of resources to the mean and the standard deviation, each member decides whether to protest or not. This decision is determined by the a-fairness gene. This gene is operationalized as follows. The value of the a-fairness gene varies from -200 to +200 expressed as a percentage. It determines the value of a member's share at which he becomes dissatisfied and protests. More concretely, if the value of the a-fairness gene is +200, the critical value for this actor is the mean income of a society plus twice (200%) the standard deviation. This means that the actor will not be satisfied unless he receives two standard deviations more than the average. If the value of the a-fairness gene is 0, then the critical value is the mean income of a society. This actor will not be satisfied unless he receives at least the average. If the value of the a-fairness gene is -200, then the critical value for the actor is the mean income of a society minus twice the standard deviation (-200%). This actor will be satisfied unless his share is less than the mean minus two standard deviations. Please note that in everyday usage a perfectly "fair" person should have zero for her a-fairness gene. If the value of the a-fairness gene is either high or low, this actor may be considered "unfair." Please note that there is no theoretical reason to limit the range of this gene to  $\pm 200\%$ . It could be  $\pm 300\%$ ,  $\pm 400\%$ , or  $\pm 500\%$ . However, I believe that  $\pm 200\%$  is sufficient for this simulation.

If an actor's income is less than the critical value, he will protest. After every member has the opportunity to protest, the society gives each member who protested the average income. However, such resources do not come from nowhere. The society adds up the amount of all requests, and the costs of the requests are paid for by every member

of the society through a tax. This is a flat rate tax. So each member has to pay the same amount of tax. Furthermore, there is a cost to making this protest. This cost is the parameter to be manipulated in the allocation setting. It determines the actual payoffs of the allocation. This allows us to create a society in which a-fairness ranges from being very favored to being not favored.

### **3.3.4.3 Operationalization of the linkage gene**

After exchange and allocation occur several times, one generation comes to an end. The cumulative earnings of each person are calculated, natural selection occurs, and mutation occurs. Each person has four genes (self-giving, e-fairness, a-fairness, and linkage), and the value of the genes changes by a small probability. The linkage gene requires some explanation. This gene is a binary gene, “1” means “on” and “0” means “off.” When it changes from 0 to 1 as a result of mutation, the value of the e-fairness gene and the value of the a-fairness gene become the same. This person makes decisions regarding protest based on the same gene. When the value of the linkage gene changes from 1 to 0, linkage becomes “off.” This person’s e-fairness gene and a-fairness gene are now independent.

Three simulations are presented below. The main simulation is the third one. The first two were designed as building blocks for the third. The first simulation is a simulation involves exchange only; and the second involves allocation only. These separate simulations are necessary in order to establish a simulation in which the cost of

protest affects the fairness genes for both exchange and allocation in a comparable way. I examine the linkage gene in the third simulation.

### **3.4 Simulation 1: E-fairness in exchange**

The purpose of this simulation is to establish a foundation for Simulation 3 in which I examine the linkage gene. In order to accomplish this goal, I need to create a situation in which the cost of restoring equality affects the willingness to do so. As you might expect, the results ought to show a negative correlation between cost and willingness. Results confirming this expectation would not be surprising.

As I explain above, in this simulation allocation does not occur. The fixed parameters were set as follows. The number of trials was 10, the number of generations was 500, and the mutation rate was 1%. The manipulated parameter was the cost of restoring fairness. For simplicity, I only had low (0) and high (50) conditions. The initial values of the genes were determined randomly by the computer.

#### **3.4.1 Results**

Table 3.1 shows the results of two the conditions in which cost is 0 or 50 points. The dependent variable is the mean of the self-giving gene and the e-fairness gene for each society in the final 10 generations. I calculated the mean of the gene among the society in the last 10 generations and also calculated the mean of 50 replications as the mean of each condition. Table 3.1 also shows how many protests to restore equality were made within a generation.

The results are very clear. When there is no cost to restoring equality, actors do so freely. If an actor is too afraid to protest, he becomes a sucker when he is paired with a very stingy actor. If an actor is too demanding, he protests without cost. However, he in fact loses points because the computer orders an equal split. That is why the mean e-fairness gene is neither high or low (about 66%). The mean self-giving gene is about 71%. If the value of this gene is less than 50%, then an actor always loses points. Thus, actors whose self-giving gene is above 50% are better off. However, amount over 50% that they want to keep does not matter much. Since there is no cost, most of the partners would protest. This is why the mean self-giving gene is about the midway between 50% and 100%.

By contrast, when the cost is high, actors who often protest because their e-fairness genes are high in fact lose points by restoring equality. Therefore, the mean e-fairness gene goes down. As a result, the mean self-giving gene goes up. Since protest is very rare, stingy actors are better off if they exploit "sheep." In such a society where the cost to restore equality is high, everybody endures unfair treatment when he plays the role of recipient and everybody exploits as much as possible when he plays the role of a decision maker.

In sum, I successfully created a setting in which the cost of restoring equality determines people's willingness to protest in exchange situations. Although the results of this simulation themselves are not noteworthy, this simulation is a building block of Simulation 3.

### **3.5 Simulation 2: A-fairness in allocation**

The purpose of this simulation is set up a foundation for Simulation 3 in which I examine the linkage gene. In order to accomplish this goal, I need to create a situation in which the cost of restoring equality in allocation situations affects the willingness to do it. As you might expect, there should be a *negative correlation between the cost and the willingness*. It will not be surprising if the results are consistent with this expectaiton.

As I explain above, in this simulation exchange does not occur. The fixed parameters were set as follows. The number of trials was 10, the number of generations was 500, and the mutation rate was 1%. The manipulated parameter was the cost of restoring fairness. For simplicity, I only had low (0) and high (50) conditions. The initial values of the a-fairness gene were determined randomly by the computer. The range of the income distribution was set to 0 to 40 so that the expected average would be 20. Thus, in a completely equal and uniform society, everybody receives 20 points on each trial. This is equivalent to Simulation 1 in which everybody receives 20 points if all members split the profit of exchange at 50-50.

#### **3.5.1 Results**

Table 3.2 shows the mean a-fairness gene and how many protests to restore equality were made within a generation. These results are very clear. When there is no cost to protest, actors try to restore equality. The higher the a-fairness gene, the more income a member receives. However, there is an upper limit. If an actor is too demanding (protesting even when he receives more than the average), the society gives

him the average income. Thus, protesting is not the best strategy in this case. That is why the average of the a-fairness gene is about 0.

By contrast, when the cost is high, the actors who protest often because their a-fairness gene is high in fact lose points by restoring equality. Therefore, the mean a-fairness gene goes down. The value, -191, is very close to the minimum number, -200. In a society where the costs of restoring equality are high, everybody just accepts what he receives from the society no matter how small his share.

In this simulation, I created a situation in which the costs of achieving equality determine people's willingness to protest inequality. Because there is no previous study on this topic, I set up a very simple situation. Although there are many other ways to treat the question of what is adaptive in allocation situations, for the purpose of this chapter, I believe that Simulation 2 is sufficient. Simulation 2 may not be very significant on its own, but it is a building block for Simulation 3.

### **3.6 Simulation 3: Linkage of e-fairness and a-fairness**

In Simulations 1 and 2, I establish building blocks for Simulation 3. In this simulation, I try to see if the two senses of fairness, e-fairness and a-fairness, can be considered independent or not. In other words, I will see whether the linkage gene evolves or not.

Simulation 3 is basically a combination of Simulations 1 and 2 with two new features. The questions to be asked are these: Is it beneficial to use the same gene in allocation and exchange situations? If so, under what conditions? Does the relative

weight of exchange and allocation matter? For example, is the gene for exchange the only important factor if social life heavily depends on exchange and slightly depends on allocation? What if both exchange and allocation are equally important?

On each trial, each actor experiences exchange and allocation once. The new additions are the linkage gene (0 or 1) that was explained earlier and the parameter that sets the relative weights of exchange and allocation. Each person's earnings on each trial are determined by the results of exchange and protest times the weight, and the results of allocation and protest times the weight. Thus, there are three parameters to be manipulated in Simulation 3. The first is the cost of restoring equality in exchange, the second is the cost of achieving equality in allocation, and the third is the relative weight of exchange (the relative weight of allocation is 1.0 minus the relative weight of exchange). The rest of the parameters are the same as in Simulations 1 and 2.

The fixed parameters were set as follows. The number of trials was 10, the number of generations was 500, and the mutation rate was 1%. The manipulated parameters were the cost of restoring fairness in exchange, the cost of restoring fairness in allocation, and the relative weight of exchange. For simplicity, I only had low cost (0) and high cost (50) conditions for the two kinds of costs. For the weight, I had three conditions, with exchange counting as 10%, 50%, or 90%. This simulation can be seen as a  $2 \times 2 \times 2$  factorial design experiment. The initial values of the four genes were determined randomly by the computer.

### **3.6.1 Results**

Table 3.3 shows the results. The first thing to notice is that the weight factor does not affect the results much. Focusing on the mean e-fairness gene and the mean a-fairness gene, little difference is caused by the value of weight. This pattern is exactly what we would expect based on the results of Simulations 1 and 2.

What is most interesting here is the mean linkage gene. When the cost of restoring equality in exchange and the cost of restoring equality in allocation are both either high or low, the mean linkage gene is somewhat moderate. By contrast, when one of the costs is higher than the other one, the mean linkage gene is low. This pattern exists regardless of the weight parameter. This pattern means that non-linkage evolves when one cost is high and the other one is low. For example, when the cost in exchange is 0 and the cost in allocation is 50, in order to succeed in this society, the actor's e-fairness gene should be about 60% and the a-fairness gene should be about -190. So, a person is better off trying to restore equality in exchange but not in allocation. In such a society, if a person's linkage gene is 1, this person must have both the e-fairness and a-fairness genes be high or low. However, this is not the best strategy. This is why linkage cannot survive in such a society.

In a different society in which both costs are high or low, one might expect that linkage would evolve. However, the results show that linkage did not prevail even in such a society, although it did not disappear. When we take a closer look at the mean e-fairness gene and the mean a-fairness gene, it is clear that both genes must be high or low in order to succeed in such a society. So, one might think that linkage has the advantage. However, in such situations, even without linkage, a person can have two genes high or

low independently. Then, whether a person has the linkage or not does not matter.

Either way, he can succeed. Then, whether linkage is on or not is determined randomly in mutation. That is why the mean linkage gene is near 0.5 when the two costs are both 0 or 50.

The implication of these results is very clear. While there are certain environments in which non-linkage is favored, there is no environment in which linkage is favored. Thus, even if we THINK that e-fairness and a-fairness are the same, they may not be. They may simply APPEAR to be the same when the costs of restoring equality in exchange and in allocation are both high or low. So, in such a society, it is no wonder that ordinary people THINK that they have only one sense of fairness that can be used for both exchange and allocation situations. However, once one of the costs begins to change, their e-fairness and a-fairness will differ from each other in response to the change in environment. Therefore, there is no reason to believe that the sense of fairness is one entity just because it APPEARS to be so.

Of course, this simulation itself cannot prove anything, but I believe that I present a strong case to argue that there can be two kinds of fairness -- e-fairness and a-fairness. But before moving to the next chapter, I should discuss one important factor that was not included in this series of simulations -- the cognitive cost of having two kinds of fairness.

### **3.7 Relations to cognitive psychology and evolutionary psychology**

Throughout the history of cognitive psychology (and especially cognitive social psychology), researchers have found that people have many cognitive traits or

dispositions that lead to inaccurate, limited, or irrational behaviors. Such discoveries prompted economists to reconsider the concept of rationality. Although it was once assumed that each person has the capacity to calculate all contingencies without bias and chooses the best action that brings the highest expected utility, this is no longer considered to be true. Now, researchers are fully aware of the existence of "bounded rationality" (Simon 1955). For example, Kahneman, Slovic, and Tversky (1982) described many biases of people making decisions. Why do people have such cognitive biases?

As I discussed in previous chapters, there are two possible answers. One is the "cognitive miser" approach that was a dominant perspective until the early 1990s (Orbell and Dawes 1991, 1993). The other, newer answer was proposed by evolutionary psychology.

What do they have to say regarding this study? They can argue that the two behaviors that restore equality based on local comparison in exchange and referential comparison in allocation should be determined by one cognitive process because doing so saves cognitive capacity. In other words, they would argue that linkage itself has an advantage of its own. This advantage is nothing to do with interaction with other people or environment. Rather, it is purely a matter of the biology inside human brains. So, more concretely, in Simulation 3, the actors whose linkage gene is 1 ("on") should earn some extra points just because the linkage is "on."

Of course, we can expect that such simulations may allow linkage to evolve under certain conditions. The outcome depends on the balance of extra points that the actors

whose linkage gene is “on” earn, and other costs. However, I would like to argue that such simulations are not meaningful in the context of this study. First, since the cognitive advantage of linkage exists inside the brain, it does not fit the context of this study that emphasizes sociological insights, such as social interaction, micro-macro linkages, and interdependency among behaviors and outcomes. Please note that I do not dismiss the possibility that in fact such a cognitive miser approach is true. I am simply focusing on different issues.

Second, evolutionary psychologists might argue that linkage was somehow adaptive in ancient environments. Since evolutionary psychology fits this study's framework, if linkage was adaptive in ancient environments, I should deal with it. However, I believe that the cognitive processes required for judgment of and reaction to unfairness are not hardwired. They are more recent ones acquired after civilizations were founded (particularly referential comparison that requires complex comparison processes). Also, the cost of restoring equality in both exchange and allocation can change relatively quickly from time to time within a society and across societies. Therefore, I would like to argue that there is not much point to saying that linkage is hardwired.

### **3.8 Summary**

This chapter uses a series of computer simulations to examine whether or not the distinction between e-fairness and a-fairness introduced in Chapter 1 is reasonable. The main purpose was to see if actors develop a tendency to make joint decisions regarding

exchange and allocation. The results show that this is not the case. Using the same sense of fairness to determine reactions to inequality in both exchange and allocation situations is not a particularly good strategy. In fact, it tends to be a bad strategy under certain conditions (such as when the costs to restore equality are different for exchange and allocation).

Having said that there can be e-fairness and a-fairness, in the next chapter I examine the effect of a-fairness on e-fairness.

**Table 3.1, Results of Simulation 1**

	Cost=0	Cost=50
Mean self-giving gene	71.19	85.78
Mean e-fairness gene	66.03	9.47
Protest	496.50	5.51

**Table 3.2, Results of Simulation 2**

	Cost=0	Cost=50
Mean a-fairness gene	-0.24	-190.60
Protest	500.07	5.61

**Table 3.3, Results of Simulation 3**

Exchange counts 10%, allocation counts 90%

	Cost in exchange is 0		Cost in exchange is 50	
	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>
Mean self-giving gene	71.37	71.16	64.96	86.47
Mean e-fairness gene	52.43	52.08	24.71	3.32
Protest in exchange	438.67	380.95	12.24	17.59
Mean a-fairness gene	-1.43	-187.97	-3.45	-190.60
Protest in allocation	496.31	10.69	489.78	9.01
Mean linkage gene	0.42	0.09	0.18	0.48

Exchange counts 50%, allocation counts 50%

	Cost in exchange is 0		Cost in exchange is 50	
	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>
Mean self-giving gene	69.50	73.62	81.36	93.51
Mean e-fairness gene	54.18	64.22	11.84	3.20
Protest in exchange	481.94	475.13	8.37	9.33
Mean a-fairness gene	2.16	-188.91	-3.18	-187.28
Protest in allocation	506.57	10.52	491.22	10.83
Mean linkage gene	0.45	0.02	0.03	0.49

Exchange counts 90%, allocation counts 10%

	Cost in exchange is 0		Cost in exchange is 50	
	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>	<i>Cost in allocation is 0</i>	<i>Cost in allocation is 50</i>
Mean self-giving gene	71.16	79.02	83.21	91.66
Mean e-fairness gene	54.39	64.25	11.37	4.61
Protest in exchange	493.36	491.73	8.56	7.92
Mean a-fairness gene	5.28	-187.33	-29.41	-177.00
Protest in allocation	514.87	10.76	417.15	24.86
Mean linkage gene	0.46	0.01	0.13	0.47

## CHAPTER 4: EXPERIMENT

In Chapter 2, I conceptualize fairness judgment as Equation 2-1 ( $Y = a + bX$ ). In Chapter 3, I examine whether there can be two “b”s,  $b_e$  for exchange and  $b_a$  for allocation. In this chapter, I turn my focus to “a.” In other words, I examine the factors that affect the intercept (or the baseline) of fairness judgments. Here, I focus on the effect of referential comparisons on local comparisons. In other words, this chapter focuses on the effect of “ $Y_a$ ” on “ $a_e$ .”

In Chapter 2, after discussing various exchange and allocation situations, I concluded that in general people use local comparisons to make fairness judgments in exchange whereas they use referential comparisons to make fairness judgments in allocation. In other words, exchange, local comparison, and e-fairness are inextricably linked, while allocation, referential comparison, and a-fairness are inextricably linked. However, I left out one situation that is quite common. That is where there are multiple exchange relations. In such a situation, each person can use both local and referential comparisons. For example, each worker in a company gives labor to the CEO and receives salary in return. However, there are also many other workers in the company. Thus, a salesperson can compare his salary to that of the CEO. This is a local comparison. At the same time, he can compare his salary with that of the other salespeople since the other salespeople are “similar others.” This is a referential comparison. In such a situation, what will happen to e-fairness judgment or a-fairness

judgment? Are they independent? Does one affect the other? In order to answer these questions, I conducted a laboratory experiment.

#### **4.1 Purpose**

In Chapter 2, I argue that there is a dampening effect. When referential comparison tells people that a situation is fair, it reduces the subjective unfairness that people experience based on local comparison. I also argue that we need to distinguish two types of referential comparison -- within-group referential comparison and across-group referential comparison. Further, I argue that the dampening effect is stronger in across-group referential comparison than in within-group referential comparison. The main purpose of this experiment is to test these two hypotheses. More details are presented in the next section.

There are some other reasons for this experiment, although they are not central. First, this is the first study to examine directly the relationship between local comparison and referential comparison in the area of fairness research in social psychology. Since the introduction of the concept of referential comparison, little study has focused on comparison processes that involve both local and referential comparisons, although this is important because we often use both kinds of comparisons in everyday life (Hegtvedt and Johnson 2000).

Second, this experiment is critical for drawing the macro-level implication of the theory presented in Chapter 2. Whether people feel that someone is fair or not is a very subjective matter. Their cognitive, emotional, and behavioral responses are affected by

external factors that are ultimately affected by the social structure. However, the causal mechanism does not stop inside individuals' minds. Many studies examine the effect of social structure on individual perceptions, behaviors, and so on. But few studies examine the effect of individual perceptions and behaviors on social structure. This experiment can potentially contribute to the sociological literature in this area. In particular, using Nakane's (1970) terms, I conceptualize vertical society as a situation in which people are less likely to use across-group referential comparison and horizontal society as a situation in which people are more likely to use across-group referential comparison. Since the dampening effect is predicted to be stronger in across-group referential comparison, it logically follows that people are less likely to protest the target of local comparison in horizontal societies than in vertical societies. As a result, the degree of social inequality may be higher in horizontal societies than in vertical societies.

## **4.2 Predictions**

Let me summarize the discussion in Chapter 2. This experiment focuses on the relationship between a-fairness judgment and e-fairness judgment. Although there are various situations in which this relationship may be analyzed, here I exclusively focus on situations in which e-fairness is the primary concern and the process and the outcome of a-fairness judgment may affect e-fairness judgment. In other words, in these situations, reactions to inequality inherently involve protest against the target of local comparisons. E-fairness judgment is treated as the dependent variable, while the process of a-fairness judgment (availability of referential comparison) is treated as the independent variable.

Although the causal mechanism can be reversed, I chose this situation because it is suited to drawing macro-level implications. Furthermore, I limit my attention to the setting in which a-fairness judgment based on referential comparison tells people that they are treated fairly while e-fairness judgment based on local comparison tells people that they are treated unfairly. As I explain in Chapter 2, I specifically create this setting in the experiment because it is the most interesting setting.

In this setting, I predict the dampening effect of a-fairness judgment on e-fairness judgment. Salience of inequality between self and the target of local comparison is lower when people use referential comparison in addition to local comparison. As a result, people are less likely to restore equality between self and the target of local comparison when they use referential comparison. Therefore, the first prediction is expressed as follows.

**Prediction 1:** In situations in which local comparison tells people that the situation is unfair and referential comparison tells them that the situation is fair, people feel less unfairness when they use referential comparison than when they use local comparison only.

The above prediction applies to either type of referential comparison. Is there a difference in terms of degree or strength of this effect between the two types of referential comparison? I predict that there is. When people use within-group referential comparison, the target of local comparison by similar others is the same person by

definition. Similar others (the target of referential comparison) are considered similar because their relationship with the target of local comparison is similar to the individual's relationship with the target of local comparison. Therefore, this target of local comparison is still salient, even after the individual uses within-group referential comparison. By contrast, if they use across-group referential comparison, similar others exist in outside groups. They are considered similar because their relationships to their targets of local comparison are similar to the individual's relationship to his target of local comparison. Now, the framework that the individual and the target of local comparison form through their direct exchange relation in the same group becomes less salient. The more salient framework is that the individual has similar others across groups and the target of comparison has similar others in other groups. Therefore, the second prediction is this.

**Prediction 2:** The dampening effect predicted in hypothesis 1 is stronger when people use across-group referential comparison than when people use within-group referential comparison.

In order to test these two general hypotheses, I constructed an experimental setting. I will return to the specific predictions again after the description of the experimental setting.

### **4.3 Design**

The experimental setting resembles a situation in which multiple exchange relations are possible. Subjects always play one role and are treated unfairly by the exchange partner. The main focus of the experiment is to see to what extent they protest against unfair exchange.

In this experiment, subjects are told that there are two roles to play, and they are assigned one of the roles. They repeatedly complete a specified task that is associated with their role, and they trade the outcome of their task performance with the exchange partner who plays a different role. The exchange partner is actually a simulated actor, and behaves unfairly to subjects. The subjects's decision is whether to restore fairness despite the cost or not. Here, I assume that inequality is the basis for unfairness. I assume that subjects will feel that they are treated fairly when they receive as much as the target of comparison receives.

I used a  $3 \times 2$  factorial design. The first factor is the availability of the comparison process. This is the main independent variable. This is the only factor that is manipulated in this experiment. It has three levels. A graphic representation is shown in Figure 4.1. The first condition is the situation in which subjects use local comparison only. Subjects are coupled with another person (a simulated actor) and exchange resources. The only thing that they can do is to compare their earnings with what the other person is getting. This condition is considered to be the base line.

The second condition is the situation in which subjects can use both local comparison and within-group referential comparison. Subjects are members of four-person groups. One person, called the Buyer, exchanges with the three other members,

including the subject. Thus, the target of local comparison is the Buyer, and the target of within-group referential comparison is the other two members who also exchange resources with the Buyer. This can be seen as a representation of a vertical society such as Japan in which people are less likely to use across-group referential comparison.

The third condition is the situation in which subjects can use both local comparison and across-group referential comparison. The situation that subjects are in is the same as in the first condition. It differs, however, in that there are two other exchange relations, and that the information about these other relations is available to subjects. Subjects compare themselves with their Buyer when they use local comparison. At the same time, they can compare themselves with the other two Producers. Thus, they can also use referential comparison. In this sense, the situation is the same as Condition 2. It differs from Condition 2 in that the target of referential comparison is the other two Producers in the other two exchange relations. If we consider an “exchange relation” to be a “group,” subjects engage in across-group referential comparison in Condition 3, and in within-group referential comparison in Condition 2. Please note that there is no interdependency between the exchange relations. People can only see what is going on in the other two exchange relations. This condition can be seen as a representation of a horizontal society such as the United States in which people are more likely to use across-group referential comparison.

Readers might think that in a horizontal society several groups of multiple exchange relations such as Condition 2 are present, and that the target of across-group referential comparison includes all other Producers in other groups. It is certainly

appropriate to imagine this. However, I did not create such a situation. There are two reasons. First, it is not realistic to create such a situation in the lab. For example, if there are three groups of four, that means that already there should be 12 people in the lab. Of course all other “participants” are simulated actors, but the real subjects must believe that there are other real participants. Second, the purpose of this experiment is to discern the difference between within-group referential comparison and across-group referential comparison. If I created three groups of four, then subjects could use both within-group referential comparison and across-group referential comparison. However, the purpose of this experiment is to create a situation in which within-group referential comparison is not possible but across-group referential comparison is possible.

The second factor is gender, either male or female. This is not manipulated, but is a blocking factor. I do not have any particular prediction regarding gender differences. Several previous studies (at least in the United States) have discovered that women are more concerned with fairness and equality than men. Thus, there may be some difference in this experiment as well. However, whether such findings are replicated or not is not a primary concern of this experiment. Thus, in the analysis section, because there are no notable gender differences, I collapse the second factor and treat this experiment as if it is a 1-factor design. The condition in which subjects could use only local comparison is called Condition 1; the condition in which subjects could use local comparison and within-group referential comparison is called Condition 2; and the condition in which subjects could use local comparison and across-group referential comparison is called Condition 3.

#### **4.4 Subjects**

I used 72 undergraduate students at the University of Arizona. Each of the 6 cells has 12 subjects, and the total N is 72. Actually, there were more subjects, but I eliminated several of them because they were not naïve, did not understand the situation, were not a native English speaker, or suspected that there was a deception. Seventy-two is the number of subjects that did not have any of these problems. Also, I should mention that participants were not recruited based on their desire to earn extra credit for their classes. They were recruited from sociology classes, a web page, and an advertisement in the campus newspaper. During the recruitment process, the fact that they would earn money by participating in the experiment was emphasized.

#### **4.5 Procedure**

The procedure is a combination of the procedures of social psychological experiments on social exchange and fairness with some new elements. Subjects are assigned the role of Producer, coupled with a Buyer, complete a specified task, and sell their product to the Buyer in exchange for money. Although they were told that they were interacting with other people, the other people were all computer-simulated actors. Subjects first went through the instructions, did practice rounds, did 10 actual rounds, and completed a post-experimental questionnaires.

Upon arrival, subjects were placed in a small room equipped with a computer. Each subject computer was connected to the main computer that controlled the

experiment. When the session started, the instructions appeared on the screen. The beginning of the instructions provided a general description of the experiment. Subjects were also told how many other participants there were. In the local comparison only condition, subjects were told that there was only one other person. In the within-group referential comparison condition, subjects were told that there were three other participants. And in the across-group referential comparison condition, subjects were told that there were five other participants. The description of the two roles, Producer and Buyer, followed. The Producer's task was to produce a product that was valuable to the Buyer. The Buyer needed the producer's product to complete the Buyer's task. The Producers produced raw material and the Buyer created a final product from it.

More specifically, the Producer's task was as follows. The computer screen showed a randomly generated four-letter combination for a short period of time. After it disappeared, the computer screen then showed four choices of four-letter combinations. The Producer's task was to find the matching pair of four-letter combinations. On each round, the Producer repeated this process until the time limit (40 seconds) was reached. The collection of four-letter combinations was the product that the Producer sold to the Buyer. Thus, the Producer was motivated to repeat this process as many times as possible. Both speed and accuracy were important.

The Buyer's task was as follows. It was to recognize patterns in sets of randomly ordered letters. More specifically, on each round, the Buyer created words out of the letters purchased from the Producer. All words had to be in English, and they had to be nouns. Also, all words had to be different. The Buyer could only use the letters that

were included on the list that the Buyer purchased from the Producer. Each letter could be used only once. On each round, the Buyer tried to create as many words as possible until the time limit (30 seconds) was reached, or the Buyer was done. The more words the Buyer created, the more points the Buyer earned. The Buyer earned 70 points per word that he created.

After the general description, subjects took CIPAT, the Cognitive Information Processing Ability Test, to measure how suitable they were for the tasks. CIPAT is a fake test that I developed for this experiment. CIPAT had two parts. During the first part, a bar painted with multiple colors was shown on the screen for only a short period of time. Then, subjects saw bars that were painted similarly to the original one. The task was to choose the bar that matched the original one. This was similar to the Producer's task, but not exactly the same. During the second part, I used several items from the verbal section of the GRE. (See the appendix for the actual items.) This part was supposed to measure how good students' vocabulary was. And of course it was directly related to the performance of the Buyer's task. As you can see, the Producer's task was supposed to be considered "simple," while the Buyer's task was considered "more advanced." And because CIPAT was a fake test, subjects were all assigned to the role of Producer. They were told that the CIPAT score showed that there were other people who were more suitable to the Buyer's task than they were. This cover story was used to reduce suspicion and to increase the legitimacy of Buyers earning more than Producers. Subjects were supposed to think that it was all right for Buyers to earn more because they were "better" than subjects and the Buyer's task was more difficult than the Producer's

task. If subjects thought that this role assignment was done randomly, they would have thought that equal earnings should be the norm no matter what, and that could have wiped out all differences between conditions.

After the role assignment, the instructions told subjects the details of the trading process. On each round, after subjects completed the task, they showed the list to the Buyer so that the Buyer could decide how much to offer. After Buyer offered the initial price to the subject, the subject had the opportunity to make a counteroffer. Then, the Buyer decided the final price. Buyers could stick to the initial offer, partially accept the counteroffer and raise the price a little bit, or accept the counteroffer completely and pay what the subject requested. After this trading process was over, subjects waited until the Buyer completed his task. Then, the screen gave subjects the feedback for the round, showing how much each person earned. This was the end of the round. Subjects repeated this process three times during the practice rounds and 10 times during the experiment.

#### **4.5.1 Manipulation of the independent variable**

The independent variable that was manipulated was the availability of comparison. This manipulation occurred at four points during the experiment. First, at the beginning of the instructions, subjects were told how many other people were there. In Condition 1 (local comparison only), they were told that there was another person. In Condition 2 (within-group referential comparison), they were told that there were three

other people. In Condition 3 (across-group referential comparison), they were told that there were five other people.

Second, in Conditions 2 and 3, after receiving the initial offer from the Buyer, Producers had a chance to share the information with the other Producers. Subjects hit the return key to "send" information regarding how many four-letter combinations they had completed and how much the initial offer from the Buyer was. At the same time, the other Producers (actually simulated actors) were supposed to hit the return key and the subjects' screens told them the other Producers' situations. In this way, subjects could use referential comparisons. The other Producers' performances were controlled by the computer. Sometimes their performances were better than those of the subjects and sometimes they were worse. This fluctuation was determined randomly to avoid suspicion. What the other Producers were offered by Buyer(s) was also controlled by the computer. The price was highest for the Producer whose performance was the best.

Third, in Conditions 2 and 3, after the Buyer(s) made their final decisions, the screen showed the price that each Producer received. Whether the Buyer accepted the counteroffer by the subject or not was determined by the computer. The Buyer accepted the counteroffer if the counteroffer was less than the initial offer to the highest Producer. If the counteroffer was greater than the highest initial offer, the Buyer raised the price only up to the level of the highest initial offer. There were reasons for controlling the Buyer's behavior in this manner. First, it gave subjects the chance to get as much as the other Producers. This would make them feel that they were treated fairly based on the referential comparison. Second, it was designed to reduce suspicion.

Fourth, after the Buyer(s) completed their tasks, the screen showed how much each person earned during the round. Thus, in Condition 1, subjects were told how much the Buyer earned. In Condition 2, subjects were told how much the Buyer and the two other Producers earned. In Condition 3, subjects were told how much each Buyer and Producer earned.

In all cases, the Buyer(s) earned much more than subjects did. Thus, local comparisons always created inequality. Please note that the behavior of the Buyer was the same across conditions. The simulated actor was programmed to behave in a same manner. The difference between conditions was the information available. Inside the program, simulated Producer(s) behaved in the same manner, and so did simulated Buyer(s). The difference was in how many simulated actors appeared on the screen and the relationship between simulated actors and subjects (whether the other Producers were in-group members or out-group members in Conditions 2 and 3).

#### **4.5.2 Dependent variables**

The main dependent variable was subjects' behavioral reaction to perceived unfairness. After each round was over, subjects had the chance to decide what to do on the next round. They could continue to trade with the Buyer, or they could sell their products to the computer. If they chose to trade with the Buyer, the same thing happened on the next round. If they chose to sell their products to the computer, both subjects and the Buyer experienced a cost. The price that the computer paid to subjects was fixed at six points per four-letter combination. The Buyer was programmed not to offer less than

this price. So, selling to the computer was costly to subjects. It was also costly to the Buyer. If subjects chose to sell their product to the computer, the Buyer could not buy the product from the subjects. Instead, the Buyer had to buy a list from the computer at a very high price. The Buyer had to pay 30 points per combination to the computer. So, the buyer could earn very few points.

This is the indicator of behavioral reaction to unfairness. In other words, the dependent variable was the number of times out of 10 rounds that subjects sold to the computer. This should show how far subjects were willing to go to restore fairness (reducing inequality between subjects and Buyer). I set up the situation so that restoring fairness was costly. Otherwise, everybody would want to restore fairness. So, in this way there was a factor that worked against behavioral reaction to unfairness. In this situation, there could be two reasons for selling to the computer. The first one was an emotional reason. Subjects got mad and wanted to punish an "unfair" Buyer. The second one was a more strategic reason. Subjects tried to influence the Buyer's future behavior. This was similar to engaging in a Tit-For-Tat strategy. Since selling to the computer was also costly to the Buyer, subjects could send a signal that the Buyer's unfair behavior would eventually result in a loss to the Buyer. The actual reason is not critical to my theory. Either way, this was the behavioral indicator of the willingness to restore equality.

Besides the behavioral indicator, there were several questions in the post-experimental questionnaire regarding perceptions of unfairness and willingness to compete against the Buyer. The post-experimental questionnaire also included several

items that might shed light on the mechanism that produced different level of behavioral reaction between conditions. These included the perceived importance of local comparison and referential comparison, and perceived similarity and identification with the Buyer and the other Producers. Details of the items will be presented in the results section.

## **4.6 Results**

### **4.6.1 Main finding -- Behavioral measurement**

Table 4.1 shows the actual average performance and earnings per round by subjects (Producer) and the Buyer with whom subjects interacted. I exclude the rounds on which subjects sold to the computer. The Buyer earned almost four times more than subjects when they trade. Thus, the degree of inequality was very high.

How did subjects respond this very "unfair" situation? Table 4.2 shows how many times out of 10 rounds subjects sold to the computer. This measure indicates subjects' willingness to restore equality. I first ran a three (condition)  $\times$  two (sex) ANOVA. Table 4.3 shows the results. It shows that there is a strong main effect of condition. Also, it shows that the interaction effect between condition and sex is marginal. However, since it is marginal, I collapsed the second dimension and treated the design as a 1-factor design. Table 4.4 shows the average frequency of selling to the computer for each condition collapsing sex. Clearly subjects tried to restore equality most in Condition 1 and least in Condition 3. In order to take a closer look, I conducted a planned comparison in ANOVA. According to the hypotheses, we should first see if

there is any effect of referential comparison. Therefore, the first comparison is the comparison between Condition 1 and the average of Conditions 2 and 3. The second concern is whether there is a difference between the two types of referential comparison. These two comparisons are mutually orthogonal. Table 4.5 shows that these two differences are statistically significant. Therefore, the two hypotheses are supported. Subjects tried to restore equality less often when they could use referential comparison, and this dampening effect of referential comparison was stronger for across-group referential comparison than for within-group referential comparison.

#### **4.6.2 Perception of unfairness**

Besides the behavioral indicator, several items in the post-experimental questionnaire measured perception of unfairness. Based on the results of an exploratory factor analysis using responses to 12 items, I chose five items as the measures of perception of unfairness (see Table 4.6). All items were measured by a 7-point Likert Scale. Correlation coefficients among these five items were quite high with a Cronbach Coefficient Alpha of about .77 (See Table 4.7). Therefore, I constructed the perception of unfairness variable by taking the mean of the responses to these five items.

The coefficient for the correlation between this new perception variable and the behavioral variable is .51 ( $p < .0001$ ). Thus, it seems that these two indicators measure something similar. Table 4.8 shows the mean of this variable in each condition. Again, the results are in the predicted direction. However, the results of the ANOVA do not completely support the hypotheses. Table 4.9 shows that referential comparison dampens

the perception of unfairness, while the difference between two types of referential comparison is not statistically significant.

#### **4.7 Exploration of cognitive mechanisms for the dampening effect of referential comparison**

The post-experimental questionnaire included several items regarding identification and similarity with the target of comparison. It was expected that the dampening effect of referential comparison occurs because referential comparison makes local comparison less salient. Thus, similarity to the target of local comparison (the Buyer) should be lower when subjects use referential comparison. Also, identification with the target of local comparison should be lower. Using referential comparison, especially across-group referential comparison, makes people's focus shift from in-group comparison to across-group comparison.

Similarity to the Buyer was measured by one item, "How similar were you to the Buyer? (1=similar, 7=different)" Identification with the buyer was measured by one item, "To what extent did you identify with the Buyer? (1=little, 7=much)" The means presented in Table 4.10 are not consistent with my expectations. Actually, the contrast similarity between Condition 1 and Conditions 2 and 3 was marginal in the expected direction. However, the difference between Condition 2 and Condition 3 is significant in the opposite direction. Subjects perceived similarity more in Condition 3 than in Condition 2. There is no difference in identification.

Next, I checked to see if there was any effect of condition on perception of similarity and identification with the other Producers. Since there are no "other Producers" in Condition 1, the analysis here is simply a t-test comparing conditions 2 and 3. Similarity to the other Producers was measured by one item, "How similar were you to the other Producers? (1=similar, 7=diferent)" Identification with the other Producers were measured by two items, "To what extent did you identify with the other Producers? (1=little, 7=much)" and "To what extent did you identify with the group of Producers? (1=little, 7=much). Table 4.11 shows the means in each condition. There is no difference across conditions.

Since the correlation among these three items is very high (see Table 4.12) and Cronbach Coefficient Alpha is about 0.82, I constructed a variable that indicates the degree of identification with the target of referential comparison (the other Producers). In doing so, I reversed the responses to the similarity item. Although there is no difference across conditions (4.63 in Condition 2 and 4.74 in Condition 3), what is interesting is the very high NEGATIVE correlation between this item and the behavioral indicator of unfairness ( $r = -.44, p < .01$ ). This means that subjects who identified with the other Producers did not sell to the computer very often. Thus, identification with the target of referential comparison did dampen unfairness created by local comparisons. The question is why this identification was not different across conditions.

## 4.8 Discussion

The behavioral indicator of unfairness clearly supports the hypotheses. Although there is a high correlation between the behavioral measurement and perceptions, the perception indicator provides weaker support for the hypotheses. Also, the responses to the post-experimental questionnaire do not give much information. The items that are supposed to measure the internal mechanisms do not vary much across conditions, although there is an overall negative correlation between the degree of identification with the target of referential comparison and the behavioral measurement of unfairness.

The generally weak results of the responses to the post-experimental questionnaire may be due to two things. One is that it is very difficult to explore internal mechanisms by asking subjects questions. In order for the responses to differ across conditions, subjects must know what they were thinking and doing. They must be aware of their state of mind. Although self-conscious human beings are assumed in neo-classical economics, there is a general consensus that such a person does not actually exist. People often do not know what they were thinking, feeling, and doing at a particular time. Also, responses to questionnaire items and actual behaviors are sometimes not consistent. Therefore, the fact that there are not many strong findings from the questionnaire responses is not that surprising. After all, the utility and the advantage of this experiment lies in the fact that there is a behavioral indicator. Therefore, unless the questionnaire responses are completely opposite to the behavioral indicator, I believe in the validity of the behavioral indicator.

The second possibility is that there is something else going on. There are several findings that may support this possibility. First, although there is a high correlation

between perception and behavior, the perception of unfairness variable did not completely support the hypotheses. Second, although there is a high correlation between identification with the target of referential comparison and behavior, again the identification variable did not differ across conditions. Thus, there seems to be a gap between behaviors and self-reports of perceptions.

To see if the effect of condition on the behavioral indicator remains after controlling for these two variables, I ran ANCOVA. If the behavioral reaction is produced by the independent variable through these two mediating variables, the results of the ANCOVA should show that there is no effect of condition. However, Table 4.13 shows somewhat unexpected results. Even after controlling for the perception of unfairness, the effect of condition is still highly significant. Also, after controlling for the degree of identification with the other Producers, the effect of condition is highly significant. Therefore, these findings may suggest that there is something that was not captured by the responses to the post-experimental questionnaire. Investigating this possibility is an important step for future research. I need to develop more precise and focused questionnaire items. Also, I need to consider alternative mechanisms that might produce the dampening effect of referential comparison and test these alternative mechanisms in an experiment.

Finally, I would like to address a potential weakness of this experiment. By definition, in Condition 2 there was only one Buyer. Thus, this Buyer had three exchange opportunities, while the rest (Producers in Condition 2 and all other Producers and Buyers in the other conditions) had one. This means that, in total, this Buyer earned three

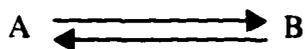
times more than the other Buyers in the other conditions. So, subjects may become angry more in this condition than the other conditions. I could control for this problem by reducing the value of the resource to the Buyer or by making the Buyer receive less in Condition 2. However, doing so would have invalidated the design of this experiment.

The question is this: does this fact that in total the Buyer earned three times more than all of the other people in Condition 2 invalidate the experimental findings?

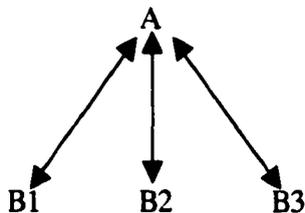
Although we cannot be 100% certain, I would like to provide several counter-arguments. First, the questionnaire items in Condition 2 asked subjects not about "the total" earnings of the Buyer. Instead, they asked about "the earnings obtained from subjects only." However, I have to admit that the questionnaire responses may not be very reliable.

Second, if subjects felt unfairness more strongly in Condition 2 because the Buyer earned three times more, the behavioral response and the perception of fairness should be highest in Condition 2. However, this is not the case. Despite the fact that the Buyer in Condition 2 earned three times more, subjects in Condition 1 perceived unfairness more and tried to restore equality more. However, there is still a possibility that somehow the effect of the fact that the Buyer earned three times more in Condition 2 has the "right" and "convenient" strength so that the behavioral responses fell in between those for conditions 1 and 3. Because the behavioral response in Condition 2 is so right in the middle and the differences from Condition 1 and Condition 3 are both statistically significant (using the Tukey test), I believe that this possibility is very unlikely.

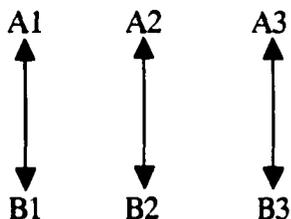
Condition 1: Local comparison only



Condition 2: Local comparison + within-group referential comparison  
Vertical society (e.g., Japan)



Condition 3: Local comparison + across-group referential comparison  
Horizontal society (e.g., the United States)



**Figure 4.1, Graphic representation of conditions**

**Table 4.1, Mean Earnings and Performances per round**

	Condition 1	Condition 2	Condition 3
Subjects' performance	11.70 4-letter combinations	11.55 4-letter combinations	11.59 4-letter combinations
Subjects' earnings	51.68 points	48.32 points	51.26 points
Buyer's performance	3.49 words	3.48 words	3.63 words
Buyer's earnings	192.83 points	194.99 points	203.00 points

1 point = 1 cent.

**Table 4.2, Mean frequency of selling to the computer**

	Condition 1	Condition 2	Condition 3
Male	4.333 (3.339)	4.167 (2.443)	1.833 (2.125)
Female	5.917 (2.875)	2.333 (2.708)	0.750 (1.138)

Numbers in parentheses are standard deviations.

**Table 4.3, ANOVA table on the frequency of selling to the computer**

Source	SS	df	F
Condition (Availability of information)	176.36	2	13.73****
Sex	3.56	1	0.55
Condition × Sex	38.69	2	3.01 +
Explained	218.61	5	6.81 ****
Error	423.83	66	
Total	642.44	71	

+ p < .10

\*\*\*\* p < .0001

**Table 4.4, Frequency of selling to the computer collapsing sex**

	Condition 1	Condition 2	Condition 3
Mean	5.125	3.250	1.292
frequency	(3.153)	(2.691)	(1.756)

**Table 4.5, ANOVA table on the frequency of selling to the computer using planned comparison**

Source	SS	df	F
Comparison 1	130.34	1	19.3***
Comparison 2	46.02	1	6.81*
Error	466.08	69	
Total	642.44	71	

Comparison 1 is the comparison between Condition 1 and conditions 2 and 3. This comparison shows whether or not there is an effect of referential comparison.

Comparison 2 is the comparison between Condition 2 and Condition 3. This comparison shows whether there is a difference between the two types of referential comparison, within-group and across-group.

**Table 4.6, Questionnaire items that construct the perception of fairness indicator**

Name	Question	Measurement
COMP1	How important was it to you to compare your earnings with the Buyer's earnings (obtained from your product only)?	1=important, 7=unimportant (Reversed)
TRY1	To what extent did you try to earn as much as the Buyer did from your product?	1=little, 7=much
LC5	Do you think that the Buyer was fair TO YOU?	1=fair, 7=unfair
ANGRY	When you decided to sell the product to the computer, to what extent were you angry with the Buyer?	1=little, 7=much
STRATEGY	When you decided to sell the product to the computer, to what extent did you try to influence the Buyer's behavior so that the Buyer would give you more on the subsequent rounds?	1=little, 7=much

**Table 4.7, Correlation coefficients of 5 questionnaire items that construct the perception of fairness variable**

	COMP1	TRY1	LC5	ANGRY
COMP1	-	-	-	-
TRY1	.45	-	-	-
LC5	.41	.16	-	-
ANGRY	.61	.42	.52	-
STRATEGY	.33	.28	.29	.51

**Table 4.8, Perception of unfairness**

	Condition 1	Condition 2	Condition 3
Mean of perception of unfairness	5.65	5.08	4.58
	(0.98)	(1.43)	(1.64)

**Table 4.9, ANOVA table on the perception of unfairness**

Source	SS	df	F
Comparison 1	10.89	1	5.73*
Comparison 2	3.00	1	1.58
Error	131.15	69	
Total	145.04	71	

**Table 4.10, Similarity to and identification with the target of local comparison**

	Condition 1	Condition 2	Condition 3
Similarity to the Buyer	4.42 (1.77)	5.67 (1.58)	4.58 (1.56)
Identification with the Buyer	3.29 (1.85)	2.54 (1.47)	3.00 (1.96)

**Table 4.11, Similarity to and identification with the target of referential comparison**

	Condition 1	Condition 2	Condition 3
Similarity to the other Producers	-	3.42 (1.74)	2.79 (1.47)
Identification with the other Producers	-	4.79 (1.84)	4.58 (1.98)
Identification with the group of Producers	-	4.5 (1.69)	4.41 (2.00)

**Table 4.12, Correlation coefficients of 3 questionnaire items that construct the perception identification with the target of referential comparison**

	Similarity	Identification	Identification
Similarity to the other Producers (Reversed)	-	-	-
Identification with the other Producers	.51	-	-
Identification with the group of Producers	.47	.82	-

**Table 4.13, ANCOVA**

Source	SS	df	F
Condition	176.36	2	15.72****
Perception of unfairness	84.67	1	12.09***
Error	381.42	68	
Total	642.44	71	

Source	SS	df	F
Condition	46.02	1	11.15**
Identification with the other Producers	51.68	1	12.52***
Error	185.78	45	
Total	283.48	47	

## CHAPTER 5: CONCLUSION

This study incorporates the evolutionary approach that has recently become popular in the social sciences into the research on fairness. This research strategy led me to reorganize previous research, and, as a result, I propose a new linear model that can express three different conceptualizations of fairness. This new model suggests two major theoretical developments as well as one major implication for the real world.

The first major theoretical development is the distinction between e-fairness and a-fairness. Early studies on fairness by social exchange theorists primarily considered exchange situations, but later on distributive justice researchers, including status value theorists, considered allocation situations only. As a result, there is certain discrepancy between the theories and the actual settings that researchers use (Cook and Hegtvedt 1983). Using the evolutionary approach resolves this confusion. I propose that fairness in allocation can be different from fairness in exchange. The validity of this argument is explored by the computer simulation described in Chapter 3.

The second major theoretical development is to propose that there is a relationship between two comparison processes, local comparison and referential comparison. Most researchers on fairness agree that results of comparison processes determine the severity of perceived unfairness and attempts to redress that unfairness. However, most of the empirical research focuses on either local comparison or referential comparison (Hegtvedt and Johnson 2000). Thus, this research is the first attempt to address the potential influence of referential comparison on local comparison. Specifically, I argue

that referential comparison has a dampening effect on local comparison, and that this effect is stronger for across-group referential comparison than for within-group referential comparison. This argument is tested by the experiment described in Chapter 4.

The most important implication of this study for the real world is that it may help us understand cross-societal differences in social inequality. This implication is developed by combining my argument about the dampening effect with social anthropological research on the forms of association. According to Nakane (1970), patterns of cross-cutting ties characterize societies. One extreme is a vertical society (in which there are no cross-cutting ties between members of sub-groups), and the other extreme is a horizontal society (in which there are many cross-cutting ties). Since across-group referential comparison is more likely to occur in horizontal societies, given the same degree of objective inequality, we can expect that the degree of perceived unfairness will be higher in vertical societies than in horizontal societies. Thus, behavioral attempts to achieve fairness will also be higher in vertical societies, too. As a result, we can expect that social inequality is higher in horizontal societies than in vertical societies. This seems to be the case when we consider the United States and Japan. Japan is considered to be an example of vertical society and one of the most “equal” societies on earth, while the United States is considered to be an example of horizontal society and one of the most “unequal” societies on earth.

## **5.1 Remaining problems and future directions**

Although I believe that the study was successful, there are several major issues that need to be addressed. I discuss these problems below.

### **5.1.1 From behavioral reactions to reduction of inequality**

I argue that social inequality will be greater in societies in which people tend to use across-group referential comparison than in societies in which people do not tend to use across-group referential comparison. The results of the experiment show that people who use across-group referential comparison try to achieve equality less than people who use within-group referential comparison. Although this finding supports my argument, it is not sufficient to argue that using across-group referential comparison definitely increases social inequality at the macro-level.

First, social inequality is produced by many different factors, and the mechanism that I identify is only one of them. Furthermore, my argument is applied to social inequality that is produced and should be reduced by e-fairness based on local comparisons. However, social inequality can also be produced by allocation. It should be reduced by a-fairness based on referential comparison. Although I believe that inequality produced by exchange is a more important issue -- as in the case of the relationship between CEOs and the "rank and file" --, inequality produced by allocation itself is surely an important issue as well. How do people try to restore equality in such situations? What kinds of external factors affect people's decisions? These questions that are directly linked to Rawls' (1971) argument regarding "the veil of ignorance" and they need to be explored.

Second, even if we limit the focus to inequality produced by exchange, still many steps are necessary in order for dissatisfied people who feel unfairness to actually achieve a reduction of inequality. These steps include mobilization of resources, organization of collective action, the resolution of free-rider problem, and so forth. When people feel that they have been treated unfairly, they try to restore fairness. Then, what happens? My theory in Chapter 2 assumes implicitly that macro-level inequality will automatically be reduced if members of a society try to achieve fairness. The experiment in Chapter 4 only tests behavioral reactions to unfairness at the individual level. However, one person's protest will not have an effect on macro-level equality. This means that group members who feel unfairness need to put their forces together and behave collectively. In other words, there must be collective action. People have to organize collective action, mobilize resources, coordinate protests, and so on. In addition, they must solve the free-rider problem. In order for my theory to hold, I need to examine whether they can solve this problem.

Collective action and free-rider problems have been studied extensively by many researchers in sociology, psychology, political science, and economics (see Yamagishi 1995 for a review). Unlike the case of the two-person prisoner's dilemma situation, there has been no definitive and general solution to this problem. There may be hope, however, if we limit our focus to situations involving fairness. A few studies focus on such situations. Lawler (1975) finds that people form revolutionary coalitions when they are treated unfairly because each person expects that the other person will also join the revolution. Decades later, Boudon (1996) argues that the sense of fairness is

transsubjective. In other words, when one person feels that he is treated unfairly, he automatically believes that other people who are treated in the same way will also feel the same. Thus, each person thinks that his sense of unfairness is shared by others. Based on this argument, Takezawa (1999) argues that a free-rider problem is more likely to be solved in a situation in which subjects are treated unfairly. When each person believes that his sense of fairness is shared, he also expects that other people will also want to restore fairness. This expectation of cooperation from other people is one of the decisive factors in raising cooperation rates in social dilemma research. Takezawa's (1999) experimental results support this argument.

Unfortunately, however, none of the previous research has ever examined a free-rider problem with the distinction of e-fairness and a-fairness in mind. The experimental settings tend to be closer to allocation, and they do not match exactly the conditions that I assume in this study. Therefore, to see if this distinction makes a difference to cooperation rates and to see what will happen if both are possible is a necessary step that I will focus on in the future.

### **5.1.2 Are e-fairness and a-fairness really independent?**

I argue that e-fairness and a-fairness can be considered separately because each is adaptive and developed in a particular environment. Although a series of simulations in Chapter 3 show that linkage between e-fairness and a-fairness is very unfavored, this is not proof that they can be independent. Thus, I need to pursue this question in the future.

One possibility is to reexamine previous questionnaire studies and conduct a new questionnaire study to find out if e-fairness and a-fairness are different. If the results show two components (e.g., that is, if factor analysis produces two factors), then I can be more certain that they are indeed different -- although factor analysis itself cannot prove anything. However, if the results do not suggest a division, I am uncertain. Such a result might be due to the fact that the environments in which respondents are embedded favor (or disfavor) both senses of fairness. If this is the case, I will need to administer the same questionnaire in multiple societies. Even if so, the question will still remain, as is always unclear whether subjective answers to questions really predict behaviors.

A more direct approach is to conduct an experiment in which each subject responds to inequalities both in exchange and allocation situations, and in which e-fairness and a-fairness are repeatedly measured. By doing this, I can see whether people consistently respond to different environments. For example, one subject might react very strongly to inequality in exchange but not in allocation. Another subject might show the opposite pattern. Or, another subject might react very strongly to inequality both in exchange and allocation. In conjunction with the questionnaire study, I may be able to test whether the questionnaire responses that I develop can predict behaviors.

### **5.1.3 Incorporating selective play and social networks into simulation**

In Chapter 3, I describe a very simple situation for a computer simulation. There is no doubt that there are many other ways to examine the equilibrium between a sense of fairness and the environment. However, just incorporating other elements so that the

situation that the simulation assumes LOOKS LIKE the natural setting is not a good strategy. Only when the new elements are theoretically important will the simulation benefit.

Currently, there is at least one important factor that I did not incorporate. That is selective play and social networks. These two concepts are inseparable because selective play assumes that there are alternative exchange partners and that the results of selective play can be seen as social networks. During 1980s, most of the simulation studies on prisoner's and social dilemmas did not assume structures or variability the imaginary society. They assumed that everybody is equal, everybody is in the same position, and everybody cannot move within the society. However, since the 1990s, the situation has begun to change. The new trend is called the "selective play paradigm" (Yamagishi and Hayashi 1996). Each member of a group may exit the situation (Orbell and Dawes 1991, 1983), choose their exchange partner (Hayashi and Yamagishi 1998), or decide to whom he wants to give (Takahashi 2000). The concept of space is also being incorporated. Lattice models and spatial mobility models (Watanabe and Yamagishi 1999) are examples of how social structures are being created in simulation settings. The important discovery produced by these very new trends is that these various models allow people to be nice even when they are treated badly. For example, according to Axelrod (1984), the best strategy is TFT. Some people may find this solution harsh because the person adopting TFT retaliates against the defective partner. And of course retaliation creates costs for both actors. However, if each actor can choose his partner, then there is no need to retaliate. If a person is cheated, he can simply exit and seek a new partner. Therefore,

retaliation costs little. This transforms the payoffs of the incentive structure so that cooperation is more favored. A similar thing might happen in the context of my simulation, too, if I incorporate such options. Then the cost to restore equality may be an internal factor in itself that arises from an external factor that is set as a parameter. The more interesting possibilities along this line are presented below.

#### **5.1.4 Social associations**

Although I made a connection between insights from the social network ideas of Nakane (1967, 1970) and the use of across-group referential comparison, still much work should be done. First, although the difference between vertical society and horizontal society makes sense when we consider Japan and America, we do not know about other societies. Is Iraq a horizontal society? What about New Zealand? But the most important problem here is that we do not know how to decide. Nakane did not provide any "scientific" way to classify societies as horizontal as vertical. In order to develop what she started, we should develop a systematic means of doing so.

Once we develop such a method, I should see if my central idea, that social inequality is higher in horizontal societies than in vertical societies, holds. Again, this idea makes sense when we consider American and Japan, but we have no idea about other societies. Also, I can start to think about the history of a society. Was America once a vertical society? When did it become a horizontal society? These are the questions that I would like to explore.

When we think about such questions, naturally we wonder what determines whether a society is horizontal or vertical. What kinds of factors create horizontal or vertical societies? Is this merely a random process? Is it just a coincidence that America is a horizontal society and Japan is a vertical society? If not, what are the reasons? These are vital questions because whether a society is horizontal or vertical determines people's use of across-group referential comparison. One possible factor is geographic mobility. Historically, Japan has been relatively stable compared to America during the last 300 years. Many different kinds of people have moved to America during the last two centuries, while only a small number of people have moved to and from Japan. Perhaps this fact contributes to the difference between horizontal America and vertical Japan. But more work is needed.

The last interesting path is to explore the effect of across-group referential comparison on the horizontal/vertical dimension. In Chapter 2, I argue that across-group referential comparison has a dampening effect. The use of it leaves social inequality high while the use of within-group referential comparison and local comparison reduces social inequality. So in a sense I implicitly assume that the degree of social inequality is the end result, the end point of the causal chain. Is that really so? Is there a possibility that there is a feedback loop from the use of across-group referential comparison to cross-cutting ties? Do high inequality, across-group referential comparison, horizontal society, and cross-cutting ties constitute an equilibrium? This is a stimulating question, but I am afraid that I am not ready to discuss it here at this point. Again, future research will provide some answers.

### **5.1.5 Where do people see a “group”?**

In Chapter 2, I argue that there can be three types of comparison, local comparison, within-group referential comparison, and across-group referential comparison. In each comparison process, there is a specific target of comparison. In local comparisons, the target of comparison is the exchange partner. In within-group referential comparisons, the target is similar others in the same group. In across-group referential comparisons, the target is similar others across groups. Although the target of comparison may be clearly determined in the case of local comparison, it is not so clear in the case of referential comparison. I argue that the main factor that defines similar others is similar roles, but this may not be sufficient. What happens if there is potentially more than one group of similar others because there are multiple roles? For example, if you are a faculty member of sociology department, who are similar others when you use across-group referential comparison? Do they include other sociologists in the United States? All levels of professors? The universities or departments that are ranked similarly? Economists or political scientists? Sociologists in other nations?

The issue is critical because how we feel based on across-group referential comparison depends on the target of comparison. These kinds of questions have been in the domain of cognitive psychology and psychological social psychology since Festinger (1954), but so far no definitive answer has been provided (Hamilton, Sherman, and Lickel 1997). There are many empirical findings, but we just do not have a general theory. Although Festinger (1954) originally argued that social comparison occurs

because people have a motivation to evaluate themselves, perhaps we should go further. Why do people have such a motivation? One possible answer is that people can adjust behaviors so that social interaction goes smoothly by knowing the relative positions of people. So social comparison works as a lubricant in our social life. However, perhaps social comparison plays a more important role. Comparison is necessary to achieve fairness, whatever it means to each person. If so, then the comparison process itself may be intrinsically linked to fairness and reactions toward unfairness. Perhaps the comparison process itself is another adaptive strategy to the environment. Although no definitive answer is foreseen at this point, it might be useful to consider comparison processes that have been studied mainly by psychologists from the meta-theoretical framework of this study that emphasizes micro-macro linkages and the equilibrium of behaviors and environments.

## **5.2 Final words**

Because this is not designed to be a journal article, I would like to close this writing with a homage to the person who inspired me a long time ago. That is Isaac Asimov who invented psychohistory more than a half century ago in his novels. Let me introduce you to Asimov's idea. According to Asimov (1991(1953)), "Psychohistory is the quintessence of sociology; it is the science of human behavior reduced to mathematical equations. The individual human being is unpredictable, but the reactions of human mobs could be treated statistically. The larger the mob, the greater the accuracy that could be achieved." (Line 11-18, page 1) He also stated that he should

have used “psychosociology” since “psychohistory” is misleading (Asimov 1996(1995)). Although psychohistory is not exactly what I am trying to do, it certainly shares a very important feature. It is about the prediction of future societies based on micro-macro linkages. Although the real psychohistory may be quite different when it emerges someday in the far distant future, if this study captures one aspect of its essence, no matter how poor and how small it is, I would be more than happy.

**APPENDIX A: INSTRUCTIONS****Condition 1****WELCOME TO THE SOCIAL INTERACTION EXPERIMENT!**

You are participating in this experiment with another student. Like you, another student volunteered for the experiment. Because we don't want your interaction to be influenced by personal characteristics such as sex or appearance, you will not meet or talk to each other either during or after the experiment. You will interact only through your computers.

During the experiment, you will use your computers to complete certain tasks to earn points. Your cumulative earnings will be converted to money at the end of the experiment and will be paid in cash by the experimenter.

To continue the instructions, please press the spacebar at the bottom of your keyboard. The next screen will appear when everybody is ready to continue.

1

\WAIT\

We will now explain how the experiment works, and give you a chance to practice. The instructions will take about twenty minutes. Make sure you read each screen of the instructions carefully. You won't be able to go back to previous screens. After the instructions, you'll have a chance to ask questions.

**PAY ATTENTION TO THE INSTRUCTIONS!!  
YOU MUST UNDERSTAND THEM COMPLETELY TO MAKE MONEY.**

If you wish, you can write down questions as you are reading, on the notepad on your desk. Each screen has a page number on it, in the lower right-hand corner, that you can refer to in your questions if you wish.

**PLEASE DON'T USE YOUR NOTEPAD FOR OTHER WRITING.**

To continue the instructions, please press the spacebar.

2

\WAIT\

First, we're going to give you a brief overview of what you will be doing in the experiment. Then we'll describe the procedures in more detail.

## OVERVIEW

You are participating in this experiment with another person. Each of you will be assigned to one of two roles in the experiment, Producer and Buyer. One of you will be assigned the role of the Buyer, and the other person will be assigned the role of the Producer, based on the results of a preliminary test.

To continue the OVERVIEW, please press the spacebar.

3

\WAIT\

The actual experiment has several rounds. On each round, participants will earn points by performing the assigned task: the Producer's task or the Buyer's task. As their roles suggest, their tasks are connected to each other: The Producer's task is to produce a product that is valuable to the Buyer. The Buyer needs the producer's product to complete the Buyer's task. The Producer produces raw material and the Buyer creates the final product from it. More specifically, the Producer performs a task that generates letters of the alphabet, and the Buyer creates words out of the letters purchased from the Producer. On each round, the following sequence of events will occur. The Producer performs the Producer's task, the Producer sells the product to the Buyer in exchange for points (this may not occur, but we will explain more later), the Buyer completes the Buyer's task and earns points based on the performance.

After all rounds are over, you will answer a series of questions about the experiment. Then, the experimenter will come to your room to pay you what you earn. One point will be converted to one cent.

Please press the spacebar to continue the instructions.

4

\WAIT\

## PRODUCER'S TASK

The producer's task is to acquire letters of the alphabet to sell to the Buyer. More specifically, on each round, the Producer collects as many 4-letter combinations as possible. The computer screen shows a randomly generated 4-letter combination for a short period of time. After it disappears, the computer screen then shows 4 choices of 4-letter combinations. The Producer's task is to find the matching pair of 4-letter combination. On each round, the Producer repeats this process until the time limit, \LIMITP\ seconds, is reached. The collection of 4-letter combinations is the product that the Producer sells to the Buyer. Thus, the Producer should try to repeat this process as

many times as possible. However, it is also important to choose the correct answer because the wrong one does not count and will not be included in the list. Thus, this task requires both speed and accuracy.

To see how this works, please press the space bar. The next screen will show you a 4-letter combination for one second. Then, it will show you 4 choices of 4-letter combinations. Try to remember what you see on the screen and choose the matching pair. Use number keys to choose and press the return key to decide.

Please press the spacebar to continue the instructions.

5

\WAIT\  
\ALERT\

### BUYER'S TASK

The Buyer's task is to recognize patterns in sets of randomly ordered letters. More specifically, on each round, the Buyer creates words out of the letters purchased from the Producer. All words must be English, and they must be nouns. Also, all words must be different. The Buyer can only use the letters that are included on the list that the Buyer purchased from the Producer. Each letter can be used only once. On each round, the Buyer tries to create as many words as possible until the time limit, \LIMITB\ seconds, is reached, or the Buyer is done. The more words the Buyer creates, the more points the Buyer earns.

Now, let us show you the screens for the Buyer's task. When you press the spacebar, you will see the list of 4-letter combinations on the top of the screen. Below the list, you will see an opening window. You have to write one word per line. Use the backspace key to delete a character. Press the return key when you finish each word and move to the next line. Once you go to the next line, the letters that are used for the word on the previous line disappear from the list. **YOU CANNOT GO BACK TO THE PREVIOUS LINE.** You will write as many words as possible until you have no letter left on the list, you cannot make any more words from the list, or \LIMITB\ seconds are up.

Please press the spacebar to continue the instructions.

6

\WAIT\  
\COMB\

Now, we have finished the general description of two tasks. The next thing we will do is to assign roles to participants. We will use the CIPAT, Cognitive Information Processing Ability Test, to measure how suitable you are for either the Producer's task or the Buyer's task. From the next screen, you will be asked several questions. Based on

your score, we will assign you the appropriate role. After your role is assigned, we will explain how the trading process between the Producer and the Buyer works. Then, we will go to practice rounds before we go to the actual rounds.

Please press the spacebar to take CIPAT.

7

\WAIT\  
\CIPAT\

You were assigned the role of Producer.

Next, we will show you how the trading process works.

From now on, some parts of the instructions shown on the screen will be different between the Buyer and the Producer.

Please press the spacebar to continue the instructions.

8

\WAIT\

## TRADING PROCESS

After the Producer has completed the Producer's task, the Buyer purchases the Producer's list of letters through a trading process. We will now explain the trading process in detail.

First, the Producer shows the Buyer the list of 4-letter combinations that the Producer collected. Second, the Buyer judges how valuable the list is and makes an offer to the Producer. The Buyer tells the Producer how many points the Buyer wants to give in exchange for the list. Then, the Producer has two options: (1) accept the Buyer's offer, or (2) make a counteroffer. If the Producer accepts the Buyer's offer, the Producer would receive what the Buyer offered. If the Producer chooses to counteroffer, the Producer tells the Buyer how many points the Producer wants to receive. After receiving a counteroffer, the Buyer finally decides how many points the Buyer gives to the Producer. The Producer has only one opportunity for making a counteroffer. The second offer by the Buyer is the final decision.

Please press the spacebar to continue the instructions.

9

\WAIT\

In sum, the following sequence of events will occur: The Producer shows the list to the Buyer, the Buyer makes an offer to the Producer, the Producer decides whether to accept or counter, and the Buyer decides the final price if the Producer decided to make a counteroffer.

For example, suppose the Producer has completed 10 four-letter combinations. The Buyer may offer 10 points per combination. If the Producer accepts this offer, the Producer's earnings on this round are 100 points, 10 points times 10 combinations.

But, the Producer may choose to make a counteroffer. Suppose the Producer asks 12 points per combination. (The Producer cannot ask less than what the Buyer has proposed.) Then, the Buyer makes a final decision. The Buyer may reject the counteroffer and give 10 points per combination to the Producer. Or, the Buyer may partially grant the Producer's request and give 11 points per combination to the Producer. Or, the Buyer may accept the counteroffer and give 12 points per combination to the Producer. However, the Buyer cannot give less than what the Buyer has originally proposed to the producer.

Please press the spacebar to continue the instructions.

10

\WAIT\

Now, let us show you how the screens look like during the trading process.

The next screen will show the list of 4-letter combinations that the Producer (you) completed. Press the return key to send this to your Buyer.

Please press the spacebar to continue the instructions.

11

\WAIT\

\TRADE1\

The next screen will show the offer from the Buyer. You have to decide whether to accept it or make a counteroffer. If you want to accept this offer, input the same price at the bottom of the screen. If you want to make a counteroffer, input your desired price. You can use the arrow keys to change the price. Use the DOWN arrow key to LOWER the price, and use the UP arrow key to RAISE the price. Press the return key to send your decision to the Buyer. You can change the price as many time as you wish before hitting the return key.

Please press the spacebar to continue the instructions.

12

\WAIT\

\TRADE2\

This screen shows the Buyer's final decision and how many points you earned on this round.

Please press the spacebar to continue the instructions.

13

\WAIT\  
\TRADE3\

At this point, you don't know how many points the Buyer earned on this round because the Buyer has not finished the Buyer's task. After the trading, the Buyer performs the Buyer's task while you are waiting. The Buyer earns 70 points per word from the computer. This price is fixed. Thus, the Buyer's earnings from your list would be how many points the Buyer earns from the Buyer's task minus the points that the Buyer paid to you. So, if the Buyer makes 5 words from the list for which the Buyer paid 100 points to you, the Buyer's earnings from your list would be 250 points, 70 points times 5 words minus 100 points.

The next screen shows you how many points the Buyer and the Producer have earned on this round.

Please press the spacebar to continue the instructions.

14

\WAIT\  
\FEED\

After each round ends, you have the opportunity to choose between two options on the next round. The Buyer does not have this choice. Only the Producer does. You can choose whether to sell your product to the Buyer or the computer. You may take your previous experience into account.

Option 1: If you choose to trade with the Buyer, nothing will change. The same trading process will occur. You will show your list to the Buyer, the Buyer will make an offer, you will decide whether to accept or not, and so on.

Please press the spacebar to see Option 2.

15

\WAIT\

**Option 2:** If you choose to sell your product to the computer, the trading process that we explained above will not occur. After you finish the Producer's task, the computer will buy the list from you. The price is fixed at \PALONE\ points per 4-letter combination. If you choose this option, the Buyer cannot buy the list from you. Instead, the Buyer must buy the list that is randomly generated by the computer. The price is fixed at \BALONE\ points per 4-letter combination. Then, the Buyer performs the Buyer's task and sell the words to the computer again at \BEXC\ points per word.

Please press the spacebar to continue the instructions.

16

\WAIT\

You may take your previous experience into account when you decide what to do. You may think, based on how the Buyer behaved in the past, that trading with the Buyer is more preferable than selling your list to the computer. Or, you may think the opposite. It is up to you to decide.

The next screen will show you how to make this choice. If you want to trade with the Buyer, choose number 1. If you want to sell your product to the computer, choose number 2. Use number keys to choose and press the return key to decide.

Please press the spacebar to continue the instructions.

17

\WAIT\

\EXIT\

The next screen will show you what you will see when you finish the Producer's task, if you chose to sell your product to the computer. Because you will not trade with the Buyer, at this point the screen tells you how many points you earned from your product.

Please press the spacebar to continue the instructions.

18

\WAIT\

\ALONE\

Now that both of you have learned your roles and tasks, let's try putting them all together in sequence. We will do 3 practice rounds. Because these are just practice rounds, what you do will not affect your earnings. The points you earn in the practice do not count toward the total earnings. So, you are encouraged to try various things to make sure that your understanding of this experiment is sufficient.

During the practice rounds, the screen will automatically change after your choices, just as it will in the experiment. You won't need to press the spacebar to go to a new screen.

Okay, to start the practice exercise, press the spacebar. When all of you are ready, the practice exercise will begin. There will be 3 practice rounds.

19

\WAIT\  
\PRACTICE 3 2 2\  

Okay, that was very good. This is the end of the instructions. If you have any questions, please write them on the notepad on your desk. We will visit your room and answer them. When you are ready, please select one of the choices below to indicate either that you have a question for the experimenter to answer, or that you have no questions and are ready to begin the experiment.

20

\QUEST\  
\CLEAR\  

We're now ready to start the experiment. When both of you have pressed your spacebars, the screen will change and begin the experiment.

\WAIT\  
\DONE\  

## **Condition 2**

### **WELCOME TO THE SOCIAL INTERACTION EXPERIMENT!**

You are participating in this experiment with three other students. Like you, the other students volunteered for the experiment. Because we don't want your interaction to be influenced by personal characteristics such as sex or appearance, you will not meet or talk to each other either during or after the experiment. You will interact only through your computers.

During the experiment, you will use your computers to complete certain tasks to earn points. Your cumulative earnings will be converted to money at the end of the experiment and will be paid in cash by the experimenter.

To continue the instructions, please press the spacebar at the bottom of your keyboard. The next screen will appear when everybody is ready to continue.

1

\WAIT\

We will now explain how the experiment works, and give you a chance to practice. The instructions will take about twenty minutes. Make sure you read each screen of the instructions carefully. You won't be able to go back to previous screens. After the instructions, you'll have a chance to ask questions.

**PAY ATTENTION TO THE INSTRUCTIONS!!  
YOU MUST UNDERSTAND THEM COMPLETELY TO MAKE MONEY.**

If you wish, you can write down questions as you are reading, on the notepad on your desk. Each screen has a page number on it, in the lower right-hand corner, that you can refer to in your questions if you wish.

**PLEASE DON'T USE YOUR NOTEPAD FOR OTHER WRITING.**

To continue the instructions, please press the spacebar.

2

\WAIT\

First, we're going to give you a brief overview of what you will be doing in the experiment. Then we'll describe the procedures in more detail.

### OVERVIEW

You are participating in this experiment with three other people. Each of you will be assigned to one of two roles in the experiment, Producer and Buyer. One of you will be assigned the role of the Buyer, and the other three will be assigned the role of the Producer, based on the results of a preliminary test.

To continue the instructions, please press the spacebar.

3

\WAIT\

The actual experiment has several rounds. On each round, participants will earn points by performing the assigned task: the Producer's task or the Buyer's task. As their roles suggest, their tasks are connected to each other: The Producer's task is to produce a product that is valuable to the Buyer. The Buyer needs the producer's product to complete the Buyer's task. The Producers produce raw material and the Buyer creates the final product from it. More specifically, the Producers perform a task that generates

letters of the alphabet, and the Buyer creates words out of the letters purchased from the Producers. On each round, the following sequence of events will occur. The Producers perform their task, the Producers sell their products to the Buyer in exchange for points (this may not occur, but we will explain more later), the Buyer completes the Buyer's task and earns points based on the performance.

After all rounds are over, you will answer a series of questions about the experiment. Then, the experimenter will come to your room to pay you what you earn. One point will be converted to one cent.

Please press the spacebar to continue the instructions.

4

\WAIT\

### PRODUCER'S TASK

The Producer's task is to acquire letters of the alphabet to sell to the Buyer. More specifically, on each round, the Producer collects as many 4-letter combinations as possible. The computer screen shows a randomly generated 4-letter combination for a short period of time. After it disappears, the computer screen then shows 4 choices of 4-letter combinations. The Producer's task is to find the matching pair of 4-letter combination. On each round, the Producer repeats this process until the time limit, \LIMITP\ seconds, is reached. The collection of 4-letter combinations is the product that the Producer sells to the Buyer. Thus, the Producer should try to repeat this process as many times as possible. However, it is also important to choose the correct answer because the wrong one does not count and will not be included in the list. Thus, this task requires both speed and accuracy.

To see how this works, please press the space bar. The next screen will show you a 4-letter combination for one second. Then, it will show you 4 choices of 4-letter combinations. Try to remember what you see on the screen and choose the matching pair. Use number keys to choose and press the return key to decide.

Please press the spacebar to continue the instructions.

5

\WAIT\

\ALERT\

### BUYER'S TASK

The Buyer's task is to recognize patterns in sets of randomly ordered letters. More specifically, on each round, the Buyer creates words out of the letters purchased from the Producer. All words must be English, and they must be nouns. Also, all words must be



Please press the spacebar to continue the instructions.

8

\WAIT\

## TRADING PROCESS

After the Producer has completed the Producer's task, the Buyer purchases the Producer's list of letters through a trading process. We will now explain the trading process in detail.

First, the Producer shows the Buyer the list of 4-letter combinations that the Producer collected. Second, the Buyer judges how valuable the list is and makes an offer to the Producer. The Buyer tells the Producer how many points the Producer wants to give in exchange for the list. Then, the Producer has two options: (1) accept the Buyer's offer, or (2) make a counteroffer.

Before the Producers decide what to do, the Producers all send each other information about their list and their offers from the Buyer. This means that the Producers can, if they wish, take account of each other's situations before deciding how to respond to the Buyer's offer. More concretely, the Producers tell each other how many 4-letter combinations that they have on their lists and how many points that they were offered by the Buyer. If the Producer accepts the Buyer's offer, the Producer would receive what the Buyer offered. If the Producer chooses to counteroffer, the Producer tells the Buyer how many points the Producer wants to receive. After receiving a counteroffer, the Buyer finally decides how many points the Buyer gives to the Producer. The Producers have only one opportunity for making a counteroffer. The second offer by the Buyer is the final decision.

Please press the spacebar to continue the instructions.

9

\WAIT\

In sum, the following sequence of events will occur: The Producers show their lists to the Buyer, the Buyer makes an offer to each Producer, the Producers share the information, take account of others' situations, and decide whether to accept or counter, and the Buyer decides the final amount of payment if the Producers decided to make a counteroffer.

For example, suppose one of the Producers has completed 10 4-letter combinations. The Buyer may offer 10 points per combination. If the Producer accepts this offer, the Producer's earnings on this round is 100 points, 10 points times 10 combinations.

But, the Producer may choose to make a counteroffer. Suppose the Producer asks 12 points per combination. (The Producer cannot ask less than what the Buyer has proposed.) Then, the Buyer makes a final decision. The Buyer may reject the counteroffer and give 10 points per combination to the Producer. Or, the Buyer may partially grant the Producer's request and give 11 points per combination to the Producer. Or, the Buyer may accept the counteroffer and give 12 points per combination to the Producer. However, the Buyer cannot give less than what the Buyer has originally proposed to the producer.

Please press the spacebar to continue the instructions.

10

\WAIT\  
\

Now, let us show you how the screens look like during the trading process.

The next screen will show the list of 4-letter combinations that the Producer (you) completed. Press the return key to send this to the buyer.

Please press the spacebar to continue the instructions.

11

\WAIT\  
\TRADE1\  
\

The next screen will show the offer from the Buyer. You have to decide whether to accept it or make a counteroffer. Before you decide, you will have the opportunity to share your situation with the other Producers. In order to send the information about your situation, press the return key. How many 4-letter combinations your list has and how many points the Buyer offered you will be shown on the other two Producers' screens. At the same time, your screen will show you the other two Producers' situations.

Then, you have to decide what to do. If you want to accept this offer, input the same price at the bottom of the screen. If you want to make a counteroffer, input your desired price. You can use the arrow keys to change the price. Use the DOWN arrow key to LOWER the price, and use the UP arrow key to RAISE the price. Press the return key to send your decision to the Buyer. You can change the price as many time as you wish before hitting the return key.

Please press the spacebar to continue the instructions.

12

\WAIT\  
\TRADE2\  
\

This screen shows the Buyer's final decision and how many points you earned on this round. The screen also shows how many points the other two Producers earned from the Buyer.

Please press the spacebar to continue the instructions.

13

\WAIT\  
\TRADE3\

At this point, you don't know how many points the Buyer earned on this round because the Buyer has not finished the Buyer's task. After the trading, the Buyer performs the Buyer's task while you are waiting. The Buyer earns 70 points per word from the computer. This price is fixed. Thus, the Buyer's earnings from your list would be how many points the Buyer earns from the Buyer's task minus the points that the Buyer paid to you. So, if the Buyer makes 5 words from the list for which the Buyer paid 100 points to you, the Buyer's earnings from your list would be 250 points, 70 points times 5 words minus 100 points.

The next screen shows you how many points the Buyer earned on this round. The bottom of the next screen will show you how many points each Producer and the Buyer have earned on this round.

Please press the spacebar to continue the instructions.

14

\WAIT\  
\FEED\

After each round ends, you have the opportunity to choose between two options on the next round. The Buyer does not have this choice. Only the Producers do. You can choose whether to sell your product to the Buyer or the computer. You may take your previous experience into account.

Option 1: If you choose to trade with the Buyer, nothing will change. The same trading process will occur. You will show your list to the Buyer, the Buyer will make an offer, you will decide whether to accept or not, and so on.

Please press the spacebar to see Option 2.

15

\WAIT\

Option 2: If you choose to sell your product to the computer, the trading process that we explained above will not occur. After you finish the Producer's task, the computer

will buy the list from you. The price is fixed at \PALONE\ points per 4-letter combination. If you choose this option, the Buyer cannot buy the list from you. Instead, the Buyer must buy the list that is randomly generated by the computer. The price is fixed at \BALONE\ points per 4-letter combination. Then, the Buyer performs the Buyer's task and sell the words to the computer again at \BEXC\ points per word.

Because there are 3 Producers, several of them may choose to trade with the Buyer and the others may choose to sell their products to the computer. If this happens, the Producers who choose to sell to the computer will wait while the others are trading their lists with the Buyer.

Please press the spacebar to continue the instructions.

16

\WAIT\

You may take your previous experience into account when you decide what to do. You may think, based on how the Buyer behaved in the past, that trading with the Buyer is more preferable than selling your list to the computer. Or, you may think the opposite. It is up to you to decide, and each Producer must decide what to do without knowing what the other Producers would do.

The next screen will show you how to make this choice. If you want to trade with the Buyer, choose number 1. If you want to sell your product to the computer, choose number 2. Use number keys to choose and press the return key to decide.

Please press the spacebar to continue the instructions.

17

\WAIT\

\EXIT\

The next screen will show you what you will see when you finish the Producer's task, if you chose to sell your product to the computer. Because you will not trade with the Buyer, at this point the screen tells you how many points you earned from your product.

Please press the spacebar to continue the instructions.

18

\WAIT\

\ALONE\

Now that all of you have learned your roles and tasks, let's try putting them all together in sequence. We will do 3 practice rounds. Because these are just practice rounds, what you do will not affect your earnings. The points you earn in the practice do not count

toward the total earnings. So, you are encouraged to try various things to make sure that your understanding of this experiment is sufficient.

During the practice rounds, the screen will automatically change after your choices, just as it will in the experiment. You won't need to press the spacebar to go to a new screen.

Okay, to start the practice exercise, press the spacebar. When all of you are ready, the practice exercise will begin. There will be 3 practice rounds.

19

\WAIT\  
\PRACTICE 3 2 2\  
\

Okay, that was very good. This is the end of the instructions. If you have any questions, please write them on the notepad on your desk. We will visit your room and answer them. When you are ready, please select one of the choices below to indicate either that you have a question for the experimenter to answer, or that you have no questions and are ready to begin the experiment.

20

\QUEST\  
\CLEAR\  
\

We're now ready to start the experiment. When all of you have pressed your spacebars, the screen will change and begin the experiment.

\WAIT\  
\DONE\  
\

### **Condition 3**

#### **WELCOME TO THE SOCIAL INTERACTION EXPERIMENT!**

You are participating in this experiment with five other students. Like you, the other students volunteered for the experiment. Because we don't want your interaction to be influenced by personal characteristics such as sex or appearance, you will not meet or talk to each other either during or after the experiment. You will interact only through your computers.

During the experiment, you will use your computers to complete certain tasks to earn points. Your cumulative earnings will be converted to money at the end of the experiment and will be paid in cash by the experimenter.

To continue the instructions, please press the spacebar at the bottom of your keyboard. The next screen will appear when everybody is ready to continue.

1

\WAIT\

We will now explain how the experiment works, and give you a chance to practice. The instructions will take about twenty minutes. Make sure you read each screen of the instructions carefully. You won't be able to go back to previous screens. After the instructions, you'll have a chance to ask questions.

**PAY ATTENTION TO THE INSTRUCTIONS!!  
YOU MUST UNDERSTAND THEM COMPLETELY TO MAKE MONEY.**

If you wish, you can write down questions as you are reading, on the notepad on your desk. Each screen has a page number on it, in the lower right-hand corner, that you can refer to in your questions if you wish.

**PLEASE DON'T USE YOUR NOTEPAD FOR OTHER WRITING.**

To continue the instructions, please press the spacebar.

2

\WAIT\

First, we're going to give you a brief overview of what you will be doing in the experiment. Then we'll describe the procedures in more detail.

### OVERVIEW

You are participating in this experiment with five other people. Each of you will be assigned to one of two roles in the experiment, Producer and Buyer. Three of you will be assigned the role of the Buyer, and the other three will be assigned the role of the Producer, based on the results of a preliminary test. Then, the computer randomly create three pairs of Producer-Buyer. These pairs will stay the same during the experiment.

To continue the OVERVIEW, please press the spacebar.

3

\WAIT\

The actual experiment has several rounds. On each round, participants will earn points by performing the assigned task: the Producer's task or the Buyer's task. As their roles suggest, their tasks are connected to each other: The Producer's task is to produce a product that is valuable to the Buyer. The Buyer needs the producer's product to complete the Buyer's task. The Producer produces raw material and the Buyer creates the final product from it. More specifically, the Producer performs a task that generates letters of the alphabet, and the Buyer creates words out of the letters purchased from the Producer. On each round, the following sequence of events will occur. The Producer performs the Producer's task, the Producer sells the product to the Buyer in exchange for points (this may not occur, but we will explain more later), the Buyer completes the Buyer's task and earns points based on the performance.

After all rounds are over, you will answer a series of questions about the experiment. Then, the experimenter will come to your room to pay you what you earn. One point will be converted to one cent.

Please press the spacebar to continue the instructions.

4

\WAIT\

## PRODUCER'S TASK

The producer's task is to acquire letters of the alphabet to sell to the Buyer. More specifically, on each round, the Producer collects as many 4-letter combinations as possible. The computer screen shows a randomly generated 4-letter combination for a short period of time. After it disappears, the computer screen then shows 4 choices of 4-letter combinations. The Producer's task is to find the matching pair of 4-letter combination. On each round, the Producer repeats this process until the time limit, \LIMITP\ seconds, is reached. The collection of 4-letter combinations is the product that the Producer sells to the Buyer. Thus, the Producer should try to repeat this process as many times as possible. However, it is also important to choose the correct answer because the wrong one does not count and will not be included in the list. Thus, this task requires both speed and accuracy.

To see how this works, please press the space bar. The next screen will show you a 4-letter combination for one second. Then, it will show you 4 choices of 4-letter combinations. Try to remember what you see on the screen and choose the matching pair. Use number keys to choose and press the return key to decide.

Please press the spacebar to continue the instructions.

5

\WAIT\

\ALERT\

## BUYER'S TASK

The Buyer's task is to recognize patterns in sets of randomly ordered letters. More specifically, on each round, the Buyer creates words out of the letters purchased from the Producer. All words must be English, and they must be nouns. Also, all words must be different. The Buyer can only use the letters that are included on the list that the Buyer purchased from the Producer. Each letter can be used only once. On each round, the Buyer tries to create as many words as possible until the time limit, \LIMITB\ seconds, is reached, or the Buyer is done. The more words the Buyer creates, the more points the Buyer earns.

Now, let us show you the screens for the Buyer's task. When you press the spacebar, you will see the list of 4-letter combinations on the top of the screen. Below the list, you will see an opening window. You have to write one word per line. Use the backspace key to delete a character. Press the return key when you finish each word and move to the next line. Once you go to the next line, the letters that are used for the word on the previous line disappear from the list. **YOU CANNOT GO BACK TO THE PREVIOUS LINE.** You will write as many words as possible until you have no letter left on the list, you cannot make any more words from the list, or \LIMITB\ seconds are up.

Please press the spacebar to continue the instructions.

6

\WAIT\  
\COMB\  
\

Now, we have finished the general description of two tasks. The next thing we will do is to assign roles to participants. We will use the CIPAT, Cognitive Information Processing Ability Test, to measure how suitable you are for either the Producer's task or the Buyer's task. From the next screen, you will be asked several questions. Based on your score, we will assign you the appropriate role. After your role is assigned, we will explain how the trading process between the Producer and the Buyer works. Then, we will go to practice rounds before we go to the actual rounds.

Please press the spacebar to take CIPAT.

7

\WAIT\  
\CIPAT\  
\

You were assigned the role of Producer.

Because there are two other Producers, we will call you Producer 1, and we will call the other two Producer 2 and 3. Also, we will call three Buyers Buyer 1, Buyer 2, and

Buyer 3. The pairs are you and the Buyer 1, the Producer 2 and the Buyer 2, and the Producer 3 and the Buyer 3.

Next, we will show you how the trading process works.

From now on, some parts of the instructions shown on the screen will be different between the Buyers and the Producers.

Please press the spacebar to continue the instructions.

8

\WAIT\

## TRADING PROCESS

After the Producer has completed the Producer's task, the Buyer purchases the Producer's list of letters through a trading process. We will now explain the trading process in detail.

First, the Producer shows the Buyer the list of 4-letter combinations that the Producer collected. Second, the Buyer judges how valuable the list is and makes an offer to the Producer. The Buyer tells the Producer how many points the Buyer wants to give in exchange for the list. Then, the Producer has two options: (1) accept the Buyer's offer, or (2) make a counteroffer.

Before the Producers decide what to do, the Producers all send each other information about their list and their offers from their Buyers. This means that the Producers can, if they wish, take account of each other's situations before deciding how to respond to the Buyers' offers. More concretely, the Producers tell each other how many 4-letter combinations that they have on their lists and how many points that they were offered by their Buyers. If the Producer accepts the Buyer's offer, the Producer would receive what the Buyer offered. If the Producer chooses to counteroffer, the Producer tells the Buyer how many points the Producer wants to receive. After receiving a counteroffer, the Buyer finally decides how many points the Buyer gives to the Producer. The Producers have only one opportunity for making a counteroffer. The second offers by the Buyers are the final decision.

Please press the spacebar to continue the instructions.

9

\WAIT\

In sum, the following sequence of events will occur: The Producers show their lists to their Buyers, the Buyers make an offer to their Producers, the Producers share the

information, take account of others' situations, and decide whether to accept or counter, and the Buyers decide the final price if the Producers decided to make a counteroffer.

For example, suppose one of the Producers has completed 10 four-letter combinations. The Buyer may offer 10 points per combination. If the Producer accepts this offer, the Producer's earnings on this round is 100 points, 10 points times 10 combinations.

But, the Producer may choose to make a counteroffer. Suppose the Producer asks 12 points per combination. (The Producer cannot ask less than what the Buyer has proposed.) Then, the Buyer makes a final decision. The Buyer may reject the counteroffer and give 10 points per combination to the Producer. Or, the Buyer may partially grant the Producer's request and give 11 points per combination to the Producer. Or, the Buyer may accept the counteroffer and give 12 points per combination to the Producer. However, the Buyer cannot give less than what the Buyer has originally proposed to the producer.

Please press the spacebar to continue the instructions.

10

\WAIT\

Now, let us show you how the screens look like during the trading process.

The next screen will show the list of 4-letter combinations that the Producer (you) completed. Press the return key to send this to your Buyer.

Please press the spacebar to continue the instructions.

11

\WAIT\

\TRADE1\

The next screen will show the offer from the Buyer. You have to decide whether to accept it or make a counteroffer. Before you decide, you will have the opportunity to share your situation with the other Producers. In order to send the information about your situation, press the return key. How many 4-letter combinations your list has and how many points the Buyer offered you will be shown on the other two Producers' screens. At the same time, your screen will show you the other two Producers' situations.

Then, you have to decide what to do. If you want to accept this offer, input the same price at the bottom of the screen. If you want to make a counteroffer, input your desired price. You can use the arrow keys to change the price. Use the DOWN arrow key to LOWER the price, and use the UP arrow key to RAISE the price. Press the return key to send your decision to the Buyer. You can change the price as many time as you wish before hitting the return key.

Please press the spacebar to continue the instructions.

12

\WAIT\  
\TRADE2\

This screen shows the Buyer's final decision and how many points you earned on this round. The screen also shows how many points the other two Producers earned from their Buyers.

Please press the spacebar to continue the instructions.

13

\WAIT\  
\TRADE3\

At this point, you don't know how many points the Buyer earned on this round because the Buyer has not finished the Buyer's task. After the trading, the Buyer performs the Buyer's task while you are waiting. The Buyer earns 70 points per word from the computer. This price is fixed. Thus, the Buyer's earnings from your list would be how many points the Buyer earns from the Buyer's task minus the points that the Buyer paid to you. So, if the Buyer makes 5 words from the list for which the Buyer paid 100 points to you, the Buyer's earnings from your list would be 250 points, 70 points times 5 words minus 100 points.

The next screen shows you how many points the Buyer earned on this round. The bottom of the next screen will show you how many points each Producer and each Buyer have earned on this round.

Please press the spacebar to continue the instructions.

14

\WAIT\  
\FEED\

After each round ends, you have the opportunity to choose between two options on the next round. The Buyer does not have this choice. Only the Producers do. You can choose whether to sell your product to the Buyer or the computer. You may take your previous experience into account. You cannot switch your Buyer. Your choice is whether to trade with your assigned Buyer or to sell to the computer.

**Option 1: If you choose to trade with the Buyer, nothing will change. The same trading process will occur. You will show your list to the Buyer, the Buyer will make an offer, you will decide whether to accept or not, and so on.**

**Please press the spacebar to see Option 2.**

15

\WAIT\

**Option 2: If you choose to sell your product to the computer, the trading process that we explained above will not occur. After you finish the Producer's task, the computer will buy the list from you. The price is fixed at \PALONE\ points per 4-letter combination. If you choose this option, the Buyer cannot buy the list from you. Instead, the Buyer must buy the list that is randomly generated by the computer. The price is fixed at \BALONE\ points per 4-letter combination. Then, the Buyer performs the Buyer's task and sell the words to the computer again at \BEXC\ points per word.**

**Because there are 3 pairs of the Producer and the Buyer, several of them may choose to trade with the Buyer and the others may choose to sell their products to the computer. If this happens, the Producers who choose to sell to the computer will wait while the others are trading their lists with their Buyers.**

**Please press the spacebar to continue the instructions.**

16

\WAIT\

**You may take your previous experience into account when you decide what to do. You may think, based on how your Buyer behaved in the past, that trading with the Buyer is more preferable than selling your list to the computer. Or, you may think the opposite. It is up to you to decide, and each Producer must decide what to do without knowing what the other Producers would do.**

**The next screen will show you how to make this choice. If you want to trade with the Buyer, choose number 1. If you want to sell your product to the computer, choose number 2. Use number keys to choose and press the return key to decide.**

**Please press the spacebar to continue the instructions.**

17

\WAIT\

\EXIT\

The next screen will show you what you will see when you finish the Producer's task, if you choose to sell your product to the computer. Because you will not trade with the Buyer, at this point the screen tells you how many points you earned from your product.

Please press the spacebar to continue the instructions.

18

\WAIT\  
\ALONE\

Now that all of you have learned your roles and tasks, let's try putting them all together in sequence. We will do 3 practice rounds. Because these are just practice rounds, what you do will not affect your earnings. The points you earn in the practice do not count toward the total earnings. So, you are encouraged to try various things to make sure that your understanding of this experiment is sufficient.

During the practice rounds, the screen will automatically change after your choices, just as it will in the experiment. You won't need to press the spacebar to go to a new screen.

Okay, to start the practice exercise, press the spacebar. When all of you are ready, the practice exercise will begin. There will be 3 practice rounds.

19

\WAIT\  
\PRACTICE 3 2 2\

Okay, that was very good. This is the end of the instructions. If you have any questions, please write them on the notepad on your desk. We will visit your room and answer them. When you are ready, please select one of the choices below to indicate either that you have a question for the experimenter to answer, or that you have no questions and are ready to begin the experiment.

20

\QUEST\  
\CLEAR\

We're now ready to start the experiment. When all of you have pressed your spacebars, the screen will change and begin the experiment.

\WAIT\  
\DONE\

## APPENDIX B: QUESTIONNAIRES AND DEBRIEFINGS

### Condition 1

All right, that's the end of the Social Interaction Experiment! You ended the experiment with a total of \M\. In a few minutes, the experimenter will come in your room, pay you your earnings, and answer your questions about the experiment.

While the experimenter is getting ready to pay you, we would like you to answer a few questions about the experiment and your interaction with the other participants. For most of the questions, we will show you a scale with two opposite descriptive labels, one on either end of the scale, and 7 response points in between. We will ask you to answer the question by selecting one of the 7 numbers on the scale.

To continue, please press your spacebar.

\WAIT\

For example, we might ask you to describe how "easy" or "difficult" you thought the experiment was by choosing a number on the following scale:

Very easy---1----2----3----4----5----6----7---Very difficult

A '1' would indicate that you thought the experiment was very easy, and a '7' would indicate that you thought the experiment was very difficult. A '4' would indicate that you thought the experiment was in between, that is, neither easy nor difficult. The other numbers would indicate varying degrees of similarity to the descriptive labels; for example, a little easy (or difficult) or somewhat easy (or difficult).

We will show you the scales one at a time. For each, type in the number on the scale that you wish to select, and then press return. Be careful—ONCE YOU HIT RETURN, YOU CANNOT CHANGE YOUR RESPONSE!

When you are ready to begin, please press your spacebar.

\WAIT\

How important was it to you to compare your earnings with the Buyer's earnings?

\LIKERT\

Important

Unimportant  
\WAIT\

To what extent did you try to earn as much as the Buyer did from your product?  
\LIKERT\  
Little  
Much  
\WAIT\

How similar were you to the Buyer?  
\LIKERT\  
Similar  
Different  
\WAIT\

To what extent did you identify with the Buyer?  
\LIKERT\  
Little  
Much  
\WAIT\

Which of the following best describes your feelings about your earnings compared to your Buyer's earnings?  
\CHOICEBOX\  
3  
My earnings from my product should be lower than the Buyer's earnings from my product.  
My earnings from my product should be the same as the Buyer's earnings from my product.  
My earnings from my product should be higher than the Buyer's earnings from my product.  
\WAIT\

Do you think that your earnings should be equal to the Buyer's earnings from your product?  
\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\

**Do you think that you and the Buyer should equally split the profit from your product?**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**Do you think that it is OK for the Buyer to have higher earnings from your product than you do because the Buyer completed a different task than yours?**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**Do you think that the relationship between the Producer (you) and the Buyer was fair?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**Do you think that the Buyer was fair TO YOU?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**When you were negotiating with the Buyer, what did you try to do?**

**\CHOICEBOX\**

**2**

**Try to get as many points as I can from the Buyer.**

**Try to get as much as the Buyer would earn from my product.**

**\WAIT\**

**When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent were you angry with the Buyer?**

**\LIKERT\**

**Little**

**Much**

\WAIT\

When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent did you try to influence the Buyer's behavior so that the Buyer would give you more on the subsequent rounds?

\LIKERT\

Little

Much

\WAIT\

Which of the following best describes your reason for selling the product to the computer? If you never sold to the computer, please imagine what you would have done.

\CHOICEBOX\

3

I was so angry that I wanted to punish the Buyer.

It was a strategy to make the Buyer offer me more on the subsequent rounds.

I wanted to earn fewer points.

\WAIT\

How much effort did you put in to complete your task?

\LIKERT\

Very Much

Very Little

\WAIT\

Which of the following best describes your primary concern during the experiment?

\CHOICEBOX\

4

Helping the group earn as much money as possible

Doing my best to complete my task

Equalizing the effort put into the task by me and the others.

Trying to figure out what the experiment was about

\WAIT\

In thinking about your decisions to trade with the Buyer or to sell to the computer, was it influenced more by concerns with FAIRNESS (equalizing earnings from your product between you and the Buyer), or by a desire to earn MONEY (obtaining as much for yourself as you could)?

\LIKERT\

Fairness  
Money  
\WAIT\

We would like you to write, on the notepad on your desk, an explanation of how you made your decisions. When you decided to trade with the Buyer, why did you do so? When you decided to sell the product to the computer, why did you do so?

When you are done writing, please turn your notepad over and PRESS YOUR SPACEBAR to indicate you are ready.  
\WAIT\  
\CLEAR\

Finally, we would like you to answer several questions about how you feel and think in your EVERYDAY LIFE. Please select the number that best represents your own opinion and feelings.

To continue, please press your spacebar.

\WAIT\

"I don't want to miss good opportunities as a result of trying to be fair to others."

\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\

"Telling a lie can be justified in certain circumstances."

\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\

"I don't want to act dishonestly under any circumstances."

\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\

**"I am mindful not to forget the spirit of fair play under any circumstances."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being overly concerned about fairness deprives a society of its vigor."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Society is made up with mutual dependency between people."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"In order to be successful in society, mutual cooperation is necessary."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being kind to others will eventually help oneself."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Those who care only their own benefits will eventually lose out."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**\CLEAR\**

**A NOTE FROM THE INVESTIGATOR:**

Now that you have finished the experiment, let me tell you a little about it. The experiment is part of a research project studying comparison processes and perceptions of fairness in social relations. We are interested in the kind of comparisons that people use in a situation involving reward allocations. In some experiments, like this one, people do not have similar others to whom they can compare. In other experiments, people do have similar others to whom they can compare. We are studying how these different types of comparisons affect people's perceptions and reactions to unfairness.

To continue this message, please press the spacebar.

\WAIT\  
\CLEAR\

This particular experiment had one other feature that you were probably not aware of. The other participant was not a real person. The responses were made by the computer. We used a computer-programmed actor because we wanted to study how people (like you) respond to the other participant, the Buyer. Using the computer to simulate the other person in this experiment was the only way we could create comparable situations across conditions.

We are sorry we could not tell you this in the beginning. If we had, it might have affected your behavior in some way. It was very important for our research that you believed you were interacting with a real person. In most of our experiments, participants DO interact with real people. Those experiments look just like this one, and it is very difficult for most people to tell the difference between interacting with real people and interacting with the computer.

To continue this message, please press the spacebar.

\WAIT\  
\CLEAR\

Thank you very much for participating in the experiment. The experimenter will come in the room shortly, to pay you and to answer any questions you have about the experiment. It may be a few minutes since we talk to each of you individually. We appreciate your patience.

\DONE\

## Condition 2

All right, that's the end of the Social Interaction Experiment! You ended the experiment with a total of \M\. In a few minutes, the experimenter will come in your room, pay you your earnings, and answer your questions about the experiment.

While the experimenter is getting ready to pay you, we would like you to answer a few questions about the experiment and your interaction with the other participants. For most of the questions, we will show you a scale with two opposite descriptive labels, one on either end of the scale, and 7 response points in between. We will ask you to answer the question by selecting one of the 7 numbers on the scale.

To continue, please press your spacebar.

\WAIT\

For example, we might ask you to describe how "easy" or "difficult" you thought the experiment was by choosing a number on the following scale:

Very easy---1----2----3----4----5----6----7---Very difficult

A '1' would indicate that you thought the experiment was very easy, and a '7' would indicate that you thought the experiment was very difficult. A '4' would indicate that you thought the experiment was in between, that is, neither easy nor difficult. The other numbers would indicate varying degrees of similarity to the descriptive labels; for example, a little easy (or difficult) or somewhat easy (or difficult).

We will show you the scales one at a time. For each, type in the number on the scale that you wish to select, and then press return. Be careful—ONCE YOU HIT RETURN, YOU CANNOT CHANGE YOUR RESPONSE!

When you are ready to begin, please press your spacebar.

\WAIT\

How important was it to you to compare your earnings with the Buyer's earnings (obtained from your product only)?

\LIKERT\

Important  
Unimportant  
\WAIT\

How important was it to you to compare your earnings with the Buyer's earnings (obtained from all 3 Producers' products)?

\LIKERT\  
Important  
Unimportant  
\WAIT\

How important was it to you to compare your earnings with the other Producers' earnings?

\LIKERT\  
Important  
Unimportant  
\WAIT\

To what extent did you try to earn as much as the Buyer did from your product?

\LIKERT\  
Little  
Much  
\WAIT\

To what extent did you try to earn as much as the other Producers?

\LIKERT\  
Little  
Much  
\WAIT\

How similar were you to the Buyer?

\LIKERT\  
Similar  
Different  
\WAIT\

How similar were you to the other Producers?

\LIKERT\

**Similar**  
**Different**  
\WAIT\

**To what extent did you identify with the Buyer?**

\LIKERT\  
**Little**  
**Much**  
\WAIT\

**To what extent did you identify with the other Producers?**

\LIKERT\  
**Little**  
**Much**  
\WAIT\

**To what extent did you identify with the group of Producers?**

\LIKERT\  
**Little**  
**Much**  
\WAIT\

**Which of the following best describes your feelings about the price (how many points per 4-letter combination) of your product compared to those of the other Producers?**

\CHOICEBOX\  
3

**My price should be lower than the ones of the other Producers.**  
**My price should be the same as the ones of the other Producers.**  
**My price should be higher than the ones of the other Producers.**  
\WAIT\

**Which of the following best describes your feelings about your earnings compared to those of the other Producers?**

\CHOICEBOX\  
3

**My earnings should be lower than those of the other Producers.**  
**My earnings should be the same as those of the other Producers.**  
**My earnings should be higher than those of the other Producers.**  
\WAIT\

Which of the following best describes your feelings about your earnings compared to the Buyer's earnings (from your product only)?

\CHOICEBOX\

3

My earnings from my product should be lower than the Buyer's earnings from my product.

My earnings from my product should be the same as the Buyer's earnings from my product.

My earnings from my product should be higher than the Buyer's earnings from my product.

\WAIT\

Do you think that the price (points per combination) of your product should be the same as the other Producers' prices?

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

Do you think that your earnings should be the same as the other Producers' earnings regardless of the performance?

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

Do you think that your earnings should be equal to the Buyer's earnings from your product?

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

Do you think that you and the Buyer should equally split the profit from your product?

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

**Do you think that it is OK for the Buyer to have higher earnings from your product than you do because the Buyer completed a different task than yours?**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**Do you think that the relationship between the Producers and the Buyer was fair?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**Do you think that the Buyer treated all three Producers equally?**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**Do you think that the Buyer was fair TO YOU?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**Do you think that the Buyer was fair to the other Producers?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**When you were negotiating with the Buyer, what did you try to do?**

**\CHOICEBOX\**

**3**

**Try to get as many points as I can from the Buyer.**

**Try to get as much as the other Producers were offered by the Buyer.**

**Try to get as much as the Buyer would earn from my product.**

\WAIT\

When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent were you angry with the Buyer?

\LIKERT\

Little

Much

\WAIT\

When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent did you try to influence the Buyer's behavior so that the Buyer would give you more on the subsequent rounds?

\LIKERT\

Little

Much

\WAIT\

Which of the following best describes your reason for selling the product to the computer? If you never sold to the computer, please imagine what you would have done.

\CHOICEBOX\

3

I was so angry that I wanted to punish the Buyer.

It was a strategy to make the Buyer offer me more on the subsequent rounds.

I wanted to earn fewer points.

\WAIT\

How much effort did you put in to complete your task?

\LIKERT\

Very Much

Very Little

\WAIT\

Which of the following best describes your primary concern during the experiment?

\CHOICEBOX\

4

Helping the group earn as much money as possible

Doing my best to complete my task

Equalizing the effort put into the task by me and the others.

Trying to figure out what the experiment was about

\WAIT\

In thinking about your decisions to trade with the Buyer or to sell to the computer, was it influenced more by concerns with FAIRNESS (equalizing earnings from your product between you and the Buyer), or by a desire to earn MONEY (obtaining as much for yourself as you could)?

\LIKERT\

Fairness

Money

\WAIT\

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When you are done writing, please turn your notepad over and PRESS YOUR SPACEBAR to indicate you are ready.

\WAIT\

\CLEAR\

Finally, we would like you to answer several questions about how you feel and think in your EVERYDAY LIFE. Please select the number that best represents your own opinion and feelings.

To continue, please press your spacebar.

\WAIT\

"I don't want to miss good opportunities as a result of trying to be fair to others."

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

"Telling a lie can be justified in certain circumstances."

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

**"I don't want to act dishonestly under any circumstances."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"I am mindful not to forget the spirit of fair play under any circumstances."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being overly concerned about fairness deprives a society of its vigor."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Society is made up with mutual dependency between people."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"In order to be successful in society, mutual cooperation is necessary."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being kind to others will eventually help oneself."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

"Those who care only their own benefits will eventually lose out."

\LIKERT\

Strongly agree

Strongly disagree

\WAIT\

\CLEAR\

#### A NOTE FROM THE INVESTIGATOR:

Now that you have finished the experiment, let me tell you a little about it. The experiment is part of a research project studying comparison processes and perceptions of fairness in social relations. We are interested in the kind of comparisons that people use in a situation involving reward allocations. In some experiments, like this one, people have similar others to whom they can compare. In other experiments, people do not have similar others to whom they can compare. We are studying how these different types of comparisons affect people's perceptions and reactions to unfairness.

To continue this message, please press the spacebar.

\WAIT\

\CLEAR\

This particular experiment had one other feature that you were probably not aware of. The other participants were not real people. Their responses were made by the computer. We used computer-programmed actors because we wanted to study how people (like you) respond to other participants, especially the Buyer. Using the computer to simulate the other people in this experiment was the only way we could create comparable situations across conditions.

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To continue this message, please press the spacebar.

\WAIT\

\CLEAR\

Thank you very much for participating in the experiment. The experimenter will come in the room shortly, to pay you and to answer any questions you have about the experiment. It may be a few minutes since we talk to each of you individually. We appreciate your patience.

\DONE\

### Condition 3

All right, that's the end of the Social Interaction Experiment! You ended the experiment with a total of \M\. In a few minutes, the experimenter will come in your room, pay you your earnings, and answer your questions about the experiment.

While the experimenter is getting ready to pay you, we would like you to answer a few questions about the experiment and your interaction with the other participants. For most of the questions, we will show you a scale with two opposite descriptive labels, one on either end of the scale, and 7 response points in between. We will ask you to answer the question by selecting one of the 7 numbers on the scale.

To continue, please press your spacebar.

\WAIT\

For example, we might ask you to describe how "easy" or "difficult" you thought the experiment was by choosing a number on the following scale:

Very easy---1---2---3---4---5---6---7---Very difficult

A '1' would indicate that you thought the experiment was very easy, and a '7' would indicate that you thought the experiment was very difficult. A '4' would indicate that you thought the experiment was in between, that is, neither easy nor difficult. The other numbers would indicate varying degrees of similarity to the descriptive labels; for example, a little easy (or difficult) or somewhat easy (or difficult).

We will show you the scales one at a time. For each, type in the number on the scale that you wish to select, and then press return. Be careful—ONCE YOU HIT RETURN, YOU CANNOT CHANGE YOUR RESPONSE!

When you are ready to begin, please press your spacebar.

\WAIT\

**How important was it to you to compare your earnings with your Buyer's earnings?**

\LIKERT\

**Important**

**Unimportant**

\WAIT\

**How important was it to you to compare your earnings with the other Producers' earnings?**

\LIKERT\

**Important**

**Unimportant**

\WAIT\

**To what extent did you try to earn as much as your Buyer did from your product?**

\LIKERT\

**Little**

**Much**

\WAIT\

**To what extent did you try to earn as much as the other Producers?**

\LIKERT\

**Little**

**Much**

\WAIT\

**How similar were you to your Buyer?**

\LIKERT\

**Similar**

**Different**

\WAIT\

**How similar were you to the other Producers?**

\LIKERT\

**Similar**

**Different**  
**\WAIT\**

**To what extent did you identify with your Buyer?**

**\LIKERT\**

**Little**

**Much**

**\WAIT\**

**To what extent did you identify with the other Producers?**

**\LIKERT\**

**Little**

**Much**

**\WAIT\**

**To what extent did you identify with the group of Producers?**

**\LIKERT\**

**Little**

**Much**

**\WAIT\**

**Which of the following best describes your feelings about the price (how many points per 4-letter combination) of your product compared to those of the other Producers?**

**\CHOICEBOX\**

**3**

**My price should be lower than the ones of the other Producers.**

**My price should be the same as the ones of the other Producers.**

**My price should be higher than the ones of the other Producers.**

**\WAIT\**

**Which of the following best describes your feelings about your earnings compared to those of the other Producers?**

**\CHOICEBOX\**

**3**

**My earnings should be lower than those of the other Producers.**

**My earnings should be the same as those of the other Producers.**

**My earnings should be higher than those of the other Producers.**

**\WAIT\**

Which of the following best describes your feelings about your earnings compared to your Buyer's earnings?

\CHOICEBOX\  
3

My earnings from my product should be lower than my Buyer's earnings from my product.

My earnings from my product should be the same as my Buyer's earnings from my product.

My earnings from my product should be higher than my Buyer's earnings from my product.

\WAIT\

Do you think that the price (points per combination) of your product should be the same as the other Producers' prices?

\LIKERT\  
Strongly agree

Strongly disagree

\WAIT\

Do you think that your earnings should be the same as the other Producers' earnings regardless of the performance?

\LIKERT\  
Strongly agree

Strongly disagree

\WAIT\

Do you think that your earnings should be equal to your Buyer's earnings from your product?

\LIKERT\  
Strongly agree

Strongly disagree

\WAIT\

Do you think that you and your Buyer should equally split the profit from your product?

\LIKERT\  
Strongly agree

Strongly disagree

\WAIT\

**Do you think that it is OK for your Buyer to have higher earnings from your product than you do because the Buyer completed a different task than yours?**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**Do you think that the relationship between the Producers and the Buyers was fair?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**Do you think that YOUR Buyer was fair TO YOU?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**Do you think that the other Buyers were fair to their Producers?**

**\LIKERT\**

**Fair**

**Unfair**

**\WAIT\**

**When you were negotiating with your Buyer, what did you try to do?**

**\CHOICEBOX\**

**3**

**Try to get as many points as I can from the Buyer.**

**Try to get as much as the other Producers were offered by their Buyers.**

**Try to get as much as the Buyer would earn from my product.**

**\WAIT\**

**When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent were you angry with your Buyer?**

**\LIKERT\**

**Little**

**Much**  
 \WAIT\

**When you decided to sell the product to the computer (or when you thought about it if you never actually sold to the computer), to what extent did you try to influence your Buyer's behavior so that the Buyer would give you more on the subsequent rounds?**

\LIKERT\  
 Little

**Much**  
 \WAIT\  
 Little

**Which of the following best describes your reason for selling the product to the computer? If you never sold to the computer, please imagine what you would have done.**

\CHOICEBOX\  
 3

**I was so angry that I wanted to punish my Buyer.**  
**It was a strategy to make my Buyer offer me more on the subsequent rounds.**  
**I wanted to earn fewer points.**

\WAIT\  
 3

**How much effort did you put in to complete your task?**

\LIKERT\  
 Very Much

**Very Little**  
 \WAIT\  
 Very Much

**Which of the following best describes your primary concern during the experiment?**

\CHOICEBOX\  
 4

**Helping the group earn as much money as possible**  
**Doing my best to complete my task**  
**Equalizing the effort put into the task by me and the others.**  
**Trying to figure out what the experiment was about**

\WAIT\  
 4

**In thinking about your decisions to trade with the Buyer or to sell to the computer, was it influenced more by concerns with FAIRNESS (equalizing earnings from your product between you and the Buyer), or by a desire to earn MONEY (obtaining as much for yourself as you could)?**

**\LIKERT\  
Fairness  
Money  
\WAIT\**

**We would like you to write, on the notepad on your desk, an explanation of how you made your decisions. When you decided to trade with the Buyer, why did you do so? When you decided to sell the product to the computer, why did you do so?**

**When you are done writing, please turn your notepad over and PRESS YOUR SPACEBAR to indicate you are ready.**

**\WAIT\  
\CLEAR\**

**Finally, we would like you to answer several questions about how you feel and think in your EVERYDAY LIFE. Please select the number that best represents your own opinion and feelings.**

**To continue, please press your spacebar.**

**\WAIT\**

**"I don't want to miss good opportunities as a result of trying to be fair to others."**

**\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\**

**"Telling a lie can be justified in certain circumstances."**

**\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\**

**"I don't want to act dishonestly under any circumstances."**

**\LIKERT\  
Strongly agree  
Strongly disagree  
\WAIT\**

**"I am mindful not to forget the spirit of fair play under any circumstances."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being overly concerned about fairness deprives a society of its vigor."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Society is made up with mutual dependency between people."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"In order to be successful in society, mutual cooperation is necessary."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Being kind to others will eventually help oneself."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**"Those who care only their own benefits will eventually lose out."**

**\LIKERT\**

**Strongly agree**

**Strongly disagree**

**\WAIT\**

**\CLEAR\**

**A NOTE FROM THE INVESTIGATOR:**

Now that you have finished the experiment, let me tell you a little about it. The experiment is part of a research project studying comparison processes and perceptions of fairness in social relations. We are interested in the kind of comparisons that people use in a situation involving reward allocations. In some experiments, like this one, people have similar others to whom they can compare. In other experiments, people do not have similar others to whom they can compare. We are studying how these different types of comparisons affect people's perceptions and reactions to unfairness.

To continue this message, please press the spacebar.

\WAIT\  
\CLEAR\

This particular experiment had one other feature that you were probably not aware of. The other participants were not real people. Their responses were made by the computer. We used computer-programmed actors because we wanted to study how people (like you) respond to other participants, especially the Buyer. Using the computer to simulate the other people in this experiment was the only way we could create comparable situations across conditions.

We are sorry we could not tell you this in the beginning. If we had, it might have affected your behavior in some way. It was very important for our research that you believed you were interacting with real people. In most of our experiments, participants **DO** interact with real people. Those experiments look just like this one, and it is very difficult for most people to tell the difference between interacting with real people and interacting with the computer.

To continue this message, please press the spacebar.

\WAIT\  
\CLEAR\

Thank you very much for participating in the experiment. The experimenter will come in the room shortly, to pay you and to answer any questions you have about the experiment. It may be a few minutes since we talk to each of you individually. We appreciate your patience.

\DONE\

Human Subjects Committee



1622 E. Mabel Street  
P.O. Box 245137  
Tucson, AZ 85724-5137  
(520) 626-6721

22 March 2000

Nobuyuki Takahashi, Ph.D. Candidate  
c/o Linda D. Molm, Ph.D.  
Department of Sociology  
Social Sciences Building, Room 400  
PO BOX 210027

**RE: THE MECHANISM AND CONSEQUENCES OF REFERENTIAL COMPARISON**

Dear Mr. Takahashi:

We received documents concerning your above cited project. Regulations published by the U.S. Department of Health and Human Services [45 CFR Part 46.101(b) (2)] exempt this type of research from review by our Committee. **Note: Recruitment flyers approved for classroom hand-out only - not to be used for posting.**

Thank you for informing us of your work. If you have any questions concerning the above, please contact this office.

Sincerely,



David G. Johnson, M.D.  
Chairman  
Human Subjects Committee

DGJ/js

cc: Departmental/College Review Committee

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