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**Cross-cultural Gender Differences in Behavior
in a Threshold Public Goods Game: Japan versus Canada**

by

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Abstract

To investigate the effects of gender and culture on socioeconomic behavior, we compare all-male and all-female participant groups from Japan and Canada, in the context of a threshold public goods game with both a strong free-riding equilibrium and many socially efficient threshold equilibria. Although higher rewards produce higher contributions, neither culture nor gender has any significant impact on the amount has contributed. Nonetheless, culture and gender do matter. Significant culture and gender effects are observed on the extent of equilibrium coordination. Coordination ability appears to be related to both more conforming behavior within rounds and less individually variable behavior between rounds. The self-construal notion of “relatedness” (e.g., Gilligan, 1982; Kashima et al., 1995) seems to explain the greater observed levels of coordination among females and Canadians when compared to males and Japanese.

Keywords: Gender; Culture; Public Good; Free-riding; Self-construal; Relatedness; Cooperation; Coordination.

1. INTRODUCTION

The last two decades have witnessed many changes in the demographics of the workforce in North American society. Two trends have drawn much attention: the increasing female participation in the workforce (e.g., Howard, 1995; Jacobs, 1992) and the rapidly growing proportion of non-white employees in organizations (e.g., Johnston & Packer, 1987; U.S. Bureau of the Census, 1994). Together with the demographic changes, we also observe an increasing popularity of teamwork in organizations (Cohen & Bailey, 1997; Guzzo & Dickson, 1996; Hackman, 1987; Sundstrom, DeMeuse, & Futrell, 1990). Spurred by the interest in “total quality programs” and employee involvement, many organizations have been experimenting with team-based production, self-managed team units, gain-sharing programs, and various types of group-based motivation schemes. Parallel with such demographic changes in the workforce and the increased use of groups by practitioners is the growth of academic interest in group research. Within the context of work groups, many studies have been conducted to examine the effects of gender or culture on work-group performance (e.g., Eagly, 1987; Earley, 1989, 1993; Miller, Taylor, & Buck, 1991; Wagner, 1995). However, most of those studies have concentrated on examining gender and culture effects separately, ignoring possible interactions.

Most theories and empirical studies that focus on gender differences in socioeconomic behavior are based largely on Western cultures, particularly those of the English-speaking Western world. Hence, they reflect a Western, and almost entirely Anglo-American perspective. This is not surprising; the primary contributions to gender research have been made by Anglo-American researchers, and it is natural to focus on one’s own environment. Doktor, Tung, and Von Glinow (1991), guest editors of a special issue of the *Academy of Management Review*, point out that an Anglo-American bias may be present in most administrative science research, and thus urge researchers to test their theories in other domains.

Generally speaking, a central question in gender or cultural research is whether a person's attitude or behavior is influenced by his/her gender and/or cultural background. Research in social psychology has suggested that men and women behave differently in many social

settings. For example, according to the "gender-centered" hypothesis (Fagenson, 1990; Gilligan, 1982), gender differences are expected because of the different ways that women and men are socialized by parents, schools, and mass media, among others. Following this logic, gender differences may also differ between cultures since norms, values, and social conventions differ across cultures. Therefore, it is important to consider whether gender differences observed in North America are culturally specific, or widely present in different cultures, where culture is considered as a set of characteristics that a group of people share in common (Hofstede, 1984).

Many cultural differences in organizational behavior have been documented. For example, there is an extensive literature investigating how cultural values and norms influence business negotiation and conflict resolution styles (e.g., Adler, Brahm, & Graham, 1992), group performance (e.g. Earley, 1989), leadership styles (e.g., Erez & Early, 1993), and work motivation (e.g. Trandis, 1993). Moreover, it has been found that culture may also influence an individual's economic behavior. For instance, Burlando and Hey (1997), using a public goods game, found that British subjects free ride more than Italians. In a public goods game in which subjects had to first decide whether or not to participate, Cason et al. (1998) found that Japanese behave more spitefully early on, ultimately achieving more efficiency than Americans, while American behavior more closely matches equilibrium predictions. Since these studies both used mixed male-female groups to examine cultural differences in the laboratory, gender differences were neither examined nor compared. To date, research in the area of cross-cultural differences in gender-specific behavior is not well developed.

One paper that did attempt to explore this issue is Croson and Buchan (1999), who used participants from the United States, China, Japan and Korea. They presented experimental evidence from a two-person trust game in which a proposer chooses to send all, some or none of an endowment to an anonymous partner, the responder. The experimenter then triples any money sent and the responder is allowed to send some of this money back to the original proposer. No significant gender effects were found among proposers, either with or without the inclusion of indicator variables for countries. However, among responders, women were

significantly more generous than men. Country dummy variables showed no significant differences between countries. Interaction effects between gender and country were not reported. Moreover, as the authors point out, there were very few female participants in Japan and Korea, making it difficult to draw conclusions about potential gender differences in those countries.

Therefore, the primary purpose of the present research is to extend past work on the effects of gender and culture by examining their impacts both separately and in concert on individual behavior in a group work context. In this study, using a threshold public goods game, we compare the behavior of males and females in the context of all-male and all-female groups in Japan and Canada. This paper is organized in the following way. In the next section, we briefly review some prominent themes from the literature on gender and culture characteristics that could potentially influence socioeconomic behavior in an experimental threshold public goods game, and discuss how men and women as well as Japanese and Canadians might differ with respect to those characteristics. In the third section, we discuss our experimental design and procedure. The results are presented in the fourth section. Conclusions and a discussion are offered in the fifth section.

2. THEORETICAL FOUNDATIONS AND HYPOTHESES

2.1 Experimental Framework: Threshold Public Goods Games

In organizations, many work-groups are created to achieve certain goals. For example, several researchers will work together to develop and test a new theory, or a construction crew will work to build a bridge together by a certain date. For such work-groups, a common goal will be achieved only after a substantial amount of effort, resources, and/or time has been contributed by the group members. Once the group achieves its goal, everyone in the group will benefit. However, there is a temptation for group members to free ride because of the group work and reward structure. For instance, if person A allocates minimal time and effort, while most of the other members devote all of their energies to the group project, the group goal may still be achieved, and person A can enjoy the benefits of the

achievement. However, if everyone else acts like person A, the project will not be finished and all members will be worse off. This example illustrates a social dilemma (Dawes, 1980), defined as a situation in which two or more persons receive a higher payoff for a non-cooperative choice or defection than a cooperative choice, no matter what the other members choose, but all members are better off if all cooperate than if all defect.

An experimental paradigm, used to examine this particular social dilemma problem, is an adaptation of Marwell and Ames' (1979) public good simulation: a threshold public goods game (e.g., Bagnoli & McKee, 1991; Cadsby & Maynes, 1999; Croson & Marks, 2000). In a threshold public goods game, each member of a group receives a monetary endowment, a proxy for their resources, such as their energy levels and skills. Group members are then allowed to decide how much they want to contribute from their individual endowments to a group account. The amount they leave in their individual account retains its original value. All group members get a bonus if and only if enough endowments are contributed to the group account. Hence, a threshold public good is analogous to a performance target for a work group. Following Schotter and Weigelt (1992) and Croson (2001), monetary contributions are designed as a proxy for the effort individuals exert towards a work-group's performance. Participants lose any money they contribute but obtain a pre-announced monetary reward if enough money is raised from the group as a whole. This design attempts to capture a fundamental characteristic of such group work: if group members exert enough effort to achieve the group target, each individual in the group receives a reward, but if effort is insufficient for the target to be achieved, all of the individual efforts go to waste.

In this game, the temptation to free ride is also captured because an individual will earn more money than anybody else if he/she contributes less than anybody else, and earn the highest possible amount if the public good is provided by the group despite his/her zero contribution. Thus, this game possesses a pure-strategy strong-free-riding equilibrium in which nobody contributes anything toward the public good. However, it also contains many pure-strategy threshold equilibria in which the group contributes exactly enough to ensure the public good is provided. In other words, in the threshold framework, both free riding and cooperating to provide the public good are consistent with Nash equilibrium behavior. Thus,

in contrast to a continuous public goods setting, an examination of free riding versus cooperation is not obscured by being simultaneously a test of equilibrium versus disequilibrium behavior.¹

Another aspect of the threshold public goods framework is that it creates a relatively “weak” situation. Some administrative theorists have argued for the "situational strength" hypothesis, which asserts that the strength of a situation impacts the expression of disposition-relevant behavior (Mischel, 1973, 1977; Weick 1979). According to Mischel’s definition, strong situations are those in which behavioral demands are unambiguous and behavioral consequences are straightforward, resulting in uniform expectations and only minimal differences in individual behavioral responses. Such situations can mask underlying individual traits because there is little variability in observed behavior. Hence, in such strong situations, individual dispositional variables are likely to have little predictive power. Relatively weak situations, on the other hand, are those in which individuals tend to differ in their perceptions of the situation and the anticipated consequences of various responses. Thus, a weak situation results in greater variability in observed behavior and responses that are more strongly correlated with individual dispositional variables. Since this experimental game offers two types of competing equilibria, a pure-strategy strong free-riding equilibrium and many pure-strategy threshold equilibria involving cooperation, we argue that it stages a relatively weak situation (Weick, 1979; Weiss & Adler, 1984) in which disposition-based behavioral differences will be maximized.

2.2 Theories on Gender Differences

The vast literature on gender develops many themes from a number of widely different perspectives. However, a substantial body of research conducted largely in the West suggests that women exhibit characteristics such as conformity, cooperation, and relatedness to a greater degree than men (e.g., Miller, 1986; Gilligan, 1982; Jordan, Kaplan, Miller, Stiver, & Surrey, 1991).

¹ Cadsby and Maynes (1999) provide a more formal theoretical description of this game and its Nash equilibria.

2.2.1 The Agentic and Communal Focus

According to Eagly's (1987) social role theory of sex differences, people are expected to behave in a manner that is consistent with societal gender roles, which are derived from shared expectations that apply to individuals solely on the basis of their sex. It is argued that such expectations arise from the different social roles typically occupied by men and women, such as men's concentration in positions of greater power and status, differential concentrations of men and women in certain paid occupations, and men's concentration in the family role of primary resource provider versus women's concentration in the family role of primary homemaker. Differential role occupancy may affect behavior because both males and females are expected to have characteristics that equip them for the tasks that they carry out in their usual social roles. Gender roles thus reflect beliefs that women and men actually differ and should differ in their typical traits and behaviors. Among the consistent tendencies reflected in research on such stereotypic beliefs are the predicted propensities for men to have high levels of agentic (or "masculine") attributes, typified by being independent, masterful, assertive, and competent, and for women to have high levels of communal (or "feminine") attributes, such as being friendly, altruistic, concerned with others, and emotionally expressive.

Based on this perspective, we hypothesize that "communal" females, compared to "agentic" males, will behave less selfishly and less competitively, and thus will contribute more to the public good.

Gender Hypothesis 1: Females will contribute more to a threshold public good and achieve provision more often than males.

2.2.2 The Relatedness Dimension

The notion of relatedness was first proposed by Hamaguchi (1977), who used the Japanese term "kanjin-shugi", literally translated as "between-people-ism" and referred to as either contextualism, or more often relatedness in English. This relatedness dimension was developed in the English-speaking world by psychologists and psychiatrists at the Stone Center at Wellesley College (Jordan, Kaplan, Miller, Stiver, and Surrey, 1991; Miller, 1986)

and supported by the work of Carol Gilligan (1982), Sara Ruddick (1989), and others (Belenky, Clinchy, Goldberger, & Tarule, 1986, Brown and Gilligan, 1992). Although this relational theory does not presume to speak for all women or men, it does assert that there are strong forces operating simultaneously to encourage both women and men to think and act in a gender-specific manner. These include internal forces based on early development (Chodorow, 1974) and external forces based on socialization and societal expectations of gender appropriate behavior (Brown and Gilligan, 1992).

Individuals possessing high relatedness place a high value on those kinds of growth and development that occur primarily in the context of interaction with others. Such growth-fostering interaction is characterized by mutual empathy and mutual empowerment, allowing both parties to recognize vulnerability as part of the human condition, to approach the interaction expecting to grow from it, and to feel a responsibility to contribute to the growth of others (Jordon, Surrey, and Kaplan, 1991; Miller, 1976).

This relational theory on gender differences has received some empirical support. For example, the provocative and influential research of psychologist Carol Gilligan (1982) argues persuasively that many women talk and think about moral problems in more relational terms than do men. In particular, she found that women construct the moral problem as being about care and responsibility in relationships, whereas men think about morality in terms of rights and rules. Gilligan reported that the women she interviewed see morality “as arising from the experience of connection and conceived as a problem of inclusion, rather than one of balancing claims” (p. 160). For women, context and sensitivity to it are all important. In contrast for the men she interviewed, Gilligan found that “individual achievement rivets the male imagination, and great ideas or distinctive activity defines the standard of self-assessment and success” (p. 163).

Kashima, Yamaguchi, Kim, Choi, Gelfand, and Yuki (1995), in a questionnaire-based study investigating the effects of culture and gender on self-construal in several countries, found that while cultures generally differ along the individualism-collectivism dimension, males and females within cultures differ primarily along the relatedness dimension. In addition, in experiments conducted by Cadsby and Maynes (1998), comparing the behavior of

females and males playing a threshold public good game in Canada, Canadian female groups initially contributed significantly more than Canadian male groups, but this significance vanished as the game progresses. However, Canadian female groups proved to be significantly better at coordinating around a selected equilibrium than Canadian male groups, particularly during the last five periods of the game. The evidence presented in these three methodologically different papers is consistent with the theoretical proposition that males and females tend to possess different relational orientations. To examine the robustness of the experimental evidence across cultures, we propose the following hypothesis:

Gender Hypothesis 2: Regardless of culture, females will coordinate more closely around a selected Nash equilibrium than males.

2.3 Theories on Cultural Differences

A considerable amount of work has been done by anthropologists, social psychologists, and sociologists in an effort to examine the impacts cultures may have on human behavior. Here, we briefly review the most relevant literature, focusing on several major themes suggested by research in this area.

2.3.1 Collectivistic and Individualistic Cultures

Geert Hofstede (1991) proposes that cultures endow individuals with different principles that influence behavior.² He argues that one dimension of national culture is measured along a continuum from “collectivism” to “individualism,” defining societies in which the interest of the group prevails over the interest of the individual as “collectivistic”, and those in which the interest of the individual prevails over the interest of the group as “individualistic”. This theme has been widely examined and supported by many others (e.g. Triandis, 1989; Triandis, Bontempo, Villareal, Asai, & Lucca, 1988; Triandis, Leung, Villareal, & Clark, 1985; Markus & Kitayama, 1991).

² Hofstede (1991) analyzes cultures based on a survey of IBM employees in 53 different countries or groups of countries. Through factor analysis of the responses to his survey questions, he identifies four dimensions along which he argues cultures may differ from each other: social inequality or power distance, individualism versus collectivism, gender concepts and roles, and uncertainty avoidance.

Japan is considered an example of a collectivistic culture; Canada is considered an example of an individualistic culture. If group interests actually do prevail over individual interests and individually competitive attitudes in Japan, the temptation to free ride might be mitigated or even absent. Therefore, we formulate our Culture Hypothesis 1a as the following:

Culture Hypothesis 1a: Japanese participants will contribute more to a threshold public good and achieve public good provision more often than Canadian participants.

2.3.2 High Trust and Low Trust Cultures

A contrasting point of view is provided by psychologist Toshio Yamagishi and his various co-authors (e.g. Yamagishi and Yamagishi, 1994; Yamagishi, Cook, & Watabe, 1998) from the perspective of trust. They argue that the general level of trust, defined as “an expectation of goodwill and benign intent” (Yamagishi and Yamagishi, 1994, p. 132), is actually lower among Japanese than among Americans. Therefore, Japanese prefer to deal with others through ongoing relationships. These relationships are necessary precisely because of the low level of general trust and provide an incentive structure motivating interacting individuals to behave in a benign manner towards each other, even in the absence of goodwill. Thus, assurance, defined as “an expectation of benign behavior for reasons other than goodwill of the partner”, and in particular “based on the knowledge of the incentive structure surrounding the relationship” (Yamagishi and Yamagishi, 1994, p. 132) often substitutes for trust in Japan.

In a recent unpublished manuscript entitled “Direct and Indirect Trust and Reciprocity,” Buchan, Croson and Dawes provided experimental evidence consistent with relatively low levels of trust in Japan. In an experimental trust game conducted in the United States, China, Japan and Korea, Japanese participants on average sent a lower proportion of their endowments to their designated recipients than did participants from any of the other countries. The difference in proportions sent was significant between Japanese and American participants. The proportion returned by the recipients to the senders was also lowest among the Japanese participants, though this latter difference was not significant between the Japanese and the Americans.

Since participants in our threshold public goods game make their decisions privately in the context of an ad hoc group brought together for the sole purpose of participating in an experiment with no obvious sanctioning or incentive system available to discourage self-interested free-riding behavior, it is possible that Japanese participants will exert more free-riding behavior than Canadian participants, whose culture resembles that of the United States. This possibility is the exact opposite of the behavior suggested by the collectivism-individualism literature from which we derived Culture Hypothesis 1a. It suggests the contrasting Culture Hypothesis 1b:

Culture Hypothesis 1b: Japanese participants will contribute less to a threshold public good and achieve provision less often than Canadian participants.

2.3.3 High Context and Low Context Cultures

Anthropologist Edward Hall argues that Japanese culture is primarily high-context, whereas American and northern European cultures are mainly low-context (Hall, 1977; Hall and Hall, 1987). Canada is also classified as a primarily low-context culture (Ogisu-Kamiya, 1997). According to Hall and Hall (1987), context profoundly affects communication. In high-context Japan, context is “widely shared” and participants are deeply involved with each other. Their “shared behavior patterns ... make the Japanese sensitive to even the subtlest of changes in emotional tone” (Hall and Hall, 1987, p. 60). “Japanese depend heavily on nonverbal communication and are very sensitive to it” (Hall and Hall, 1987, p. 126). In contrast, in a low-context culture like Canada’s, explicit and direct verbal communication is of paramount importance. If correct, Hall’s ideas suggest that Japanese might coordinate more readily around an equilibrium outcome, while Canadians might find their attempts at such coordination thwarted by the prohibition on direct communication during the laboratory game. Hence, the hypothesis derived from this high context versus low context communication theory is as follows:

Culture Hypothesis 2a: Japanese will coordinate more closely around a selected Nash equilibrium than Canadians.

2.3.4 Relatedness across Cultures

Kashima et al. (1995), in the aforementioned study, had expected that while males and females would differ primarily along the relatedness dimension, cultures would differ mainly along the individualism-collectivism dimension. Although they found this generally to be the case, Japan was a major exception. Kashima et al. were surprised to find that Japanese females scored lower in relatedness than any other female grouping and lower even than Korean, Hawaiian and Australian males. American males scored only slightly lower than Japanese females on this characteristic. Japanese males showed significantly less relatedness than Japanese females and less than any other gender-culture grouping in the study.

Kashima et al.'s (1995) finding that both Japanese females and Japanese males exhibit much less relatedness than their US and Australian counterparts suggests that Japanese participants in general could play a threshold public goods game quite differently than Canadians. In particular, if a group's ability to coordinate around an equilibrium is positively correlated with its level of relatedness, as argued by Cadsby and Maynes (1998), Japanese participants might show less tendency to coordinate closely around a selected equilibrium. This relative inability to coordinate could well be even more pronounced for Japanese males. This gives rise to Culture Hypothesis 2b, which contrasts with Culture Hypothesis 2a, derived previously from the literature on high versus low context cultures.

Culture Hypothesis 2b: Japanese participants will coordinate less closely around a selected Nash equilibrium than Canadian participants.

2.4. Gender Differences across Cultures

In addition to such hypothesized gender and culture differences, it is also important to investigate the possibility of interaction effects between gender and culture. Indeed, there is a widely held popular belief that gender relations and gender politics differ between Japan and North America. For example, Ogasawara (1998) studied the subtle relationship between males and females in a large Japanese company. This research was motivated by the difficulties the author encountered explaining the unique position of women in Japanese

society to Americans she met while attending graduate school in the United States.

Ogasawara's qualitative analysis demonstrated that the existence of different gender roles and positions in different societies can produce different gender-based self-construal and behavior between societies as well. Such differences between Japan and North America might be reflected in the selection of varying approaches by male and female groups in Japan and Canada to the social dilemma posed by the threshold public goods game.

Hofstede (1991), in his cross-cultural work, also stresses differing gender roles in his discussion of so-called "masculine" versus "feminine" cultures, another one of his four cultural dimensions. In "masculine" societies, "social gender roles are clearly distinct (i.e., men are supposed to be assertive, tough, and focused on material success whereas women are supposed to be more modest, tender, and concerned with the quality of life)". In contrast, in "feminine" cultures "social gender roles overlap (i.e., both men and women are supposed to be modest, tender and concerned with the quality of life)" (Hofstede, 1991, p. 82-83).

Hofstede ranks Japan as one of the most masculine of countries, while Canada is 24th on a list of 53. Thus, if Hofstede (1991) is correct, one might expect a greater difference between the behavior of male and female groups in Japan than in Canada, supporting the notion that, though no significant difference was found in Canada beyond the first few periods (Cadsby & Maynes, 1998), Japanese males might free ride significantly more than Japanese females throughout a threshold public goods game. Other differences found by Cadsby and Maynes (1998) between female and male behavior in Canada, such as the level of coordination around a selected equilibrium and the degree of conformity within a group, might also be greater in Japan.

Gender-Culture Interaction Hypothesis: There will be a bigger behavioral difference in terms of contributions, coordination and conformity, between Japanese males and females than that between Canadian males and females.

A comparison of two recent studies, one from Japan (Kugihara, 1999) and the other from Canada (Cadsby and Maynes, 1998), appears to lend some support to this hypothesis. Kugihara (1999) investigated gender differences in social loafing behavior among males and females in Japan. Using a rope-pulling task, Kugihara (1999) found that while males

exerted less individual effort when pulling as a group than when pulling alone, females exerted a similar effort under both conditions. Though the sample was small (two groups of nine females and two groups of nine males), this was interpreted as evidence that social loafing, closely analogous to free riding, is more prevalent among males than among females in Japan. Cadsby and Maynes (1998) got quite different results in Canada, where there was no evidence of more free riding among men than among women beyond the first few periods of a threshold public goods experiment. Thus, the Japanese study suggests greater gender-based differences in behavior than the Canadian study. However, in the Japanese social-loafing study no financial incentives were used, whereas salient financial incentives were utilized in the Canadian threshold public goods study. Thus, it is unclear whether it is the different cultures or the different experimental designs that are responsible for the different results. We will investigate the gender-culture interaction hypothesis using an identical experimental design in both countries.

2.5. Reward as a Covariate

Prior literature has corroborated the “reward-matters” hypothesis with both continuous (e.g., Issac, McCue, & Plott, 1985; Issac & Walker, 1988) and threshold public goods experimental data (e.g., Cadsby and Maynes, 1999; Croson & Marks, 2000). Specifically, it is hypothesized that people may try harder to reach a consensus around a cooperative outcome, the greater the benefits from doing so. In contrast, when those benefits are lower, fewer people may be willing to undertake the risk of cooperation, and those who initially cooperate may be quicker to give up in the face of non-cooperation from other players. Thus, we expect that all groups will contribute significantly more towards a threshold public good and achieve the threshold with significantly greater frequency when the monetary reward from provision is higher than when it is lower regardless of culture or gender. Indeed, in Cadsby and Maynes (1998), both male and female groups increased their contributions at higher reward levels in Canada.

Reward Hypothesis: Japanese male and female groups, like Canadian male and female groups, will contribute more to a threshold public good and achieve provision more

often, the higher is the reward resulting from provision.

Eckel and Grossman (1996), in the somewhat different context of a punishment game,³ observed that women were more responsive to payoff parameter changes. In order to examine if such an interaction between gender and payoff generalized to other contexts, Cadsby and Maynes (1998) manipulated the reward level in their threshold public goods experiment, some data from which forms the Canadian part of this cross-cultural project. However, the interaction effect was not observed. Reward is also manipulated as a covariate in this experimental design in Japan both for comparability with the Canadian study and to permit us to investigate any possible interactions between reward, gender and culture in the broader intercultural context.

3. METHOD

3.1 Experimental Participants

One hundred and sixty Canadian students (half were male) at the University of Guelph and one hundred and sixty Japanese students (half were male) at Osaka University and Future University-Hakodate participated in the study for monetary rewards contingent on performance. The Canadian subjects were first-year undergraduate students randomly selected and recruited by telephone from those living in residence. Unfortunately, cultural differences between universities made it impossible to recruit Japanese subjects in an identical manner. At Osaka University, the experiments were first advertised by means of posters. Subsequently graduate student assistants recruited undergraduate students as subjects at a student cafeteria. At Future University-Hakodate, the experiments were first publicized and then first-year undergraduate students were recruited by means of a sign-up sheet. At Guelph and Osaka, few of the students knew each other. However, the Hakodate student population is relatively small and the subjects seemed to know each other quite well.

3.2 Experimental Design and Procedure

³ Their experiment was a two-stage experiment in which players made consecutive dictator decisions. Players were given the opportunity to punish a “bad” player by purchasing the right to do so.

Sixteen experimental sessions were conducted in each country. The results of the Canadian sessions have been reported as part of a broader Canadian study in Cadsby and Maynes (1998). In Japan, twelve new sessions were run at Osaka University and four new sessions at Future University-Hakodate. The sixteen new Japanese sessions allow us to test for gender effects in Japan and cultural differences between Japan and Canada, including the hypothesized interaction between gender and culture. Each session involved ten participants playing a threshold public goods game for 25 periods.⁴ Of the 16 experimental sessions conducted in each country, half employed all-male groups, while the other half employed all-female groups. At the beginning of each session, an experimenter read the instructions aloud while the participants followed along on their own printed copies.⁵ The instructions informed the participants that:

- (1) There are ten players in each group.
- (2) No communication among players is allowed during the game, which consists of 25 periods.
- (3) Each player is initially endowed with 10 tokens at the beginning of each period.
- (4) The task is to decide individually and privately the number of tokens to contribute.
- (5) If the group contributes the pre-announced minimum of 25 tokens, each player receives an equal number of additional tokens. A player's earnings equal the initial endowment of 10 tokens, minus the contribution, plus the additional tokens. If the threshold is not reached, contributions are not returned so that each player's earnings equal the initial endowment minus the contribution.

At each session, a particular game was repeated 25 times. Repetition gives players an opportunity to learn about the game and the strategies of other players. It also affords the experimenters an opportunity to see if the players converge to an equilibrium or not. After each repetition or period, the group contribution for that period was announced publicly. However, individual contributions were not disclosed. The stage game is consistent with

⁴ A researcher who conducted many of the Canadian experiments, helped run the first ten sessions at Osaka University and the four sessions at Future University-Hakodate to ensure that comparable procedures were used.

⁵ Hamaguchi translated the English instructions into Japanese. The Japanese instructions were then used in a mock session with several graduate students at Osaka University to test the translation for clarity. Finally, Kawagoe checked the translation for accuracy. A copy of the instructions is available from the authors upon request.

two types of pure-strategy equilibrium: a strong free-riding equilibrium in which nobody contributes anything and many threshold equilibria in which the group contributes just enough to achieve the threshold and thus receive the reward.

At the end of each session, token holdings were converted into money at a pre-announced exchange rate. Treatments were conducted with reward levels of 5, 8, 10 and 15 additional tokens per player. In the Canadian sessions, the exchange rate was chosen so that the average of the payoff in the strong free-riding equilibrium with that in the threshold equilibrium would be equal to about \$28.40 Canadian. Undergraduate students at the University of Guelph could earn between \$8.00 and \$10.00 per hour at work-study jobs on the university campus. Since students at the Japanese universities generally earn from 800 to 1000 yen per hour in similar part-time positions, the Japanese exchange rate was chosen so that the comparable average would be about 2840 yen⁶. Each experimental session lasted between one and a half and two hours.

3.3 Independent and Dependent Variables

There are three independent variables in this study: gender, culture, and reward. The first two are categorical in nature, whereas reward is a metric variable. There are five dependent variables: the level of group contributions, the number of times the public goods was provided, the degree of equilibrium coordination, the extent of conformity, and the degree of individual contribution variance from period to period. The degree of equilibrium coordination is calculated as the distance from the nearest equilibrium achieved by each group of ten players in each period with smaller distances corresponding to a higher level of coordination. The extent of conformity is measured by calculating the average of the absolute individual differences from the mean group contribution in each period with smaller differences corresponding to a higher trend of conformity. The average level of individual contribution variance from period to period is measured by averaging the individual numbers for each group.

⁶ The resulting exchange rates per token depended on the reward as follows: 10.1 yen (when reward equaled 5), 8.9 yen (when reward equaled 8), 8.27 yen (when reward equaled 10) and 7.0 yen (when reward equaled 15).

4. RESULTS

4.1 Descriptive Data

Table 1 summarizes the results of the 32 sessions, organizing them into panels by culture and gender. For each session, the table shows the amount contributed in the first period and average group contributions as well as the number of times the public good was provided both by five-period intervals and over all 25 periods. Sessions fj02, fj08, mj02 and mj08 were conducted at Future University-Hakodate; the other Japanese sessions were conducted at Osaka University. The results for a given treatment appear to be very similar between the two Japanese universities. This impression was corroborated by Chow tests conducted for each of the 25 periods, all of which failed to reject the null hypothesis that the Hakodate and Osaka results came from identical populations.

Figure 1 illustrates average group contributions for each period by gender and culture, aggregating over the different reward levels. All four gender-culture groupings show a gradual decline in contributions from the earlier to the later periods. Canadian females contribute more than the other groupings in 19 out of 25 periods and Japanese males contribute less than the other groupings in 14 out of 25 periods. However, in the last five periods, Japanese males actually contribute more than the other groupings in two of the five periods.

4.2 Hypotheses Testing

We examine the results of our experiments by employing analysis of covariance (ANCOVA). Following Fox (2000), we use deviation regressor coding for the categorical variables and deviations from the mean for the covariate. Specifically, for the culture factor, Canadian is coded as -1 and Japanese as 1; for the gender factor, male is coded as -1 and female as 1. The reward covariate is expressed in terms of the deviations from its mean of 9.5. Since individuals participating in the same session may respond to each other's actions, data from individuals in the same session are not independent. Therefore, it is necessary to use group averages so that each of the 32 sessions contributes just one observation to each

ANCOVA regression. Similarly group data from one period are not independent of data from the other periods. In order to avoid imposing a specific structure on the period-to-period evolution of the dependent variables, we report four ANCOVA regressions for each dependent variable, each one representing a different phase of the sessions. The first uses data averaged over the first five periods (interval 1 in Table 1) to represent initial behavioral responses to the game, the second uses data from periods 6 to 20 (intervals 2 to 4) to represent behavior as participants learn about and respond to the game and each other, and the third uses data from periods 21 to 25 (interval 5) to represent behavior as equilibrium convergence asserts itself toward the end of the sessions. The fourth ANCOVA employs data from all 25 periods to represent the overall results of the sessions.

Both Gender Hypothesis 1 and Gender Hypothesis 2 make unidirectional predictions. Therefore, we examine all main effects of gender on our dependent variables using one-tailed tests of the null hypothesis against the predicted unidirectional effect. In the case of culture, we consider two sets of mutually exclusive hypotheses: Culture Hypothesis 1a versus Culture Hypothesis 1b and Culture Hypothesis 2a versus Culture Hypothesis 2b. Therefore we test all null hypotheses involving culture using two-tailed tests. We also use two-tailed tests for the reward and for all interaction effects. We examine our hypotheses by assessing the main and interaction effects of gender, culture and reward from the four ANCOVA regressions on each of the dependent variables in turn.

4.2.1 Group Contributions and the Provision Success Rate

Table 2 reports ANCOVA results for average group contributions measured over interval 1, intervals 2-4, interval 5, and all 25 periods. During interval 1, the gender coefficient is positive ($p=.000$), the culture coefficient is negative ($p=.001$) and the reward coefficient is positive ($p=.010$). All are highly significant. No significant interactions are found in the first interval. Thus, in the early periods of the experimental sessions women contributed significantly more than men, Japanese contributed significantly less than Canadians, and higher rewards produced higher contributions. Thus, the initial reactions of participants lend some support to Gender Hypothesis 1, Culture Hypothesis 1b, and the Reward Hypothesis.

However, after interval one, there are no longer any significant differences attributable to culture or gender, nor are there any interaction effects between the reward and culture and/or gender variables. As players learn about the game and respond to each other's actions, only reward remains significant ($p = .000$) with the predicted positive coefficient becoming larger in the later stages of the game. This reflects both the deterioration of contributions toward the strong free-riding equilibrium of zero in low reward games, and the coalescence of contributions around a threshold equilibrium of 25 tokens at higher reward levels. When group contributions averaged over all 25 periods are used as the dependent variable, only reward is significant ($p = .000$). Thus, after a short learning period, only the Reward Hypothesis receives support from the data.

Table 2 also reports ANCOVA results for the provision success rate over interval 1, intervals 2-4, interval 5 and all 25 periods. During the first interval, gender is positive and significant ($p = .002$), culture is negative and significant ($p = .005$) and reward is positive and significant ($p = .053$). None of the interaction terms is significant. Thus, at the beginning of the session, the higher contributions of females result in greater success at providing the public good, while the lower contributions of Japanese produce the opposite result. The higher contributions resulting from higher rewards also result in more success at providing the public good. During the rest of the game, the reward coefficient remains positive and significant ($p = .000$ in intervals 2-4 and interval 5), becoming larger as the game progresses. In intervals 2-4, the negative coefficient on culture is marginally significant ($p = .062$), but this effect must be interpreted in conjunction with a marginally significant negative interaction between gender and culture ($p = .062$). Together, these results reflect the contrast between the large difference in the number of successes achieved by Japanese females (20 successes) versus Canadian females (44 successes) compared with the small difference between Japanese males (30 successes) and Canadian males (31 successes) during these intervals. The results for success rate contrast with those for average contributions, which exhibit no significant gender or culture effects at all during these intervals. This reflects the fact that in spite of contributing similar amounts, Japanese females often just miss, while Canadian females often just attain successful provision. During the 5th interval, neither gender nor

culture significantly affects the success rate. Using the success rate over all 25 periods as the dependent variable, gender is positive and marginally significant ($p=.081$), culture is negative and significant ($p=.009$) and the interaction between gender and culture is negative and marginally significant ($p=.081$), reflecting primarily the patterns over the first 20 periods discussed above. Reward is strongly significant ($p=.000$). Thus, though Japanese, particularly Japanese females, initially attain fewer successes, this effect disappears as lower reward groups move toward the strong free-riding equilibrium and higher reward groups move toward a threshold equilibrium in the final periods.

In summary, the initial impulses of participants lend support to Gender Hypothesis 1 and Culture Hypothesis 1b as well as the Reward Hypothesis. However, after a short learning period for average contributions and a longer learning period for the number of successes, our results corroborate the Reward Hypothesis, but reject Gender Hypothesis 1 and both Culture Hypotheses 1a and 1b. Although we observe a marginally significant gender-culture interaction on the number of successes in intervals 2-4, reflecting larger culture effects on the success rate for females than for males, this interaction lends no support to our Gender-Culture Interaction Hypothesis, which predicted that gender effects would be significantly greater in Japan than in Canada. In fact, dummy-coded regressions with males coded as 0 and females coded as 1, controlling for culture, reward, and their interactions reveal a positive gender effect of 0.117 ($p=.060$) in Canada and an insignificant negative gender effect of -0.083 ($p=.87$) in Japan. The higher absolute value of the Canadian gender effect runs contrary to the Culture-Gender Interaction Hypothesis.

4.2.2 Equilibrium coordination

Equilibrium coordination is calculated as the distance from the nearest equilibrium achieved by each group of ten players in each period with smaller distances corresponding to a higher level of coordination. Table 3 reports the distances from equilibrium of the four gender-culture groupings, averaged further over all 25 periods and over interval 1, intervals 2-4, and interval 5. It also reports ANCOVA results for over the same intervals.

In interval 1, nothing is significant except for the interaction between gender and culture

($p=.010$). This reflects the fact that Canadian males begin the sessions closer to equilibrium than Canadian females, while Japanese males are farther from equilibrium than Japanese females. In intervals 2-4, gender is negative and marginally significant ($p=.092$), while culture is positive and highly significant ($p=.001$), implying that females are closer to equilibrium than males and Japanese are farther from equilibrium than Canadians. Reward is also negative and significant ($p=.003$), reflecting the fact that at this middle stage of the sessions, high-reward treatments have converged significantly closer to an equilibrium than low-reward treatments. The high reward sessions usually converge to a socially-optimal threshold equilibrium. High rewards are apparently very helpful in resolving the social dilemma posed by the threshold game relatively quickly in a socially efficient manner. In contrast, low reward groups are often still struggling between the socially-damaging free-riding and a socially-efficient threshold equilibrium at this stage. By interval 5, reward is no longer significant ($p=.211$). Low-reward sessions have now generally moved as close to an equilibrium as high-reward sessions. Females continue to be closer to an equilibrium than males, though the significance of this effect is still marginal ($p=.064$), while Japanese continue to be farther from an equilibrium than Canadians ($p=.041$).

The overall results show a significant negative effect for gender ($p=.032$), a significant positive effect for culture ($p=.001$) and a significant negative effect for reward ($p=.001$). They also show marginally significant negative interactions between culture and reward ($p=.075$) and between gender, culture and reward ($p=.061$). Together these interactions suggest that Japanese females may be more responsive to reward than other groups in their convergence behavior.

These results corroborate Gender Hypothesis 2, which predicts that females will coordinate more closely around a Nash equilibrium than males, and Culture Hypothesis 2b, which asserts that Japanese will coordinate less closely around a Nash equilibrium than Canadians. The lack of any significant interaction effects between gender and culture provides no support for the Gender-Culture Interaction Hypothesis.

These equilibrium coordination tests do not differentiate between groups of players that focused on one type of equilibrium by the time they reached the final interval and those that

were still switching between equilibria as the game was drawing to a close. In fact, all the sessions involving Canadian females focused on either a threshold or a free-riding equilibrium during the final interval. However, this was not the case for any of the other three culture-gender groupings. The group distance from focused equilibrium measure, reported in Table 3 for the final interval, penalizes switching between a free-riding and a threshold equilibrium. It is calculated by averaging the distances from the one equilibrium to which the average group contribution during the last five periods is closest. Of course, for the non-switching Canadian female sessions, this makes no difference. For all the other culture/gender groupings, the average distance from focused equilibrium is greater than the average distance from the nearest equilibrium in each period, reflecting the switching that took place. Measured by the group distance from focused equilibrium, we observe that female participants are significantly closer than male participants ($p=.024$), and Canadian participants are significantly closer than Japanese participants ($p=.042$) by the time they reach the final interval.

We also observe a marginally significant negative interaction between culture and reward ($p=.083$) although the main effect of reward itself is not significant. This suggests that relative to Canadians, Japanese coalesce more closely around an equilibrium at higher than at lower reward levels. Figure 2 illustrates this effect by plotting the fitted values of distance from focussed equilibrium for each gender-culture grouping at the lowest reward level of 5, the highest reward level of 15 and the average reward level of 9.5. The flat Canadian lines suggest that the level of reward makes little difference to the Canadian ability to focus on and converge to an equilibrium. The negatively-sloped Japanese lines suggest the opposite for Japanese. Japanese seem to have more difficulty selecting and converging to an equilibrium when rewards from cooperation are low than when they are high. Perhaps this is a reflection of a more collectively-oriented culture having difficulty converging to the very individualistic free-riding equilibrium, but not being collectively-oriented enough to converge easily to a more cooperative threshold equilibrium when rewards are low. However, this is a mere suggestion. For Japanese males, the reward coefficient is -0.466 , but the p -value only approaches significance at 0.120 . Similarly, for Japanese females the reward coefficient of

-0.469 has a p-value of only 0.118.

In conclusion, our analysis of focused equilibrium coordination in the last interval strongly corroborates both Gender Hypothesis 2 that women will coordinate more closely around a selected Nash equilibrium than men, and Culture Hypothesis 2b that Canadians will coordinate more closely around a selected Nash equilibrium than Japanese. Our Gender-Culture Interaction Hypothesis is not supported.

4.2.3 Conformity

In two earlier papers, Cadsby and Maynes (1998) found that a group's ability to coordinate around an equilibrium was apparently related to the tendency of its members to behave alike. In this threshold public goods game, there are an infinite number of pure-strategy equilibria, making coordination potentially difficult. However, there are only two symmetric pure-strategy equilibria so that a tendency to behave alike may facilitate equilibrium selection, coordination and convergence.⁷ Of course, if symmetric equilibria are selected, coordination may also result in conformity.

Conformity is measured by calculating the average of the absolute individual differences from the mean group contribution on a period-by-period basis for each session. Table 4 reports the conformity measure averaged further over interval 1, intervals 2-4, and interval 5, and all 25 periods, as well as the ANCOVA analyses of the conformity data. The null hypothesis of no main effect for gender is tested against the one-tailed alternative suggested by Cadsby and Maynes (1998) that females will be more conforming than males. Two-tailed tests are used for tests of all other main effects and interactions. There is a significantly negative gender effect in the first interval ($p=.052$); however, it must be interpreted in conjunction with a negative and significant ($p=.002$) interaction effect between gender and culture. The interaction reflects the fact that while Japanese females are more conforming than Japanese males, the opposite is true for Canadians. In intervals 2-4, 5, and

⁷ One of the symmetric equilibria is the strong free-riding equilibrium in which each participant contributes zero. The other is the symmetric threshold equilibrium in which each participant contributes 2.5. There are an infinite number of asymmetric threshold equilibria since there are an infinite number of contribution combinations that add up to 25, the amount required for the public good to be provided.

overall, the main effect of gender remains significantly negative and the interaction disappears ($p=.003$ for intervals 2-4, $p=.007$ for the final interval 5, and $p=.000$ for the 25 periods overall). Thus, after the first five periods females are more conforming in both countries, helping to explain their higher levels of coordination over the same periods.

For culture, the results are not as definitive. During intervals 2-4, culture is positive, but not significant ($p=.117$), while during the final interval 5, it is positive and marginally significant ($p=.064$). Thus, there is some suggestion that Japanese are less conforming than Canadians, corresponding to their tendency to coordinate less well on an equilibrium.

The coefficient on reward is positive, but not significant ($p=.335$) during intervals 2-4. However, there is a negative and significant ($p=.044$) three-way interaction between gender, culture and reward. This reflects the fact that while Japanese females tend to be less conforming at lower levels of reward relative to Japanese males, Canadian females tend to be more conforming at lower levels of reward relative to Canadian males. While Japanese females were apparently behaving rather differently from each other at low levels of reward, Canadian females at low reward levels were mostly giving zero, having focussed on the strong free-riding equilibrium. By the final interval, the coefficient on reward has become positive and significant ($p=.006$), and all interactions involving reward have disappeared. At low levels of reward, most sessions have converged to the strong free-riding equilibrium where each participant contributes the same amount, namely zero. At high levels of reward, most sessions have chosen a threshold equilibrium, but not necessarily the symmetric one. Hence, at higher reward levels, people are significantly less conforming, but not significantly less coordinated around an equilibrium as reported earlier.

4.2.4 Individual Contribution Variance

Another factor that may be associated with convergence to a pure-strategy equilibrium is the extent to which individuals change or mix their strategies from period to period. The proposed relationship between individual contribution variance and equilibrium coordination is bi-directional. On the one hand, if many participants are changing their strategies from period to period, it may be more difficult for the others in their session to respond and

coordinate with their actions. On the other hand, selection and coordination around a pure-strategy equilibrium should result in a reduction in individual variability from period to period.

Table 5 reports the variances of individual contributions averaged for each gender/culture grouping and measured over interval 1, intervals 2-4, interval 5, and over all 25 periods, as well as the ANCOVA analyses for these data. During the first interval, only the interaction between gender and culture is significant ($p=.005$), reflecting the fact that while Japanese females are initially less changeable than Japanese males, the reverse is true for Canadians. However, after the first interval, we find that women are significantly less variable in their behavior than men ($p=.001$ for intervals 2-4, $p=.012$ for the final interval 5, and $p=.003$ for the 25 periods overall).

Japanese are significantly more variable than Canadians in intervals 2-4 ($p=.038$) and more variable with marginal significance in interval 5 ($p=.087$). Over all 25 periods, the main effect of culture is not significant ($p=.207$), but there is a significant negative interaction between gender and culture ($p=.020$). This reflects the fact while over all 25 periods Japanese males were significantly more variable in their behavior than Canadian males ($p=.013$), amongst females there was no significant difference ($p=.403$). During the first five periods, Japanese females were less variable than Canadian females, whereas during the middle and later periods they were more variable. The early low variability of Japanese females did not seem to help them coordinate on an equilibrium later in the session, and their behavior then became more variable in the middle intervals. The marginally significant negative three-way interaction between gender, culture and reward in these intervals ($p=.067$) indicates that this greater variability was primarily in sessions with a low level of reward. Again, we see some suggestion of uncertainty among Japanese females in low reward sessions over whether to cooperate or not. However, the generally lower variability of females and higher variability of Japanese in the middle and later intervals does correlate well with the ability of females and Canadians to coordinate more closely around a selected equilibrium than males and Japanese respectively.

5. DISCUSSION AND CONCLUSION

This paper compares the behavior of Japanese males and females with Canadian males and females in the context of a threshold public goods game possessing both a strong free-riding equilibrium and many socially efficient threshold equilibria. Reward matters: higher rewards lead to higher contributions and a higher provision rate, strongly corroborating the Reward Hypothesis. Both gender and culture also affect group dynamics in a threshold public goods game, but in a more subtle way.

Although females initially contributed more and were more successful at providing the public good than males, this pattern quickly vanished in the face of repetition. The pull of economic incentives thus seems to overwhelm the gender differences predicted by Gender Hypothesis 1. Despite the availability of equilibria involving cooperation as well as an equilibrium involving competition, an initially "weak situation" seems to gain strength with repetition. However, a significant gender effect did develop as the game progressed. Females became more focussed and coordinated around a selected equilibrium than males. Regardless of whether an equilibrium involving cooperation or one involving competitive free-riding was emerging, females seemed better able to recognize and respond to each other's strategy choices than males. Thus, Gender Hypothesis 2, predicated on the notion that relatedness as a form of self-construal seems to be more prevalent and important among females than among males, is corroborated. This is consistent with both the greater relatedness of females reported by Gilligan (1982) based on interviews with males and females in the United States and the greater relatedness of females reported by Kashima et al. (1995) based on questionnaires for a variety of nationalities including Americans and Japanese. It also confirms that the behavioral patterns reported by Cadsby and Maynes (1998) based on Canadian data, some of which were also used in this study, extend to Japan as well.

Although we found that culture had no significant impact on the amount contributed after interval 1, the results did show that Canadians had more successes in threshold public good provision than did Japanese participants during intervals 2-4. However, this effect was of only marginal significance, and vanished by the last five periods of the game. Thus, there is

no support for Culture Hypothesis 1a and only limited support for Culture Hypothesis 1b. As in the case of gender, ultimately economic incentives seem to overwhelm the cultural differences initially expressed. Moreover, the idea that “high-context” Japanese would coordinate better around an equilibrium than “low context” Canadians, embodied in our Culture Hypothesis 2a, is strongly rejected. Instead, the contrasting Culture Hypothesis 2b received strong support as Canadians coordinated significantly more closely around a selected equilibrium than Japanese after the first five periods. This is consistent with the questionnaire-based findings of Kashima et al. (1995) that levels of relatedness are much lower in Japan for both males and females than in the US, Australia, Hawaii or Korea. There is no support for the Gender-Culture Interaction Hypothesis that predicted greater differences between the genders in more "masculine" Japan than in less "masculine" Canada.

Coordination around an equilibrium is related both to conforming and less variable behavior. Females, who coordinate more closely around an equilibrium, also choose strategies that are significantly more alike and less variable than do males. Canadians, who coordinate more closely around an equilibrium, also choose strategies that are less variable than Japanese. However, the main effect of culture on conformity is only marginally significant during the last five periods. Canadian females, who coordinate most closely around an equilibrium, are also the most conforming and the least variable during the middle and final subintervals of the game. Japanese males, who coordinate least closely around an equilibrium, are also the least conforming and most variable throughout the game.

The gender and culture hypotheses that received support from our experiment were both based on the notion that high-relatedness individuals placed in a group and faced with interacting individual decisions would coordinate more successfully than low-relatedness individuals. This corroborates the findings of Kashima et al. (1995) regarding the distribution of relatedness between males and females and between Japanese and other cultures. Perhaps more importantly, it demonstrates that the prevalence of different types of self-construal among different populations can significantly affect behavior in a social dilemma game with salient economic incentives and multiple equilibria.

Like most studies, our research is not without limitations. Some of the limitations of our

study are highlighted here in order to underline the need for greater theoretical refinement and more extensive generalizability. First, the variables of interest in this study are gender and culture. Such demographic characteristics are used here as proxies for dispositional characteristics, such as an agentic versus a communal nature or an individualistic versus a collectivistic orientation. Future research could incorporate psychological measures as manipulation checks or use the data collected through such measures to establish a more accurate account of the effects of gender and culture, as well as latent variables influenced by gender and culture, on behavior. Second, we restricted our study of gender and culture effects on behavior to all-male and all-female groups in two different cultures. It is also important to study gender and culture effects in the context of mixed-gender and multi-cultural groups. Such studies should produce a fuller understanding of how gender and culture may affect behavior in the more heterogeneous groups typical of the modern workplace. Third, a threshold public goods game with salient rewards was employed in our experimental study. The clarity of the experimental task and the availability of objective measures of group performance promote internal validity. However, the laboratory nature of the task may limit the generalizability of our findings to real-world contexts. In real life, work takes time, and involves effort, fatigue, excitement, boredom and other affective, cognitive, and social experiences. Hence, a monetary contribution to an experimental public good, designed as a proxy for individual effort in a group-work context, reflects just one aspect of the multi-faceted and interactive nature of group work in the real world. Therefore, field studies are an important complement to laboratory research. If similar results emerge in a real world organizational setting where group members are assessed and rewarded in the context of their ongoing work assignments, we could apply our findings with added confidence in a variety of social and work contexts.

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Table 1
Summary of Japanese and Canadian Threshold Public Goods Sessions

Session	Reward	Tokens Exchanged							Number of Times Public Good Provided					
		First	Average by Five-Period Interval					Overall	Average by Five-Period Interval					Overall
		Period	1-5	6-10	11-15	16-20	21-25		1-5	6-10	11-15	16-20	21-25	
Panel A: Japanese Females														
fj01	5	28.7	23.7	23.5	14.0	12.9	6.8	16.2	1	1	0	0	0	2
fj08	5	32.1	22.5	13.4	15.8	11.7	6.6	14.0	2	0	0	0	0	2
fj05	8	29.1	23.6	14.0	14.5	11.9	4.8	13.8	2	0	1	0	0	3
fj06	8	30.5	22.3	17.8	21.1	16.3	9.0	17.3	2	0	0	1	0	3
fj03	10	27.8	25.6	22.4	22.6	18.8	19.8	21.8	2	2	2	1	0	7
fj04	10	26.5	23.8	22.8	20.5	18.3	10.1	19.1	2	1	1	0	0	4
fj02	15	25.5	22.7	26.5	23.5	25.3	26.7	24.9	1	3	2	2	4	12
fj07	15	36.6	28.3	20.4	22.4	22.2	24.3	23.5	4	1	1	1	2	9
Panel B: Japanese Males														
mj02	5	24.5	19.0	11.1	20.2	9.6	9.1	13.8	0	0	1	0	0	1
mj08	5	33.0	18.5	8.4	7.7	5.2	12.8	10.5	1	0	0	0	0	1
mj05	8	26.3	19.0	17.5	9.7	9.9	20.3	15.3	1	1	0	0	1	3
mj06	8	23.8	18.9	25.2	16.6	23.7	15.7	20.0	0	3	0	3	0	6
mj03	10	29.9	25.8	16.1	6.0	9.7	2.7	12.1	2	1	0	0	0	3
mj04	10	24.2	26.1	21.1	24.8	23.5	20.4	23.2	2	1	3	1	1	8
mj01	15	38.6	23.3	27.5	20.8	28.9	27.2	25.5	1	3	2	4	3	13
mj07	15	24.0	24.3	26.1	25.5	29.4	23.4	25.7	2	2	3	2	1	10

Session	Reward	Tokens Exchanged							Number of Times Public Good Provided					
		First Period	Average by Five-Period Interval					Overall	Average by Five-Period Interval					Overall
			1-5	6-10	11-15	16-20	21-25		1-5	6-10	11-15	16-20	21-25	
Panel C: Canadian Females														
fc01	5	41	29.8	24.0	15.0	5.9	1.8	15.3	4	2	0	0	0	6
fc02	5	42	26.0	9.1	10.3	4.6	0.5	10.1	1	0	0	0	0	1
fc07	8	37.5	29.7	24.3	23.3	25.2	26.1	25.7	4	2	1	3	3	13
fc08	8	39.5	29.7	25.0	22.8	26.9	19.1	24.7	3	3	1	3	0	10
fc05	10	36.75	26.8	23.6	23.5	26.1	22.8	24.5	3	1	1	4	2	11
fc06	10	37	28.3	24.3	24.3	24.9	24.3	25.2	4	2	2	3	0	11
fc03	15	35.5	30.8	24.8	26.5	26.0	24.0	26.4	4	2	3	5	2	16
fc04	15	31.5	27.0	24.1	20.7	24.8	23.0	23.9	3	2	1	3	2	11
Panel D: Canadian Males														
mc01	5	39.5	23.3	14.4	11.0	3.7	2.0	10.89	1	1	1	0	0	3
mc02	5	28.3	25.7	20.5	18.8	11.6	6.6	16.6	3	0	0	0	0	3
mc07	8	29	23.8	22.0	17.0	24.6	15.8	20.6	2	2	0	2	0	6
mc08	8	29.25	24.1	20.7	22.1	20.6	9.9	19.5	1	1	1	1	0	4
mc05	10	23	25.5	25.2	23.8	25.3	23.2	24.6	2	3	3	3	1	12
mc06	10	29.5	23.4	19.7	17.0	15.8	6.0	16.3	1	1	1	0	0	3
mc03	15	32.5	25.4	25.2	24.6	24.3	25.8	25.1	3	3	2	3	5	16
mc04	15	23.5	26.6	20.4	19.5	17.2	17.7	20.3	2	2	1	0	1	6

Table 2
 ANCOVA Results for Average Group Contribution and Provision Success Rate (p-values in parentheses)

	Interval 1 (Periods 1-5)	Interval 2-4 (Periods 6-20)	Interval 5 (Periods 21-25)	Overall (Periods 1-25)
<u>Results for Average Group Contribution.</u>	F(7, 24)=8.70 Prob>F=.000	F(7, 24)=4.31 Prob>F=0.003	F(7, 24)=5.04 Prob>F=0.001	F(7, 24)=5.72 Prob>F=0.000
Constant	24.784 (.000)	19.286 (.000)	15.256 (.000)	19.580 (.000)
Gender (Gen) ¹	1.497 (.000)	0.767 (.164)	0.353 (.378)	0.830 (.105)
Culture (Cul)	-1.828 (.000)	-1.021 (.196)	-0.276 (.807)	-1.033 (.122)
Reward (Rew)	0.266 (.010)	1.061 (.000)	1.728 (.000)	1.036 (.000)
Gen*Cul	-0.394 (.263)	-0.173 (.824)	-1.814 (.118)	-0.546 (.406)
Gen*Rew	-0.109 (.257)	-0.072 (.734)	0.246 (.431)	-0.016 (.928)
Cul*Rew	0.156 (.112)	0.143 (.506)	-0.067 (.829)	0.103 (.565)
Gen*Cul*Rew	-0.049 (.605)	-0.254 (.241)	0.118 (.704)	-0.138 (.442)
<u>Results for Success Rate</u>	Interval 1 F(7, 24)=3.87 Prob>F=.006	Interval 2-4 F(7, 24)=5.23 Prob>F=.001	Interval 5 F(7, 24)=3.75 Prob>F=.007	Overall F(7, 24)=8.20 Prob>F=.000
Constant	0.413 (.000)	0.258 (.000)	0.175 (.000)	0.274 (.000)
Gender (Gen) ¹	0.113 (.00111)	0.008 (.374)	0.013 (.370)	0.028 (.008)
Culture (Cul)	-0.010 (.005)	-0.050 (.062)	-0.025 (.507)	-0.056 (.009)
Reward (Rew)	0.018 (.053)	0.036 (.000)	0.050 (.000)	0.036 (.000)
Gen*Cul	-0.025 (.442)	-0.050 (.062)	-0.013 (.739)	-0.036 (.081)
Gen*Rew	0.000 (1.000)	0.000 (1.000)	-0.001 (.891)	-0.001 (.885)
Cul*Rew	0.003 (.711)	0.003 (.658)	0.001 (.927)	0.002 (.689)
Gen*Cul*Rew	-0.002 (.791)	-0.008 (.274)	0.013 (.224)	-0.002 (.702)

¹ One-tailed test for gender effects.

Table 3
ANCOVA Results for Distance from Equilibrium (p-values in parentheses)

<i>Group Distance From Nearest Equilibrium Each Period (Group Means)</i>					<i>Group Distance from Focussed Equilibrium</i>
	Interval 1 (Period 1-5)	Interval 2-4 (Periods 6-20)	Interval 5 (Periods 21-25)	Overall (Periods 1-25)	Interval 5 (Periods 21-25)
Japanese Females (JF)	4.116	5.882	5.338	5.420	5.848
Japanese Males (JM)	6.225	5.979	5.767	5.986	7.061
Canadian Females (CF)	5.359	3.494	2.596	3.688	2.596
Canadian Males (CM)	3.996	4.764	4.839	4.626	5.789

<i>ANCOVA Results for Distance from Equilibrium</i>					<i>ANCOVA Results for Distance from focussed Equilibrium</i>
	Interval 1 F(7,24)=1.94 Prob>F=.108	Interval 2-4 F(7, 24)=4.45 Prob>F=.003	Interval 5 F(7, 24)=1.89 Prob>F=.115	Overall F(7, 24)=5.84 Prob>F=.000	Interval 5 F(7, 24)=1.89 Prob>F=.115
Constant	4.924 (.000)	5.030 (.000)	4.635 (.000)	4.930 (.000)	5.324 (.000)
Gender (Gen) ¹	-0.187 (.277)	-0.342 (.092)	-0.668 (.064)	-0.376 (.032)	-1.101 (.024)
Culture (Cul)	0.246 (.435)	0.900 (.001)	0.917 (.041)	0.773 (.001)	1.131 (.042)
Reward (Rew)	-0.130 (.142)	-0.230 (.003)	-0.150 (.211)	-0.194 (.001)	-0.206 (.168)
Gen*Cul	-0.868 (.010)	0.293 (.252)	0.454 (.295)	0.093 (.634)	0.495 (.357)
Gen*Rew	0.002 (.977)	-0.027 (.701)	0.002 (.988)	-0.015 (.778)	0.043 (.768)
Cul*Rew	-0.117 (.183)	-0.088 (.214)	-0.114 (.337)	-0.099 (.075)	-0.262 (.083)
Gen*Cul*Rew	-0.064 (.459)	-0.093 (.188)	-0.177 (.141)	-0.104 (.061)	-0.044 (0.762)

¹ One-tailed test for gender effects.

Table 4
ANCOVA Results for Average Conformity by Gender and Culture (p-values in parentheses)

<i>Average Conformity by Gender and Culture (Group Means)</i>				
	Interval 1 (Periods 1-5)	Interval 2-4 (Periods 6-10)	Interval 5 (Periods 11-15)	Overall (Periods 1-25)
Japanese Females (JF)	0.885	1.241	0.997	1.121
Japanese Males (JM)	1.510	1.556	1.555	1.547
Canadian Females (CF)	1.436	1.097	0.878	1.121
Canadian Males (CM)	1.215	1.384	1.105	1.295

<i>ANCOVA results for Conformity</i>				
	Interval 1 F(7, 24)=2.85 Prob>F=0.026	Interval 2-4 F(7, 24)=2.58 Prob>F=.0394	Interval 5 F(7, 24)=3.43 Prob>F=.011	Overall F(7, 24)=3.52 Prob>F=.010
Constant	1.261 (.000)	1.320 (.000)	1.134 (.000)	1.271 (.000)
Gender (Gen) ¹	-0.101 (.052)	-0.150 (.003)	-0.196 (.007)	-0.149 (.000)
Culture (Cul)	-0.064 (.295)	0.079 (.117)	0.142 (.064)	0.063 (.140)
Reward (Rew)	-0.020 (.239)	0.013 (.355)	0.060 (.006)	0.016 (.178)
Gen*Cul	-0.211 (.002)	-0.007 (.866)	-0.082 (.27)	-0.063 (.140)
Gen*Rew	0.007 (.668)	-0.006 (.623)	0.006 (.749)	-0.001 (.913)
Cul*Rew	-0.009 (.590)	-0.004 (.758)	-0.030 (.155)	-0.010 (.379)
Gen*Cul*Rew	-0.020 (.242)	-0.028 (.044)	-0.010 (.619)	-0.023 (.054)

¹ One-tailed test for gender effects.

Table 5
 ANCOVA Results for Average Individual Variances by Gender and Culture (p-values in parentheses)

<i>Average Individual Variances by Gender and Culture (Group Means)</i>				
	Interval 1 (Periods 1-5)	Interval 2-4 (Periods 6-10)	Interval 5 (Periods 11-15)	Overall (Periods 1-25)
Japanese Females (JF)	1.249	2.539	1.653	2.516
Japanese Males (JM)	3.343	3.466	3.018	3.791
Canadian Females (CF)	1.919	1.488	1.018	1.939
Canadian Males (CM)	1.553	2.595	2.184	2.588
<i>ANCOVA results for Average Individual Variances</i>				
	Interval 1 F(7, 24)=1.90 Prob>F=.113	Interval 2-4 F(7, 24)=3.35 Prob>F=.012	Interval 5 F(7, 24)=2.39 Prob>F=.053	Overall F(7, 24)=3.13 Prob>F=.017
Constant	3.362 (.000)	3.768 (.000)	3.250 (.000)	3.460 (.000)
Gender (Gen) ¹	-0.335 (.146)	-0.713 (.001)	-0.858 (.012)	-0.636 (.003)
Culture (Cul)	-0.283 (.371)	0.450 (.038)	0.632 (.087)	0.266 (.207)
Reward (Rew)	-0.081 (.354)	0.032 (.571)	0.172 (.090)	0.041 (.472)
Gen*Cul	-0.964 (.005)	-0.184 (.378)	-0.392 (.279)	-0.513 (.020)
Gen*Rew	0.043 (.613)	-0.019 (.742)	0.056 (.571)	0.026 (.637)
Cul*Rew	-0.047 (.587)	-0.070 (.228)	-0.167 (.098)	-0.095 (.106)
Gen*Cul*Rew	-0.039 (.652)	-0.108 (.067)	-0.008 (.933)	-0.052 (.368)

¹ One-tailed test for gender effects.

Figure 1
Average Group Contribution by Gender for Canadian and Japanese Sessions

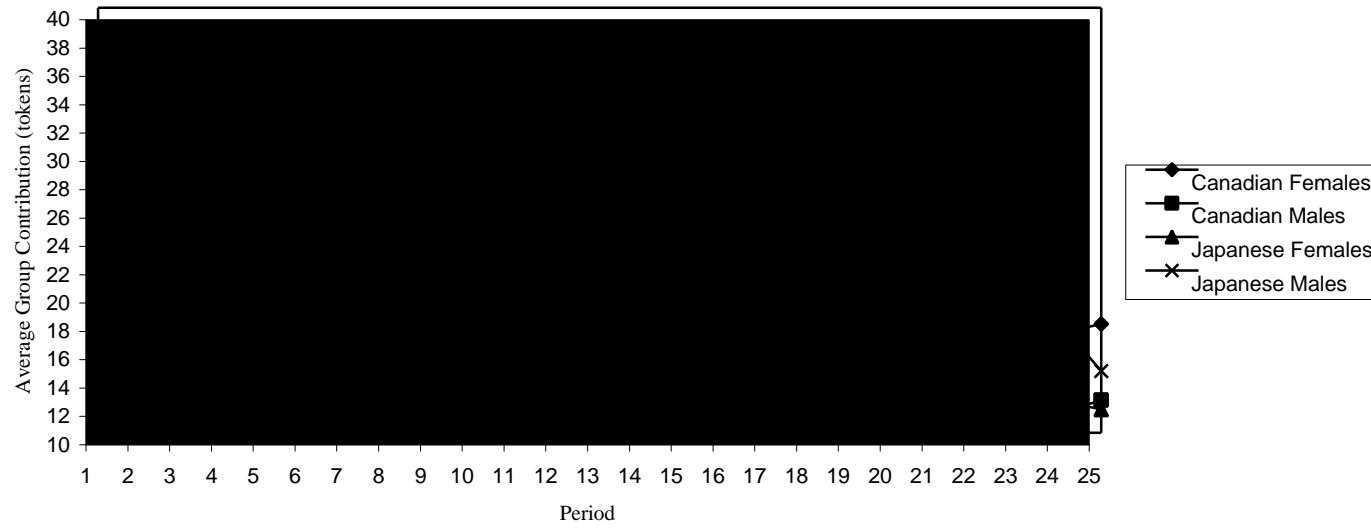


Figure 2
Fitted Distance From Focussed Equilibrium By Gender and Culture for Interval 5

