KIEP Working Paper 07-08

Experimental Economic Approaches on Trade Negotiations

Hankyoung Sung

Korea Institute for International Economic Policy

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Kyung Tae Lee
President

Korea Institute for International Economic Policy

300-4 Yomgok-Dong, Seocho-Gu, Seoul 137-747, Korea
Tel: 02) 3460-1114 / FAX: 02) 3460-1144,1199
URL: http//www.kiep.go.kr

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KOREA INSTITUTE FOR
INTERNATIONAL ECONOMIC POLICY (KIEP)
300-4 Yomgok-Dong, Seocho-Gu, Seoul 137-747, Korea
Tel: (822) 3460-1178 Fax: (822) 3460-1144
URL: http://www.kiep.go.kr

Kyung Tae Lee, *President*

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Executive Summary

This paper experimentally examines the multilateral bargaining games to derive some policy implications for real trade negotiations. It shows the following findings: there are significant delays in games including veto players in some circumstances, but no delays in games including multiple-vote players. In addition, non-veto players as weak players, which are disadvantaged in taking share, make collusive attempts against veto players, but not effectively. As policy implications, this paper suggests enforceable deadlines or threats toward low-quality agreements to reduce the delay problems. Furthermore, as another remedy for the delays, it suggests an effort to group countries like multiple-vote players in unequal-weight games.

Keywords: Veto, Trade negotiations, Delay
JEL Classification: C7, D7, C78, D72

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Experimental Economic Approaches on Trade Negotiations

Hankyoung Sung

이 논문은 실제 무역협상에 대한 정책적 시사점을 도출하기 위하여 다자간 협상게임을 실험적으로 분석한 것이다. 본고는 다음의 실험적 발견들을 보여준다. 첫째, 어떤 특정한 상황하에서 거부권을 가진 경기자를 포함하는 게임은 유의하게 지연되지만, 여러 표를 가진 경기자를 포함하는 게임은 지연되지 않는다. 뿐만 아니라 편익을 가져가는 데 불이익을 당하는 약자들인 거부권이 없는 경기자들은 거부권을 가진 자에 대항하여 상호협력하려는 시도를 보이나, 별로 효과적이지는 않다. 정책적 시사점으로 이 논문은 강제할 수 있는 데드라인이나 낮은 단계로의 합의에 이를지도 모른다는 위협이 지연의 문제를 감소시킬 수 있음을 보여주었다. 더욱이, 이 논문은 지연을 방지하는 또다른 대안으로 여러 표를 가진 경기자와 비슷하게 여러 나라들을 묶으려는 노력을 제안하고 있다.

Hankyoung Sung is an associate research fellow at Korea Institute for International Economic Policy (KIEP). He received his Ph.D in Economics at the Ohio State University. His recent publications are “Essays on Veto Bargaining Games” (2006), “The Analyses on Expected Issues and Effects for Medical Service in Korea-China FTA” (2006), and “Dissertation abstract: Essays on veto bargaining games” (2007).

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Hankyoung Sung**

I. Introduction

Experimental economics have been recognized as a promising area in the field of economics in these days. Experimental economics have been widely applied to auctions, political economy, public economy, and so on. It can be used to test theoretical predictions of economic models to give some feedback on the models, or applied to some policies to check their effectiveness before implementation.

The purpose of this paper is to apply experimental economics approaches to analyze trade negotiations such as the Uruguay Round (UR) and Doha Development Agenda (DDA). Using experimental results on bargaining, which are derived in this paper, we try to describe those trade negotiations.

* The data for this paper is used for Frechette, Kagel, and Morelli (2005b) and Kagel, Sung, and Winter (2007). I thank John Kagel for allowing me to use the experimental data. I also thank Dr. Jinkwon Lee, Dr. Hyejoon Lim, and Dr. Chuhl Chung for their valuable comments. All errors are mine.

** Associate Research Fellow, FTA Research Team, Trade and Investment Department, Korea Institute for International Economic Policy.

This paper starts from game theoretic approaches and moves toward the experimental economic approaches. There are several approaches to negotiations. The business side puts more emphasis on the psychological effect, negotiators' aptitude, and events happening while negotiations are going. It is much more practical, but often it can be criticized as it could be overly cognitive rather than analytic. Game theoretic approaches are also criticized, as they are too theoretical to apply to real negotiations. Even though they still give some valuable implications about negotiations, such as why and how much each player should take, game theoretical approaches do not describe all aspects of negotiations. Experimental economic approaches are believed to provide some explanations of discrepancy between theory and real negotiations.

Our main interests in this experiment are whether there exist noticeable delays in the comparisons among the bargaining games considered. Furthermore, this paper discusses who is responsible for the delays. This paper considers four types of games: Veto, Control, Unequal Weight (UW), and Equal Weight (EW). Veto and Control have two treatments by different discount factors, δ=.95 (Veto95 and Control95) and δ=.50 (Veto50 and Control50). To investigate who causes the delays in the games, this paper focuses on the role of strong players who seem to take more shares available on the floor. Veto players (VPs), who have the right to defeat the proposal that may not satisfy them in the Veto game, or multiple-vote players (MVPs) in UW, who have more than one vote in games while another player has only one vote, are generally more powerful than non-veto players (NVPs) in Veto games or just one-vote players (OVPs) in UW, in that VP or MVP seem to take more shares.

Gamson (1961) shows the benefits players take are proportional to their voting power, which suggests MVPs would take more shares than OVPs. However, Baron and Ferejohn (1989) implies shares taken by players are dependent upon whether they have power to make offers in the bargaining regardless of the number of votes the player has as long as the number of votes is not enough to make a winning majority. We find that the existence of VP causes significant delays in negotiations from the experimental results, but no delays are from MVPs.

It is common that negotiations are delayed. Some delays may be necessary for players to learn structures of the game like others' influence, their payoff, and so on. However, the delays are often much longer than necessary. For UR, it was meant to be finalized by 1990, but it was delayed until 1994. For DDA, members announced that DDA negotiations would be done by 2004, but its progress has been stuck. In addition, even some pessimistic views on DDA are now spreading. This delay that is often observed in trade negotiation does not exist in the concept of subgame perfect equilibrium, which means games are always over in their first stage.

This paper also investigates the position of weak players such as NVP and OVP. It shows how much share were taken by those weak players and how they behaved as weak players against strong players. Mostly, those countries are not in a position to demand considerable benefit from the negotiations if they are in multilateral trade negotiations. This paper finds that NVPs are weak players that take smaller shares than others, but OVPs are not. In addition, NVPs attempt to be collusive against VPs, which are believed to be strong players, but it is not effective.

Finally, using conclusions from the experimental results, this paper provides some policy implications to lead trade negotiations to efficiency, and provides some instructions for weak players.

The first theoretical attempt for negotiations is from Rubinstein (1982). However, Rubinstein (1982) is a two-player model, so it is not appropriate for multilateral bargaining. In this paper, for multilateral noncooperative bargaining, Baron and Ferejohn (1989) and Winter (1996) are applied as models for the experiments discussed in Section II. Frechette, Kagel, and Lehrer (2001) experimentally tests Baron and Ferejohn models in both closed and open agendas. Frechette, Kagel, and Morelli (2005a) and Frechette, Kagel, and Morelli (2005b) provide some experimental results for a bargaining game with MVPs and OVPs. Frechette, Kagel, and Morelli (2005c) also provide some comparisons in experimental approaches between Baron and Ferejohn's (1989) bargaining and Morelli's (1999) demand bargaining models.

Kagel, Sung, and Winter (2007), which considers multilateral bargaining games with VPs, is the first experimental paper on bargaining games including VPs, and it sticks to Veto games.[1] However, this paper provides the first comparisons between two types of strong players: VPs and MVPs.

In Section II, this paper explains the theory for the experiments. Section III introduces the experimental designs, followed in Section IV by a series of experimental results along with some policy implications that come from their applications to real trade negotiations. Section V concludes this paper.

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1) Kagel, Sung, and Winter (2007) finds some similar results in experiments, which means that strong players like VPs do not take share as they are predicted in the theory, and weak players like NVPs take more than predicted.

II. Theory[2)]

The theoretical models for experiments are about decision making in a group using the voting games of Baron and Ferejohn (1989). At the beginning of each bargaining round, a player is selected with the probability 1/3 to make a proposal. A proposal is an allocation (x_1, x_2, x_3) of the single unit of benefit among the three players, i.e., $x_i \geq 0$ and $\sum_i x_i = 1$. Each proposal is voted up or down by the three members of a group without any room for amendment. A proposal passes if it gets the support of a winning coalition.

In the Veto games, a winning coalition is any coalition containing at least two members, one of whom is the VP. In the UW games, winning coalitions should contain at least one of the multiple-vote players. In the Control and UW games, group any coalition containing at least two members is a winning coalition. If a proposal passes, each player receives his proposed payoff and the game ends. If a proposal is rejected, a second stage of bargaining begins with the process repeating itself, again with a random choice of proposer. Finally, if the agreement (x_1, x_2, x_3) is reached in stage t, then player i receives the payoff 1- $x_i \delta^t$, where δ is the common discount factor. The theoretical benchmark for this paper is the stationary subgame perfect equilibrium (SSPE) of the game.

For the veto games, it can be shown that the (ex-ante) expected payoffs of the players in an SSPE must satisfy the following two equations:

2) Theories and experiments for this paper are from Sung (2006), Kagel, Sung, and Winter (2007) and Frechette, Kagel, and Morelli (2005b).

$$u_{v} = (1/3)(1-\delta u_{nv})+(2/3)\delta u_{v} \quad (1)$$

,

$$u_{nv} = (1/3)(1-\delta u_{v})+(1/3)(1/2)\delta u_{nv} \quad (2)$$

,

where u_{v} is the payoff of the VP, u_{nv} is the payoff of a NVP, and δ is the discount factor. The first equation asserts that the expected payoff of a VP arises from two events. The first (with probability 1/3) involves the veto player making a proposal in which he earns $1-\delta u_{nv}$ and the other (with probability 2/3) involves a proposal by a NVP in which the VP earns δu_{v}. A similar equation applies to NVPs. Here the second term refers to the event in which the proposer is the VP, in which case each NVP will be selected to receive an offer with probability 1/2.

The ex-ante expected payoffs of the players also determine the ex-post payoffs when being selected to propose. For the veto player this is given by $u_{v}^{*} = 1-\delta u_{nv}$ and for the NVP it is given by $u_{nv}^{*} =1-\delta u_{v}$. For values of discount factors $\delta = .95$ and $\delta = .50$, the ex-ante equilibrium payoffs are given in Table 1.[3)]

For UW, EW, and Control games in which decisions are taken by a simple majority (without a VP) the equilibrium payoffs are derived more easily, but, for UW, two players, who are MVPs, have five votes and one player, who is OVP, has one vote. Veto and Control games have two treatments, $\delta = .95$ and $\delta = .50$, $\delta = 1$ for UW and EW. In other words, there is no discount of shares available in UW and EW. As we follow Baron and Ferejohn (1989) and the three

3) For further details on the derivation of the SSPE of the game, see Winter (1996).

players in UW, EW, and Control are symmetric, each earns 1/3 in expected payoff.

Theory does not expect any delays in Veto and Control games. For UW and EW, delays are not inefficient because there is not a discount of the available share for those, which is not typical in negotiations. In real trade negotiations, which are believed to be costly in delays, we often observed significant delays. Although the delay comes from the learning process in the trade negotiations, in part, it is more likely to happen because of some player's intention to get more benefit from the negotiations. In DDA negotiation, the main factor in delay is non-negotiable arguments of strong players such as the United States and the European Community. From this fact, we can guess the existence of strong players, who demand large portions of benefits to be satisfied, may delay negotiations.

In the grand coalition, all players in a group get positive share, which is not in the equilibrium. However, in real trade negotiations, it is more likely that every country is supposed to have at least some benefit from the trade negotiations.[4)] Nevertheless, if it is a small country which could not demand considerable benefit, the country may well get almost no advantage from the negotiations.

4) Maggi and Morelli (2006) shows that the unanimity rule could be the optimal mechanism in the self-enforcing voting system.

III. Experimental Procedures

Three subjects had to divide $30 among themselves in each bargaining round. Between 12 and 18 subjects were recruited for each experimental session, so that there would be between 4 and 6 groups bargaining simultaneously in each session. After each bargaining round, subjects were randomly re-matched in groups, with the restriction that in the veto sessions each group contained a single VP and in the UW sessions each group had two MVPs. Subject numbers also changed randomly between bargaining rounds (but not between stages within a given bargaining round). In the veto sessions, veto players were selected randomly at the beginning of the session with their role as VPs remaining fixed throughout the session.

The procedures for each bargaining round were as follows: First all subjects entered a proposal on how to allocate the $30 among each of the three subjects in their bargaining group. Then, one proposal was picked randomly to be the standing proposal. This proposal was posted on subjects' screens giving the amounts allocated to each player by subject number. If the proposal was accepted, the proposed payoff was implemented and the bargaining round ended. If the proposal was rejected, the process repeated itself (hence initiating a new stage for the same bargaining round), with the amount of money available reduced by the relevant discount factor. Complete voting results were posted on subjects' screens, giving the amount allocated by subject number, whether that subject voted for or against the proposal, and whether the proposal passed or not.[5)]

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5) Screens also displayed the proposed shares and votes for the last three

In Veto and UW sessions, the VP or MVP were clearly distinguished on everyone's computer screen throughout the entire bargaining process.

Subjects were recruited through e-mail solicitations from the set of students enrolled in undergraduate economics classes at the Ohio State University for the current and previous academic quarter.[6]

For each treatment, there were two inexperienced subject sessions and one experienced subject session. Experienced subjects all had prior experience with exactly the same treatment for which they were recruited.[7]

However, since not everyone chose or was able to return, we did not attempt to hold type (VP, NVP, MVP, and OVP) constant between inexperienced and experienced subject sessions.[8] As we will see, past experience as a VP, NVP, MVP, or OVP impacts some behaviors. As such, our analysis focuses on the behavior of inexperienced subjects, as the role of veto player tends to remain fixed in real world committees.

A total of 10 bargaining rounds were held in each experimental session with one of the rounds, selected at random, to be paid off on.

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bargaining rounds as well as the proposed shares and votes for up to the past three stages of the current bargaining round.

6) The demographic and ability characteristics of this recruiting method compared to the University population are reported in Ham and Kagel (2006).

7) All subjects were invited back for experienced subject sessions. In case an uneven number of subjects returned, we randomly determined who would be sent home.

8) So, for experienced sessions, MVP[VP] could be OVP[NVP] when they were inexperienced subjects.

In addition, each subject received a participation fee of $8. For sessions with inexperienced subjects, these cash bargaining rounds were preceded by a bargaining round in which subjects were "walked through" the contingencies resulting from either rejecting or accepting an offer. Inexperienced subject sessions lasted approximately 1.5 hours; experienced subject sessions approximately 1 hour as summary instructions were employed and subjects were familiar with the task. Although each bargaining round could potentially last indefinitely, there was never any need for intervention by the experimenters to insure completing a session within the maximum time frame (2 hours) for which subjects were recruited. Table 1 lists the number of sessions and the number of subjects in each treatment condition as well as theoretical predictions on shares players took.

IV. Experimental Results

1. Delays in negotiations

In our experiments, we had two types of strong players, VP and MVP. In this section, this paper compares the length of games including strong players with the theory or games without strong players.

As shown in Figure 1, compared to the theory, the length of all games is longer. We suspect players in experiments need some time to learn the nature of games or they could have some psychological resistance to concluding games early as the theory predicts.

Conclusion 1: *For inexperienced subjects, compared to EW and Control95, we found that there was no delay in UW. However, UW and EW are more delayed than Veto50 and Control50, and less delayed than Veto95. Experienced subjects have similar tendencies to inexperienced subjects, but some tendencies are not statistically as significant as those of inexperienced subjects.*

Table 2 shows the results of Mann-Whitney tests for the comparisons of the length of games.[9] The summarized results are as follows:

(1) UW is less delayed than EW for both inexperienced and experienced subjects, but the difference is not statistically significant at any conventional levels.

9) The comparisons of the length of Veto and Control games are found in Kagel, Sung, and Winter (2007). They found that Veto95 is more delayed than Control95 for experienced subjects.

(2) UW is less delayed than Veto95, but more delayed than Veto50 for both inexperienced and experienced subjects. However, for experienced subjects, the difference in between UW and Veto50 is not statistically significant at any conventional levels.

(3) UW is more delayed than Control95 for inexperienced subjects and less delayed for experienced subjects, but for both the differences are not statistically significant at any conventional levels. However, UW is more delayed than Control50 for both inexperienced subjects (less than 1% significance level) and experienced subjects (less than 6% significance level).

(4) EW is less delayed than Veto95, but more delayed than Veto50 for both inexperienced and experienced subjects; but, for experienced subjects, the difference in between EW and Veto95 is not statistically significant at any conventional levels.

(5) EW is more delayed than Control95 for inexperienced subjects and less delayed for experienced subjects, but for both, the differences are not statistically significant at any conventional levels. However, EW is more delayed than Control50 for both inexperienced subjects (less than 1% significance level) and experienced subjects (less than 2% significance level).

From the experimental results, we find the following:

First, the existence of MVP does not cause any noticeable delays in the game. In the beginning, the existence of strong players may cause remarkable delays in negotiations, but it may not be the case for MVP in the experiments. There is no sign of delays compared to games in the experiments in UW. Rather, on average, more delays are observed in EW than in UW even though they are not statistically significant at conventional levels. Since MVP was believed to be a strong player, they may try to delay games to get more shares. This may come from the setting in which we have two MVPs in UW. So, if we have one MVP in UW, MVP may delay games. However, then MVP is just a VP. This implies that MVPs may not be restrained to expedite the negotiation process.

Second, games with VPs are considerably delayed when δ =.95, and games with VP when δ =.50 are less delayed compared to UW and EW. This shows VP could be the one who causes the delays when there is low cost of delay. In these comparisons, there are two opposite driving forces. So, since δ is lower in Veto than in UW and EW, Veto game should have lower frequency of delays. However, because of the veto power, which is the right to defeat proposals on the floor, there could be more frequency of delays in Veto games. Even though UW and EW do not have any 'veto' power, which is believed to be the source of delays, they inflict no cost from delays. Experimental finding suggests that a 5% discount was not enough to prevent more delays in Veto game than UW and EW, but a 50% discount was. Consequently, veto power with low discount (δ =.95) is dominating "no discount of shares", but veto power with high discount (δ =.50) is dominated by 'no discount of shares'. These experimental findings hint at how to restrain veto power, which may cause delays in negotiations.

Third, as subjects have prior experience, the differences between the length of games get less evident. In real trade negotiations, the experience would be measured as how many trade negotiations the country went through. More experience may not mean a faster negotiation process all the time. However, it is possible that experiences with conflicts between parties while trade negotiations are ongoing lessen potential ones in some future negotiations.

In real trade negotiations, delays by VPs are well observed for multilateral trade negotiations such as the UR or DDA. The UR was initiated in 1986 and it was very delayed by those who are considered strong players. Currently, the DDA is also delayed more than expected. It was supposed to be finalized in 2004, but we hardly find any sign of proceeding.

It is appropriate to identify one big country as a VP, because every country in the WTO is a merely single member, which legitimately has one vote. There are four big countries (G4)−the United States (US), European Community (EC), Brazil, and India− which may be called VPs, and each of them now represents each group that has similar interests in negotiations. According to the experimental results, the existence of a big country like a VP causes significant delays. We can find similar things in the DDA negotiations. The EC and the US, which may be considered VPs, are in conflict in agricultural sectors. In addition, Brazil and India, which are VPs for developing countries, are confronted with the EC and the US in Non-Agriculture Market Access (NAMA) negotiations. For the Working Party on GATS Rules (WPGR) or the Working Party on Domestic Rules (WPDR), the US, a major player and so-called VP, is quite stubborn about changing their domestic regulations for the DDA negotiations.[10] Their conflicts were revealed at the G4 meeting in July, 2007.

We may have some hints for the following fundamental questions. How do we reduce the negative effect by VP such as delay in trade

10) GATS is the acronym of the General Agreement on Trade in Services.

negotiations? One possible answer is already implied above. If there is considerable cost in delays, the trade negotiations may not be delayed. Then, the question arises of how to implement cost in delays in DDA negotiations. One possible answer is a self-punishment rule in mandate which may result in shrinking available benefits. If we could establish a mandate that rules that DDA should be wrapped up in low-quality packages or DDA should be over and restart with a new agenda if no agreement is made by some deadline, and if it is enforceable, VPs would not delay the negotiations as much as they do now.[11)] The problem is whether those punishments can be implemented or not.

Most trade negotiations which had enforceable deadlines generally reached agreements right before the deadline. The Korea-US FTA launched with a deadline as Trade Promotion Authority (TPA) of the US administration expires. Negotiators in both Korea and the US knew there was little possibility that TPA could be extended. The UR and DDA had the deadline. However, the deadlines for the UR or DDA were not enforceable as TPA in the US due to the nature of the WTO. If those were enforced, we expect that the negotiation would be resolved.

Another possible answer, unique in this paper, comes from the role of MVPs. MVPs are not easily defined in DDA negotiations, because one delegate represents one country in the WTO. Interestingly, our experimental results suggest a positive side of MVPs, which result in no delays. If we can make a group like MVP, then the process of negotiations would be expedited. If some members form some working groups including (not all) VPs and limit VPs' arguments

11) Putting a deadline in place has identical effects with discounting available shares.

inside the groups, then the group could be like an MVP in our games. If there are enough groups for one group not to rule over all groups, the delay might be reduced.

2. Role of Weak Players: Share taken and Voting Patterns

If some countries, which neither are in a group that have a considerable influence in negotiations and nor are strong countries, their share is believed to be relatively smaller than others'. Most research discusses the influence of strong players in the negotiations, and considers the role of weak players like NVP and OVP trivial.

This chapter discusses power of weak players and their voting behaviors in the negotiations.

Conclusion 2: *Most OVPs took smaller share than EWPs and CPs, but the differences are not statistically significant at any conventional levels. However, OVPs took larger share than NVPs.*

Table 3 shows the average shares taken by weak players and comparisons in shares between weak players. On average, as shown in Table 3 and Figure 2, OVPs took a slightly smaller share in the experiment than in the theory, but the difference is minimal. NVPs took a larger share than the theory expected. We suspect fairness considerations, which are important topics in the experiments and theory, worked.[12)]

Table 4 reports the test results on the comparisons between OVPs

12) See Kagel, Sung, and Winter (2007) for more discussions on fairness considerations in Veto games.

and other players. OVPs took a smaller share than EWPs and CPs, but the differences are not statistically significant at any conventional levels.[13] However, OVPs took larger share than NVPs. From the experimental findings, OVPs may not be called weak players in terms of shares they took. In theory, the role of weak players, who has only one-vote or no veto power, are so limited in the negotiation that they hardly affect the result of trade negotiations. However, in experiments, for OVPs, their power is not little as people guess. Even though NVPs in Veto games or OVPs in UW could not form a winning coalition for themselves, in Veto games, and voting power is limited in UW games, some of them must be in the winning coalition. So, they could be a necessary partner for strong players. In addition, we expect this result, no weak players in UW, can be explained by the fact that virtually they have an equal voting power in that nobody is able to defeat or form a winning majorities for itself. No delays by MVPs imply this result as well.

The experimental results also suggest the weaknesses of NVPs. In real trade negotiations like DDA, small countries mostly should be satisfied with negligible benefits from the negotiations. So, it is not desirable for small countries, which are mostly members of the WTO, to allow any room in the mandate that VPs exercise their veto power.

Conclusion 4: *VP95s [NVP95s] are more [less] likely to vote in favor of the proposals than CP95s, other things equal. However, voting behaviors of players in Veto50 are not clearly distinguished from CP50.*

13) For experienced subjects, OVPs took larger share than CPs, but the difference is not statistically significant at any conventional levels.

In this part, voting behaviors of players in games are estimated by the random effect probit models. It is quite worth while to overview the voting behaviors of NVPs and OVPs in that it could give some insights for some instructions in trade negotiations as weak players.

$$y_{it} = I\{\beta_1 + \beta_2 Share_{it} + \beta_3 DNVP95_{it} + \beta_4 DVP95_{it} + \beta_5 DNVP95_{it} * Share_{it} + \beta_6 DVP95_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\}$$

(Equation 3)

,

$$y_{it} = I\{\beta_1 + \beta_2 Share_{it} + \beta_3 DNVP50_{it} + \beta_4 DVP50_{it} + \beta_5 DNVP50_{it} * Share_{it} + \beta_6 DVP50_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\}$$

(Equation 4)

where I{•} is an indicator function that takes value 1 if the left-hand side of the inequality inside the brackets is greater than or equal to zero and 0 otherwise. Own share ($Share_{it}$) is in an explanatory variable. The dummy variable DNVP95[DNVP50] takes value one if the voter is a NVP95[NVP50] and zero otherwise, and the dummy variable DVP95[DVP50] takes value one if the voter is a VP95[VP50] and 0 otherwise. The data for the estimation includes three types of voters, VP95s[VP50s], NVP95s[NVP50s], and CP95s [CP50s]. The equation is estimated using a random effect probit model with one way subject error component for all stages. Note that datasets for models exclude two proposals offering 100% of share to a voter throughout this chapter, which is far from rational behavior of proposers.

Table 5 reports the results of random effect probit model estimations.[14)] The estimate of coefficient on own share has positive sign, is relatively large value, and is statistically significant. The effects of DNVP95[DNVP50] and DVP95[DVP50] are reported as follows.

(1) In Veto95 and Control95, DNVP95 and DNVP95*Share are statistically significant at better than the 2% level for inexperienced subjects and 1% level for experienced subjects in the log-likelihood test. The marginal effect of DNVP95 is positive and statistically significant at the 1% level. So, NVP95s is more likely to vote in favor of the proposals than the CP95s, other things equal. For inexperienced subjects, DVP95 and DVP95*Share are jointly statistically significant at better than the 1% level, but DVP95 and DVP95*Share are not statistically significant for experienced subjects. The marginal effect of the DVP95 variables are mostly negative and statistically significant at the 1% level, which implies that VP95s were less likely to vote in favor of a proposal than the CP95s, other things equal.

(2) In Veto50 and Control50, for both inexperienced and experienced subjects, the coefficients of DVP50, DNVP50 and their interaction terms with shares DNVP50*Share and DVP50*Share are not statistically significant in their own sight, but DNVP50 and DNVP50*Share are jointly significant at better than the 10% level. However, for inexperienced subjects, the log-likelihood tests on DVP50 and DVP50*Share report that these are not statistically significant. The marginal effects of the DNVP50 are

14) The marginal effects are calculated as follows: $\beta_2+\beta_4$ ∗Share for DNVP95 [DNVP50], and $\beta_3+\beta_5$ ∗Share for DVP95[DVP50]. The share for DNVP95 [DNVP50] is the share offered to NVP95s[NVP50] and the share for DVP95[DVP50] is the share offered to VPs.

positive and those of DVP50 are negative but those are not statistically significant except only for experienced subjects DVP50 is statistically significant at better than 10% level.

Again, we can identify that the VPs in low cost of delay are reluctant to agree the proposals on the floor and NVPS in low cost of delay are relatively cooperative, but the behavior of players in high cost of delay may not be identifiable.

Conclusion 5: *For inexperienced subjects, NVP95s facing a proposal from another NVP95s are more likely to vote in favor of than NVPs facing proposals from VPs. However, in Veto50, UW, and EW, that was not found. In addition,*

$$\begin{aligned} y_{it} = I\{&\beta_1 + \beta_2 Share_{it} + \beta_3 DNVNV95_{it} + \beta_4 DVP95_{it} \\ &+ \beta_5 DNVNV95_{it} * Share_{it} + \beta_6 DVP95_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\} \end{aligned}$$

(Equation 5)

$$\begin{aligned} y_{it} = I\{&\beta_1 + \beta_2 Share_{it} + \beta_3 DNVNV50_{it} + \beta_4 DVP50_{it} \\ &+ \beta_5 DNVNV50_{it} * Share_{it} + \beta_6 DVP50_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\} \end{aligned}$$

(Equation 6)

$$\begin{aligned} y_{it} = I\{&\beta_1 + \beta_2 Share_{it} + \beta_3 DMVP_{it} + \beta_4 DOVP_{it} \\ &+ \beta_5 DMVP_{it} * Share_{it} + \beta_6 DOVP_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\} \end{aligned}$$

(Equation 7)

$$\begin{aligned} y_{it} = I\{&\beta_1 + \beta_2 Share_{it} + \beta_3 DMVPOVP_{it} + \beta_4 DMVPMVP_{it} \\ &+ \beta_5 DMVPOVP_{it} * Share_{it} + \beta_6 DMVPMVP_{it} * Share_{it} + \alpha_i + v_{it} \geq 0\} \end{aligned}$$

(Equation 8)

Table 6 reports the estimates of the following random effect modeling equation taken the veto games.

DNVNV95[DNVNV50] is a dummy variable whose value is 1 if the voter is an NVP95[NVP50] and faces a proposal from another NVP95[NVP50], and 0 otherwise.

DMVP[DOVP] is a dummy variable whose value is 1 if the voter is a MVP[OVP] and 0 otherwise. DMVPOVP[DMVPMVP] is 1 if the voter is a MVP who faces a proposal from OVP[another MVP], and 0 otherwise.

As in Tables 6 and 7, own share is strictly positive and statistically significant at better than the 1% level.

(1) In Veto95, both DNVNV95 and DNVNV95*Share are not statistically significant, but jointly they are statistically significant at better than the 1% level. DVP95 is statistically significant at better than the 1% level, but DVP95*Share is not statistically significant. Jointly DVP95 and DVP95*Share are statistically significant at better than the 1% level. The marginal effects of the DNVNV95 variables are positive and statistically significant at the 1% level.

(2) In Veto50, DNVNV50 is not statistically significant, but DNVNV50*Share is statistically significant at the 10% level. Jointly, DNVNV50 and DNVNV50*Share are statistically significant at the 3% level. Individually, DVP50 and DVP50* Share are not statistically, significant, but jointly they are statistically significant at the 7% level. The marginal effects of the DNVNV50 and DVP50 variables are not statistically significant for inexperienced subjects, but, for experienced subjects, the marginal effects of the DVP50 variables are

statistically significant at better than 5% level.

From the results for inexperienced subjects we find that NVP95s facing a proposal from another NVP95 are more likely to vote in favor of that proposal than an NVP95 facing the same proposal from a VP95. I suspect this implies that NVP95s show their gratitude to NVP95 proposers which offer positive share by accepting their offers. We may indicate these favorable acceptances between NVPs' collusive attempts against veto players who definitely take more benefit than them.[15] However, as they gained experience, they did not do so.

It turned out that collusive efforts by NVP95s were not very effective, since VP95s took definitely higher shares than NVP95s and NVP95s did not behave when they were experienced subjects. As a policy implication, this finding implies that in trade negotiations, alliances including weak players but excluding strong players may not be effective, because the strong players could be still VPs. As long as the veto right is alive and cost of delay is minimal in the negotiations, delay seems to be inevitable.

In the estimation results from UW and EW shown in Table 7, there are no statistically significant variables except own share as before. This means that the role of players may not affect the voting behaviors in UW and EW.

15) The collusive efforts of NVPs are supported by the high frequency of generous offers for NVPs by another NVP in Kagel, Sung, and Winter (2007).

V. Concluding Remarks

There are inevitable limitations in laboratory experiments to compare with real trade negotiations. First, while in real trade negotiations negotiators know the identity of opponents and study them before negotiations start, players in laboratory experiments know what type of players they play game with when they play the games.

Second, in real trade negotiations, communication between negotiators is allowed away from the table, but in lab experiments it is not allowed under the experimental setting.[16)]

Third, in theory, this paper uses the power of making offers as crucial to determine how much share each player takes. However, in the experiement, it was not as large as the theory predicts.

Nevertheless, the basic structure of the game in experiments and real trade negotiations is similar in that players try to get more of the available benefit, some players have more power than others (for Veto and UW), and the process may be continued until they reach agreements. Furthermore, our experiments capture some findings which are silent in the theory but not in real trade negotiations, like unnecessary delays in negotiations and collusive attempts between weak players. In particular, this paper finds no delays by MVPs and suggests policy implications to utilize MVPs in order to resolve delay problems in real trade negotiations like the DDA.

16) In these days, some experiments allow cheap talks between players while they are in experiments, but this is not the case for the experiments in this paper.

This paper is open to possible future extensions. First, trade negotiations have two phases known as internal and external bargaining. The outcomes from external trade negotiations provoke the reallocations of resources or benefits within the country. For example, there are arguments that, because of the Korea-US FTA, the agricultural sector in Korea is at a relative disadvantage, but the manufacturing sector, like the automobile industry, gets better. So, it is obvious that disadvantaged sectors object to the negotiations or demand more compensation. Those internal conflicts affect trade negotiations, but in our model and experiments, they are not considered. The theoretical and experimental developments for this would be an important future research topic. Second, the demand bargaining game in Morelli (1999) and considerations on unanimity systems in Maggi and Morelli (2006) may give some room for future application.

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Appendix

Table 1. Theoretical Predictions and experimental designs

Treatments		number of subjects	type of players	ex-ante equilibrium payoffs (SSPE)
Veto games	δ =.95 (Veto95)	33 inexp 15 exp	veto players (VP95)	91.3 %
			non-veto players (NVP95)	4.35 %
	δ =.50 (Vete50)	33 inexp 15 exp	veto players (VP50)	60 %
			non-veto players (NVP50)	20 %
Control games	δ =.95 (Control95)	30 inexp 15 exp	Control (CP95)	33.33 %
	δ =.50 (Control50)	30 inexp 12 exp	Control (CP50)	33.33 %
Unequal Weight games	δ =1 (UW)	27 inexp 18 exp	multiple-vote player (MVP)	33.33 %
			one-vote player (OVP)	33.33 %
Equal Weight games	δ =1 (EW)	27 inexp 12 exp	equal weight player (EWP)	33.33 %

Table 2. Comparisons of the length of games

comparisons	test statistics (p - value)	
	inexperienced subjects	experienced subjects
UW vs. EW	-0.946 (0.17)	-0.622 (0.26)
UW vs. Veto95	-2.604*** (0.01)	-1.587* (0.06)
UW vs. Veto50	2.629*** (0.01)	0.949 (0.34)
UW vs. Control95	0.070 (0.47)	-0.708 (0.24)
UW vs. Control50	2.854*** (0.00)	1.594* (0.06)
EW vs. Veto95	-1.673** (0.09)	-0.903 (0.37)
EW vs. Veto50	3.729*** (0.00)	1.607* (0.06)
EW vs. Control95	1.088 (0.14)	-0.007 (0.49)
EW vs. Control50	3.906*** (0.00)	2.178** (0.01)

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. One-tailed Mann-Whitney tests are performed.

Table 3. Average Ex-Ante Shares of Weak Players in Experiments and Theory

players	average shares taken		theory
	inexperienced subjects	experienced subjects	
OVP	0.325	0.360	0.333
NVP95	0.229	0.236	0.0435
NVP50	0.263	0.243	0.2

Theory is from Baron and Ferejohn (1989) and Winter(1996).

Table 4. Comparisons of payoffs of Weak Players between Experiments and Theory

comparisons	test statistics (p - value)	
	inexperienced subjects	experienced subjects
OVP vs. EWP	-0.581 (0.28)	-0.130 (0.45)
OVP vs. NVP95	3.569*** (0.00)	4.108*** (0.24)
OVP vs. NVP50	2.143** (0.02)	2.678*** (0.01)
OVP vs. CP95	-0.758 (0.23)	-0.229 (0.41)
OVP vs. CP50	-0.407 (0.34)	0.573 (0.23)

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. One-tailed Mann-Whitney tests are performed.

Table 5. Random Effect Probit Model Estimations: Veto and Control games

		Equation 3 (Veto95 and Control95)		Equation 4 Veto50 and Control50	
		inexperienced	experienced	inexperienced	experienced
Share		10.854***	24.517***	9.726***	15.433***
		(1.337)	(6.810)	(1.027)	(5.462)
DNVP95		1.361**	5.590**		
		(0.544)	(2.523)		
DVP95		-1.026	3.229		
		(1.032)	(2.965)		
DNVP50				-0.085	2.026
				(0.457)	(1.879)
DVP50				-0.419	-0.259
				(1.127)	(3.049)
DNVP95*Share		-2.060	-11.603*		
		(1.459)	(7.004)		
DVP95*Share		-1.172	-10.266		
		(2.214)	(7.632)		
DNVP50*Share				2.257	-2.390
				(1.889)	(6.054)
DVP50*Share				0.825	-2.928
				(3.303)	(7.915)
Constant		-3.339***	-8.520***	-2.275***	-3.851**
		(0.472)	(2.484)	(0.286)	(1.811)
No. of Observations		702	280	486	196
Log Likelihood		-255.656	-66.226	-110.611	-36.909
DNVP95 or DNVP95	LR test	8.55**	11.73***	4.83*	5.80*
(H0: $\beta_3 = \beta_5 = 0$)	Marginal Effects	1.016***	3.221***	0.279	1.763
		(0.376)	(1.135)	(0.242)	(1.279)
DVP95 or DVP50	LR test	12.24***	3.36	0.37	5.71*
(H0: $\beta_4 = \beta_6 = 0$)	Marginal Effects	-1.548***	-1.353*	-0.083	-1.569*
		(0.373)	(0.775)	(0.360)	(0.873)

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table 6. Random Effect Probit Model Estimations: Veto games

		Equation 5 (Veto95)		Equation 6 (Veto50)	
		inexperienced	experienced	inexperienced	experienced
Share		9.307***	11.545***	9.374***	16.628***
		(1.268)	(2.987)	(1.755)	(5.303)
DNVNV95		0.614	1.661**		
		(0.406)	(0.786)		
DVP95		-1.923*	-2.431		
		(1.017)	(1.942)		
DNVNV50				-1.155	0.450
				(1.087)	(0.980)
DVP50				-0.668	-1.356
				(1.165)	(2.088)
DNVNV95*Share		0.679	-7.753**		
		(1.645)	(3.156)		
DVP95*Share		0.295	2.307		
		(2.210)	(5.057)		
DNVNV50*Share				9.399*	-8.264
				(5.626)	(6.077)
DVP50*Share				1.177	-5.827
				(3.596)	(6.945)
Constant		-2.413***	-2.724***	-2.025***	-2.097**
		(0.408)	(0.754)	(0.410)	(0.912)
No. of Observations		426	146	256	110
Log Likelihood		-165.606	-61.561	-52.818	-25.284
DNVNV95 or DVP95 ($H0: \beta_3 = \beta_5 = 0$)	LR test	9.53***	7.84** (1.9%)	7.17**	3.07
	Marginal Effects	0.710*** (0.268)	0.150 (0.341)	0.083 (0.521)	0.139 (0.809)
DNVNV50 or DVP50 ($H0: \beta_4 = \beta_6 = 0$)	LR test	12.98***	4.97*(8.4%)	0.84	14.71***
	Marginal Effects	-1.791*** (0.423)	-1.394 (0.873)	-0.189 (0.743)	-3.963** (1.680)

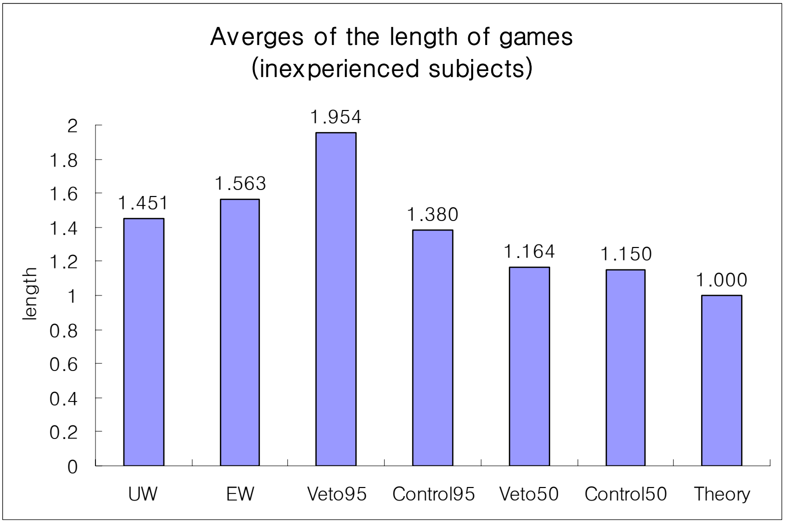
***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table 7. Random Effect Probit Model Estimations: UW and EW games

		Equation 7 (UW and EW) inexperienced	Equation 7 (UW and EW) experienced	Equation 8 (UW) inexperienced	Equation 8 (UW) experienced
Share		9.902***	9.681***	10.103***	10.434***
		(1.304)	(2.202)	(2.415)	(3.298)
DMVP		-1.958*	-0.325		
		(1.106)	(1.341)		
DOVP		0.261	-0.236		
		(0.901)	(1.560)		
DMVPOVP				-2.349	0.688
				(1.629)	(1.597)
DMVPMVP				-2.487	-6.886
				(1.997)	(6.550)
DMVP*Share		4.159	0.064		
		(2.796)	(3.352)		
DOVP*Share		-0.638	0.753		
		(2.301)	(3.965)		
DMVPOVP*Share				4.422	-2.618
				(4.070)	(4.000)
DMVPMVP*Share				6.138	14.870
				(5.005)	(15.132)
Constant		-3.262***	-3.003***	-3.233***	-3.239**
		(0.478)	(0.840)	(0.909)	(1.315)
No. of Observations		490	204	240	130
Log Likelihood		-143.855	-39.263	-65.355	-23.286
DMVP or DMVPOVP	LR test	4.09	0.69	3.03	0.97
(H0: $\beta_3 = \beta_5 = 0$)	Marginal Effects	-1.028*	-0.312	-1.212*	0.050
		(0.544)	(0.693)	(0.724)	(0.714)
DOVP or DMVPMVP	LR test	0.08	0.05	1.97	2.39
(H0: $\beta_4 = \beta_6 = 0$)	Marginal Effects	0.092	-0.017	-1.283	-4.304
		(0.439)	(0.555)	(1.089)	(3.948)

***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Figure 1. Average length of games



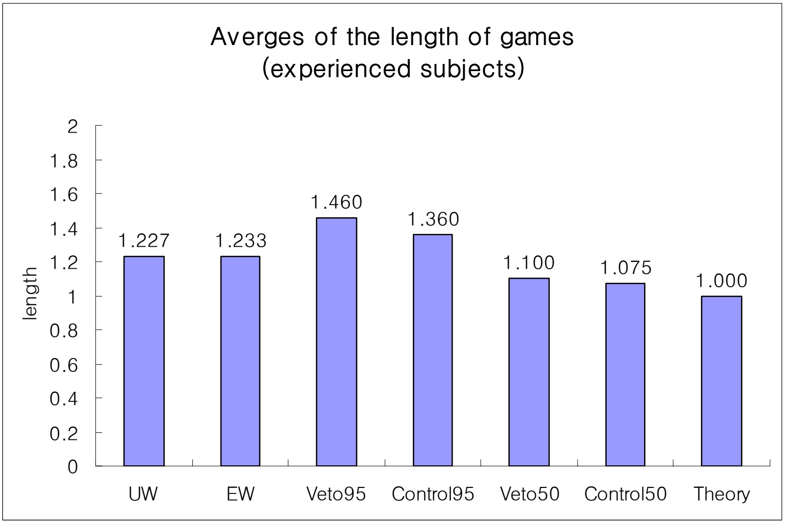
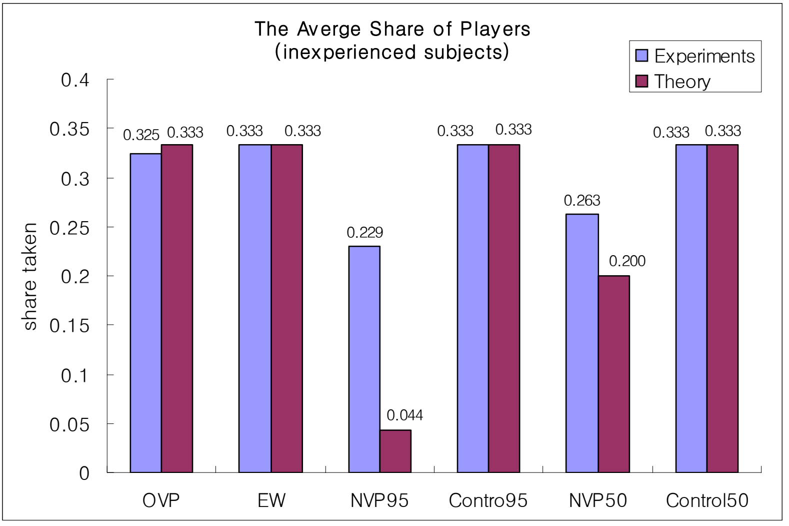
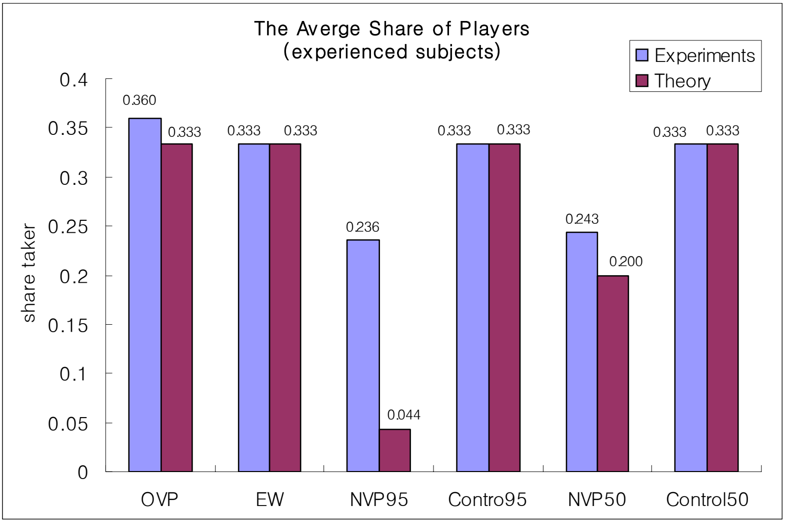


Figure 2. Average share taken by players





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Standing Order for Residents Outside Korea

Type of Membership (One-Year)	Annual Fee*	
	Institutions	**Individuals**
All publications (60-70 titles, including periodicals, annually)	US$ 500	US$ 250
Only English publications (10-15 titles annually)	US$ 300	US$ 150

** Airmail charges are included.*

** Subject to change without prior notice.*

KIEP

300-4 Yomgok-Dong, Seocho-Gu, Seoul 137-747 Tel: (822) 3460-1080 Fax: (822) 3460-1144