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NEW HORIZONS IN CROSS-NATIONAL EXPERIMENTATION¹

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ABSTRACT

This study demonstrates the feasibility of a previously unutilized format for social research in a cross-national context. Dyadic exchange experiments were conducted with internet-based experimental software, using subjects physically located in the United States and the Netherlands. In this study, I discuss issues regarding cross-national experimentation, provide an overview of Elementary Theory and its predictions for dyadic exchange, and present the results of a unique experimental setting, along with a detailed description of the methods used to conduct the study. Results indicate that the resistance predictions of Elementary Theory hold irrespective of national boundaries.

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INTRODUCTION

This paper presents the results of a series of unique cross-national exchange experiments utilizing ExNet 2.0, a web-based experimental instrument. The cross-national nature of these experiments was unique in that the exchange dyads were comprised of Dutch subjects in the Netherlands interacting via the internet with American subjects in South Carolina.

As observed by Foschi (1980) and elaborated by Willer (1985), the bulk of comparative research across geographical or cultural boundaries takes the form of "cultural difference studies," in which culture takes the form of an independent variable. For example, Yamagishi et al. (1998) investigate cultural characteristics of the United States and Japan that affect the trust and commitment of American and Japanese students in group settings. Punnett and Clemens (1999) find that culturally homogenous business teams spend less time in making decisions concerning international expansion than do culturally mixed teams. Similarly, Alcock (1975) finds Canadians to be much more cooperative than Indian nationals in asymmetric bargaining situations. Note that all three of these studies proceed from the assumption that individuals of

differing nationalities possess different cultural characteristics that affect their behavior in certain social situations.

In contrast to cultural difference experiments, cross-national replications seek to test the universality of existing theory. According to Willer and Szmataka (1993) "experiments are the best tests of theory and ... theory is the best design for experiments" (p. 38). Theoretical predictions should be universal – because they "should hold independent from particulars of time and place" (p. 39). Cross-national replication of experimental studies is a strategy for strengthening a claim to universality, if an experimental design produces the same results over repeated tests in a variety of settings.

The goals of this paper are two-fold. The paper seeks to increase the universality of Elementary Theory. It also explores a new experimental setting for cross-national research, taking advantage of recent developments in web-based experimental software. It begins with a discussion of cross-national experimental research, emphasizing the type of cross-national comparisons made and the location in which the experiments are conducted. I then discuss basic concepts of Elementary Theory, which were used to derive predictions for the outcome of these experiments. Presentation and discussion of results follow a detailed description of the methods used to conduct the first series of cross-national interaction experiments.

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CROSS-NATIONAL RESEARCH

Diverse notions exist among social scientists concerning the rationale for, and implications of, cross-national or cross-cultural research, and about the methods through which such research is most appropriately undertaken. Only a small proportion of cross-national studies involve experimental methods, yet the diversity among those studies is still great (Foschi and Hales, 1979, Foschi, 1980; Willer and Szmataka, 1993). Willer and Szmataka (1993) distinguish between two basic approaches to cross-national experimentation: "cultural difference experiments" and "cross-national replications" (Willer and Szmataka, 1993 p. 40). Cultural difference experiments" use cultural differences as operationalizations of independent variables, while "cross-national replications" use variations in culture "to test for the generality and robustness of a theory" (Willer and Szmataka, 1993 p. 40).

Implicit in all cross-national research is the assumption that different social settings may involve differences that could, in some way, influence the behaviors of experimental subjects. Cross-cultural replication of experiments allows researchers to reproduce the abstract features of earlier studies, while varying specific features of the research setting. According to Foschi (1980), this allows experimental evidence in support of, or contrary to, a theory to stand on its own, without being limited to specific features of one culture or another. The goal is to determine if the same results will obtain in different settings.

Different results produced by conducting the same experiment in different cultural contexts have a potentially negative impact on a theory, suggesting that is limited to particular characteristics

of time or place. To be sure, differing results may occur due to any number of factors, including inadequate experimental design, misinterpretation of instructions and technological difficulties. The point here is that, given the range of variation that can occur across different experimental settings, similar results could not be expected to occur at all, but for the existence of a strong theory.

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Willer and Szmatka (1993) argue that cross-national replication can help to mitigate certain threats to internal validity that are common to highly controlled laboratory experiments. First, by generating similar results across highly contrasting settings, such research decreases the likelihood that results obtained in one setting were due to specific characteristics unique to a single population. Second, the threat of interactions between the phenomena being tested and particular characteristics not addressed in the theory is reduced by demonstrating that conditions produced in the laboratory produce the same results, regardless of contrasting social conditions outside of the laboratory. Even greater insurance against the above-mentioned threats to validity would be provided if the experimental setting allowed interactions among subjects drawn from contrasting social environments.

Cross-National Experimental Studies

The design of cross-national experimental studies presents a number of challenges, particularly with regard to the location in which they are to be conducted and the type of comparison to be made. By location, I refer to whether the experiment was conducted at a single site or multiple sites. By "type of comparison," I refer to the manner in which cultural differences are incorporated into the experimental design. Some studies compare results from a number of experiments, each conducted using subjects drawn from a single national or cultural population. Others compare behavioral outcomes of subjects drawn from different national or cultural populations interacting in the same experimental session.

Cross-national experiments conducted at a single site allow models to be tested using groups of varying composition. For example, P. Willer (1985) examined differences in the bargaining patterns of U.S. citizens and Arab nationals residing in the United States. Results of U.S.-only dyads were compared to results from Arab-only dyads, as well as to dyads consisting of one U.S. and one Arab subject. Although prevailing stereotypes would suggest that Americans and Arabs take quite different approaches to negotiation and exchange, very little variation was found among the outcomes of the pairings. These results suggest that the dyad is an inherently equal structure, regardless of the cultural backgrounds of experimental subjects.

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One problem with conducting cross-national experiments in a single location is that some subjects act within their own cultural environment while others are "foreigners." When Americans enter into negotiation with Arabs and the negotiations take place in the United States, we cannot know the extent to which the bargaining behavior of Arab subjects is influenced by the adaptations they have made. For cultural difference experiments, this poses serious problems,

due to the previously mentioned threats of correlated bias. For cross-national replications, the problem lies more in the fact that the results may still be peculiar to a particular location, thus lending weaker support to claims of universality.

Most cross-national experiments compare outcomes of different groups tested at different places. Willer and Szmataka (1993) found no significant difference in the exchange outcomes realized by subjects in the United States as compared with subjects in Poland. Roth et al. (1991) found similar ultimatum and market negotiating outcomes among Israeli, Yugoslavian, US and Japanese subjects. Lin et al. (1991) found that U.S. and Chinese subjects arrived at nearly identical resource distributions. In all three cases, the similarity of results suggests that the many differences existing among societies had little or no effect on the behavioral outcomes of subjects in the experimental settings.

When experiments are conducted in several national settings, subjects interact only with other subjects of their own nationality – Poles engage in exchange with other Poles, Israelis offer ultimatums to other Israelis, Chinese managers allocate resources among groups of Chinese workers. While the similarity of outcomes strongly suggests that nationally different groups of subjects arrive at the same results, it does not show that the manner in which they arrived there is also the same. We cannot know if the Polish subjects approach negotiation in the same way as do U.S. subjects, nor can we know what would happen when an Israeli considers the ultimatum offer of a Yugoslavian.

Technology and Laboratory Experimentation²

Advances in technology have perhaps had no more profound impact on any social scientific methodology than on laboratory experimentation. In fact, it could be said that experimentation has developed apace with the computer revolution, taking advantage of the most current developments in information technology. The "technology" employed in laboratory experiments refers to the physical conditions and information of the laboratory setting, the method of communications employed during experiments, and the media of exchange and interaction among subjects.

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Early theory-based experiments depended in large part on the physical preparation of laboratory spaces. Lines of interaction were defined by seating arrangements and physical barriers such as room dividers and cardboard screens. Transactions among subjects took the form of the physical exchange of such tangible objects as poker chips, with the timing of rounds measured by stopwatches, egg timers, and the like. Experimenter instructions and communications among subjects were accomplished directly through normal conversation, paper and pencil messaging, and simple intercom or "light and buzzer" systems. Because of the relatively low cost and facility requirements of such "low tech" settings, experimentation grew rapidly as a research methodology. Still, this technology offered its practitioners less than optimal levels of control and replicability.

The advent of the personal computer allowed a substantial advance in the ability of researchers to design highly controlled experimental settings that could be faithfully reproduced time and again. Due to the development of systems of networked computers and specially designed software, dedicated social science laboratories came to depend less upon actual physical arrangements. Greater consistency in experimenter instruction was achieved by writing the instructions directly into the experimental software, to be displayed for subjects to read on their screens. Greater control over subject interactions was accomplished by allowing the physical separation of subjects connected by systems of electronic communication.

Unfortunately, enhanced control and replicability came at the price of decreased accessibility, and the number of experimental researchers declined considerably. According to Willer et al. (2000), only about eight electronic laboratories are currently employed by experimental sociologists in the United States. While somewhat more common among experimental economists, the inaccessibility of technologically advanced laboratory facilities has seriously slowed all experimental research, including the progress of cross-cultural and cross-national research (Willer et al., 2000, p. 4).

In recent years, it has been suggested that the internet will allow greater flexibility and renewed accessibility of laboratory methods to social scientists. Some experimental researchers have already begun to design and use internet-based software. The current study is the first to make use of internet technology to conduct a series of multi-local, multiple pool experiments in a cross-national context.

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THEORY

The Elementary Theory of Social Structure investigates, predicts, and explains the effects of structure on the behavior of actors in social relations (Willer and Anderson, 1981; Willer and Markovsky, 1993; Willer, 1999). The motives of actors involved in exchange are mixed, for both actors have an interest in completing an exchange, but each actor also has an interest in seeking the best possible payoff at the expense of the other. That is to say that actors are motivated by the desire to gain the best possible outcome (P_{max}) while avoiding the worst possible outcome (P_{con}). The worst possible outcome is that which will occur at the point of confrontation, at which point no exchange takes place. The interest of A in obtaining the best payoff is defined as $P_{Amax} - P_A$, and the interest of actor A in avoiding the worst possible payoff is defined as $P_A - P_{Acon}$. A's resistance to an offer can then be the ratio of the former to the latter.

$$R_A = \frac{P_{Amax} - P_A}{P_A - P_{Acon}}$$

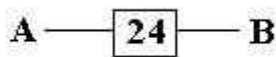
According to the second principle of Elementary Theory, actors will reach agreement at the point of *equiresistance* (Markovsky et al., 1993). The theory predicts, therefore, that an agreement between actor *A* and actor *B* will be reached when $R_A = R_B$.

Figure 1 shows a dyadic exchange structure in which a profit pool of twenty-four resources – "points" – can be divided by actors *A* and *B*. The total number of points exchanged cannot exceed twenty-four, so that each point earned by *A* represents a point that cannot be earned by *B* (and *vice versa*). Letting P_i represent the payoff gained by actor *i*, $P_A + P_B = 24$. Because neither actor will agree to a division in which it receives no points, the maximum payoff – the best result possible – for either actor (P_{Amax} or P_{Bmax}) equals twenty-three. If no exchange takes place, neither actor gains any resources. A condition of equal power exists when P_{con} for both actors is zero.

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Figure 1: A Dyadic Resource Pool Structure



For the dyadic structure shown in Figure 1, resistance predicts that, when actors are undifferentiated, each will receive half – or twelve – of the twenty-four resources.

Structural Contrasts Between the United States and the Netherlands

The inclusion of American and Dutch subjects in this study was not a frivolous choice. Important contrasts exist between the socioeconomic structures of the two nations. If these differences affect bargaining behavior, such effects should be apparent in the results of the experiments. Rather than seeking to identify deeply ingrained differences between U.S. and Dutch society with regard to negotiation and exchange behavior, it was expected that few differences would be found in exchange outcomes.

Although both the United States and the Netherlands are among the most affluent and technologically advanced Western democratic societies, the highly stratified orientation of the United States can be placed in distinct contrast with the more egalitarian orientation of the Netherlands. While the socioeconomic structures of the United States are maintained in part by cultivating values of individualism and competition, the egalitarianism of the Netherlands requires fostering values of equality and consensus.

ET does not incorporate the variable of social orientation into its model for predicting exchange outcomes, but it claims universality not bound by specifics of any particular empirical setting. Cross-national experimentation is a strategy for evaluating that claim to universality. We therefore do not begin with the hypothesis that U.S. subjects will be more competitive or Dutch subjects more oriented toward consensus. Instead, we expect that there will be no difference between the exchange outcomes of Dutch and American subjects.³

METHOD

In the current study, subjects were seated at computer terminals. U.S. subjects were isolated in separate rooms in a sociology laboratory, while Dutch subjects were placed at four of the fifteen terminals in a multimedia computer classroom. Up to four dyads were run simultaneously during each of five experimental sessions. Each dyad consisted of one U.S. subject and one Dutch subject. All subjects were female undergraduate students.

Prior to the start of the experiment, subjects completed an online tutorial module explaining how to "play the game." Instructions included how the exchange structures would appear on the screen, how to locate her position in the structure, how to read, send, and accept offers, and how to keep track of the amount of time remaining in the experiment. Subjects were made aware that their partners were in the other country.

At the start of each exchange round, instructions appeared on the screen informing subjects that they had to reach agreement with their partners in order to earn any points. Subjects were made aware that they would be paid according to the number of points they earned in the experiment, and that they should therefore try to earn as many points as possible. They were specifically instructed to take nothing else into account.

As discussed by Roth et al. (1991), effective cross-national experimentation requires considerable attention to a number of practical concerns, including the effects of language and currency differences, as well as interpersonal differences among multiple experimenters. In the current study, language differences posed only minor problems. English is in widespread use in the Netherlands, particularly in academic environments. All Dutch subjects were fluent in English, and were aware ahead of time that the experiment would be conducted in English.

Furthermore, experimental tasks were accomplished through a graphical user interface (GUI), requiring subjects to read no textual information, outside of the instructions appearing at the beginning of each round. The tutorial module and experimental instructions were in English for both the U.S. and the Dutch subjects. Dutch subjects took somewhat longer to complete the tutorial than did the U.S. subjects. Completion of the tutorial, however, required that the subject use the system in the correct manner, so it is reasonable to assume that both sets of subjects were equally familiar with the system.

Subjects had been informed in advance that most participants would earn about eight dollars (sixteen to eighteen guilders), but that their actual earnings would depend upon their performance in the experiment. Unlike the difficulties encountered by Willer and Szmata (1993) in arriving at comparable payments for Polish and U.S. subjects, a single formula was used to calculate earnings for both groups of subjects in this study. Points were worth \$.06 each. Earnings were recorded (in U.S. dollars) by the experimental software and periodically displayed

on subjects' computer screens. Payments for Dutch subjects were converted to local currency using the exchange rate in effect on the first day of the week in which the experiments took place. All subjects were paid in local currency at the end of the experiment.

Each subject was asked to negotiate the division of twenty-four points with her partner, within the time period allowed for negotiation. If an agreement was reached, each subject earned the agreed-upon number of points. If no agreement was reached before time ran out, neither subject earned any points.

Two experimenters ran the experimental sessions: one in South Carolina and one in Groningen. Both experimenters were American, and had extensive experience conducting experiments with ExNet 2.0. Details of the experimental procedures, including the recruitment of subjects, their assignment to dyads and PC terminals, the timing of sessions, and contingent procedures for absent subjects had been arranged in advance by the two experimenters jointly. During the actual sessions, the experimenters maintained contact through an online real-time messaging service so that they could correct problems, were any to arise.⁴

The most troublesome coordination problem turned out to be the time difference. Because The Netherlands is six hours ahead of the United States, Dutch subjects were scheduled to participate in the early afternoon, while U.S. subjects were scheduled beginning at 7:30 in the morning. Several scheduled sessions were unable to be run, due to the failure of U.S. subjects to arrive at their scheduled times.

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RESULTS

Table 1 provides the average exchange ratios for U.S. and Dutch subjects for each of the twelve experimental sessions. Table 1 shows the mean of exchange ratios for both groups of subjects. The average rates of exchange were very close to the resistance predictions of even 12/12 divisions. On average, U.S. subjects earned 12.41 points per experiment, while Dutch subjects earned 11.58.

Also shown in Table 1 is the percentage of rounds resulting in unequal divisions that were "won" by U.S. or Dutch subjects. Most rounds resulted in an even division of points – neither subject "won" – while a very few resulted in no exchange agreement. Of the rounds resulting in an unequal division of points, 51.5% ended in agreements favoring the U.S. subject and 48.5% were to the advantage of the Dutch subject.

Table 1: Exchange Outcomes of Cross-National Dyad Experiments

	Rate of Exchange		Percent of Unequal Rounds Won	
	US Subjects	Dutch Subjects	US Subjects	Dutch Subjects
Mean	12.41	11.58	51.5%	48.5%
Median	12	12	50.0%	50.0%

Mode	12	12	50.0%	50.0%
N	12		10	
t-value	1.3041		0.141523	
P(T<=t) two-tailed	0.2188		0.890574	

As shown in Table 1, there was no significant difference either in the mean earnings of U.S. and Dutch subjects or in the mean number of rounds "won" per experimental session. These results, while far from conclusive, suggest support for the universality of resistance predictions for dyadic exchange – despite clear differences between U.S. and Dutch societies, these differences do not appear to affect the exchange outcomes predicted by the theory.

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Differences in Negotiating Style

Although the outcomes were highly similar for both pools of subjects, differences in the negotiating styles of U.S. and Dutch subjects are apparent upon closer analysis of the results. As shown in Table 2, U.S. subjects were significantly more likely to make the first offer of an uneven division of points benefiting themselves – the first "low offer."

Table 2: Likelihood of Making First Offer and Making First "Low" Offer

	First "low" offer made by:		First offer made by:	
	US Subjects	Dutch Subjects	US Subjects	Dutch Subjects
Mean	7.8 (65.23%)	4.1 (34.77%)	6.6 (55.67%)	5.3 (44.33%)
N	12		12	
t-value	2.3779		0.8252	
P(T<=t) two-tail	0.03		0.42	

Because the tutorials and instructions were in English, however, it may be that U.S. subjects were "quicker on the draw" than Dutch subjects, who were participating in a language other than the one they use on a daily basis. If this was the case, the tendency of U.S. subjects to make the first "low" offer could be simply the result of a greater tendency to make the first offer at all – but that inference is not supported. There was no significant difference in the likelihood of U.S. subjects to make the first offer of a round and that of Dutch subjects.

DISCUSSION

Due to the small number of experimental sessions of this study, the results presented herein can be used to draw only tentative conclusions regarding the universality of resistance predictions for dyadic exchange structures. Although the results showed some apparently culture-based contrasts in negotiating style, these differences had no impact on the outcome of exchange negotiations. Despite the small number of sessions, however, and even in light of the numerous uncontrolled differences inherent in the novel experimental setting, the experiments produced results that are clearly in line with the predictions of ET. With regard to dyadic exchange

structures in full-information settings, this outcome strengthens the theory's claim to universality beyond that of the Willer and Szmata (1993) United States-Poland cross-national replications.

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Perhaps the most important result of the current experiments lies outside of any cross-national support of theory. The study itself demonstrates the feasibility of a new format for investigating social behavior in a cross-national context. That advances in internet technology offer the possibility for expanding the range of experimental settings and the populations from which subjects are drawn has been discussed by Willer et al. (2000) and Kollock (1998), among others. Although web-based experimental software has been in use by researchers for several years, it has not been used to extend experimental settings beyond the walls of a single laboratory facility – until now. This study shows that conducting experiments across a number of locations no longer depends upon the development of new technology, because that technology is already in hand. Now cross-national experiments face only fairly straightforward practical challenges of coordination and communication.

The current study also extends the meaning of "cross-national research." Until now, such research has consisted solely of comparisons of results obtained either from multiple studies conducted in multiple locations or of single studies involving a mix of subjects with different nationalities, some of whom are alien to the country in which the research is conducted. By stepping outside the bounds of a single laboratory setting, this study brought into real-time interaction subjects separated by distance, time, and by any number of social, political and economic characteristics of two countries. As more and more experimental software is developed and made accessible through the internet⁴, more and more researchers will be able to transcend the traditional experimental limitations of the academic settings in which theories have traditionally been tested.

FOOTNOTES

1 This research was supported by a grant from the National Science Foundation to David Willer and Lisa Rutström (IIS-9817518). The author thanks C. Dudley Girard and Casey Borch at the University of South Carolina and Frans N. Stokman and Marcel A. L. M. van Assen at the University of Groningen for technical assistance in conducting the experiments. The author also acknowledges valuable comments and suggestions from David Willer and Lisa Rutström at the University of South Carolina, Martha Foschi at the University of British Columbia, and Martin Dufwenberg at Stockholm University, and from an anonymous reviewer of an earlier draft of this paper.

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2 This discussion of technology and experimentation is based upon materials included in Willer et al. (1999) and Willer et al. (2000).

3 Indeed, were such differences to be evident in the results, we would not be able to attribute them to certain values that may or may not be emphasized in one society or the other. Such differences would call for further examination, perhaps later being formally incorporated into the theory.

4 A web-based library of experimental software and data archiving system for experimental economics and sociology is currently being developed at the University of South Carolina, in conjunction with collaborations in many different locations. A detailed discussion of this project is included Willer et al. (2000). A similar online network for research and researchers is being developed in Europe (T. Burns, Uppsala University, Sweden; personal communication).

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