Pre-Analysis Plan: Economic Integration, Sanctions, and Preventive War

An Experimental Investigation

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1 Abstract

This study investigates how economic integration and the threat of sanctions influence the likelihood of preventive conflict. We develop a two-stage bargaining model where a declining power faces a rising power. Integration increases the total economic surplus but also accelerates the power shift towards the rising power. The declining power can use economic sanctions to mitigate this power shift. We test the model's predictions using a laboratory experiment with six treatments varying the level of integration (Low, Medium, High), the availability of sanctions, and whether integration is endogenously chosen. We hypothesize that medium integration leads to preventive conflict due to a large power shift and weak sanctions, while high integration fosters peace because the credible threat of severe sanctions disciplines the rising power. We also test whether subjects endogenously choose high integration to access this sanction mechanism.

2 Experimental Design

2.1 The Game

The experiment implements a two-stage bargaining game between two players.

- **Roles:** Player A (the proposer) and Player B (the responder). Player A represents a "rising power" whose relative bargaining position strengthens over time, while Player B represents a "declining power" whose position weakens. In Stage 1, Player B holds a battlefield advantage (60% winning probability); without sanctions, A's odds improve substantially in Stage 2, reflecting B's relative decline.

- **Integration Level:** Determines the size of the available surplus in each stage, as well as the magnitude of the power shift and the costs of conflict.

- **"Take Action" Option:** In most treatments, Player B can choose to "take action" in Stage 1. This costs B 2 points but improves B's winning odds if conflict occurs in Stage 2. This option captures the idea of economic sanctions that weaken the opponent's future position.

Timeline:

1. **Stage 1:** A pot of points is available. Player A proposes how to divide it. Player B then chooses:

    - **Accept:** Both players receive their allocated shares and proceed to Stage 2.

- **Reject:** A computerized lottery determines who wins the entire pot (combining both stages), and both players pay a conflict cost. The game ends.

- **Take Action:** Player B accepts the allocation but pays an additional 2-point cost. Both players proceed to Stage 2, but B's winning odds in any Stage 2 conflict are now improved.

2. **Stage 2:** A second pot of points is available. Player A proposes how to divide it. Player B then chooses:

  - **Accept:** Both players receive their allocated shares from both stages. The game ends peacefully.

  - **Reject:** A lottery determines who wins the combined pot from both stages. Stage 1 allocations are voided. Both players pay a conflict cost. The game ends.

2.2 Incentives

- **Starting income:** 15 points per round.

- **Exchange rate:** 12 points = 1 yuan.

- **Participation fee:** 15 yuan.

- **Number of rounds:** 30 rounds with random rematching.

2.3 Treatments

We employ a between-subjects design with six treatments.

Table 1: Experimental Treatments

Treatment	Take Action?	Stage 1 Pot	Stage 2 Pot	Conflict Cost	Predicted Outcome
EXO-Low	Yes	12	18	8	Peace (Standard)
EXO-Med	Yes	13	27	9	Conflict
EXO-Med-NS	No	13	27	9	Conflict
EXO-High	Yes	20	30	15	Peace (Sanction-Disciplined)
EXO-High-NS	No	20	30	15	Peace (Standard)
ENDO	Yes	Choice	Choice	Choice	Choose High, then Peace (Sanction-Disciplined)

The lottery prize in case of conflict equals the sum of the two pots (30, 40, or 50 points depending on integration level).

Table 2: Winning Probabilities in Conflict

Treatment	Stage 1 Conflict	Stage 2 (No Action)	Stage 2 (After Action)
EXO-Low	A: 40%, B: 60%	A: 50%, B: 50%	A: 50%, B: 50%
EXO-Med	A: 40%, B: 60%	A: 60%, B: 40%	A: 40%, B: 60%
EXO-Med-NS	A: 40%, B: 60%	A: 60%, B: 40%	—
EXO-High	A: 40%, B: 60%	A: 70%, B: 30%	A: 30%, B: 70%
EXO-High-NS	A: 40%, B: 60%	A: 70%, B: 30%	—

Key features: In Stage 1, Player B always has better odds (60% vs. 40%). In Stage 2, without "take action," Player A's odds improve with integration level, representing the power shift. If

B took action in Stage 1, B's Stage 2 odds improve dramatically (e.g., from 30% to 70% in EXO-High), representing the effect of sanctions on the balance of power.

2.4 Sample Size

- **Target:** 60 subjects per treatment (6 sessions of 10 subjects each).

- **Power:** Based on previous experiments, we expect to detect medium effect sizes (Cohen's $d \approx 0.5$) with greater than 80% power.

3 Hypotheses

H1 (Preventive Conflict): The frequency of Stage 1 conflict in **EXO-Med** will be significantly higher than in **EXO-Low**.

- *Rationale:* In Medium integration, the power shift is so severe that Player A cannot offer enough in Stage 1 to make B prefer peace. The Stage 1 pot (13 points) is smaller than B's expected value from fighting. In Low integration, the pot (12 points) is large enough relative to B's fighting incentive (10 points expected) to sustain peace.

H2 (Sanction-Disciplined Peace): The frequency of conflict in **EXO-High** will be significantly lower than in **EXO-Med**.

- *Rationale:* In High integration, the "take action" option becomes valuable because it dramatically shifts B's odds in Stage 2 conflict (from 30% to 70%). This makes "take action" a credible threat that B can use to demand better offers from A, sustaining peace without actual conflict.

H3 (Sanction Premium): Player A's payoff in **EXO-High** will be significantly higher than in **EXO-High-NS**.

- *Rationale:* When "take action" is available (EXO-High), Player B (the declining power) holds a credible threat: paying 2 points to shift Stage-2 odds from 30%/70% (A wins / B wins) to 70%/30%, substantially improving B's future war payoff. Anticipating this threat, Player A (the rising power) makes larger Stage-1 offers to avoid sanctions, raising A's own payoff relative to EXO-High-NS where no such threat exists. Crucially, *both* players earn more in EXO-High than EXO-High-NS, since sanction-disciplined bargaining avoids conflict and unlocks more of the available surplus. The sanction premium for Player A is approximately 3 points per round.

H4 (Endogenous Choice): In the **ENDO** treatment, Player B will choose **High Integration** at a rate significantly exceeding 1/3 (i.e., random choice across three options).

- *Rationale:* High integration maximizes Player B's equilibrium payoff (18 points vs. 15 at Medium and 10 at Low), because deep interdependence makes the "take action" sanction threat credible and powerful enough to discipline A's offers. Although choosing Medium integration also yields a high immediate war payoff (15 points), Player B—as the declining power—prefers High integration because sanction-disciplined peace dominates preventive war in terms of both payoff and efficiency. We test whether the proportion choosing High exceeds 1/3 using a one-sided binomial test.

H5 (Menu Effect at Medium Integration): There is no significant difference in war frequency or DP payoff between **EXO-Med** and **EXO-Med-NS**.

- *Rationale:* In EXO-Med, the "take action" option is dominated—it costs 2 points and only restores B's Stage-2 odds to 60%, which is less valuable than the expected conflict payoff from Stage-1 rejection. If subjects recognize this, the mere availability of a dominated sanction option should not affect behavior. This test controls for possible menu effects: if war rates differ between EXO-Med and EXO-Med-NS, it would suggest that the presence of an unused option influences decision-making.

4 Variable Definitions

4.1 Outcome Variables

- **Conflict Frequency:** Proportion of rounds where Player B chose "Reject" in Stage 1.

- **Take Action Frequency:** Proportion of rounds where Player B chose "Take Action" in Stage 1.

- **Player A Payoff:** Total points earned by Player A per round (including starting income).

- **Player B Payoff:** Total points earned by Player B per round (including starting income).

- **Integration Choice:** The integration level chosen by Player B in ENDO (Low, Medium, or High).

- **Stage 1 Offer:** Points Player A allocates to Player B in Stage 1.

- **Efficiency:** Realized total surplus (Player A payoff + Player B payoff, excluding starting income) divided by the maximum possible surplus under full cooperation (no conflict, no sanctions) for the given integration level.

4.2 Explanatory Variables

- **Treatment:** Categorical variable for EXO-Low, EXO-Med, EXO-Med-NS, EXO-High, EXO-High-NS, ENDO.

- **Round:** Round number (1–30) to control for learning.

- **Subject ID:** For random effects or fixed effects.

5 Analysis Plan

5.1 Primary Analysis

- **Conflict Rates (H1 and H2):**

  - Compare session-level average conflict rates using rank-sum test.
  - Probit/Linear regression of conflict on treatment dummies, with standard errors clustered at the session level.

- **Sanction Premium (H3):**

  - Compare Player B payoffs in EXO-High vs. EXO-High-NS using rank-sum tests.
  - Linear regression of payoffs on a "No Sanction" treatment dummy.

- **Menu Effect (H5):**

  - Compare session-level average conflict rates in EXO-Med vs. EXO-Med-NS using rank-sum tests.
  - Compare Player B payoffs between the two treatments.
  - Report equivalence test (TOST) to provide evidence for the null hypothesis of no difference.

- **Endogenous Choice (H4):**

  - Calculate the proportion choosing High integration in ENDO.
  - Test whether this proportion exceeds $1/3$ (random choice) using a binomial test.

5.2 Secondary Analysis

- **Take Action Usage:** Analyze how B's choice of "take action" responds to A's Stage-1 offers; test whether sanction usage is concentrated in cases where A's offer falls below the sanction-disciplined equilibrium threshold.

- **Stage 2 Dynamics:** Test whether "take action" in Stage 1 leads to more generous Stage-2 offers from A in the following round (learning). Report Stage-2 conflict rates and offer distributions conditional on Stage-1 action choice.

- **Learning over Time:** Compare conflict rates in early rounds (1–10) vs. middle (11–20) vs. late rounds (21–30) within each treatment, using OLS with round fixed effects. We expect EXO-Med conflict to increase and EXO-High conflict to decrease over time as subjects learn the equilibrium.

- **Conditional War Analysis:** Within each treatment, estimate conflict frequency separately for observations where A's Stage-1 offer is below vs. at-or-above the theoretically predicted equilibrium threshold. We expect sharp drops in conflict once offers meet or exceed the threshold in treatments where peace is the SPE prediction.

- **Payoff Regressions:** OLS regressions of Player A and Player B payoffs on treatment dummies (reference: EXO-Low). Standard errors clustered at the session level. Report separately for each role.

- **ENDO Conditional Outcomes:** In the ENDO treatment, decompose conflict rates, payoffs, and sanction usage by the integration level chosen by B. We expect the conditional outcomes to closely mirror the corresponding exogenous treatments (EXO-Low, EXO-Med, EXO-High).

- **Efficiency Analysis:** Compare total surplus by treatment as a fraction of the maximum possible surplus. Report OLS regressions of efficiency on treatment dummies with session-level clustered standard errors.

6 Predicted Payoffs

Note: Total payoff = Starting income (15 points) + Game payoff. In EXO-Med, payoffs are expected values from the conflict lottery.

Table 3: Expected Payoffs per Round (from the game, excluding starting income)

Treatment	Predicted Outcome	Player A Gets	Player B Gets
EXO-Low	Peace	20 points	10 points
EXO-Med	Conflict	≈15 points	≈7 points
EXO-Med-NS	Conflict	≈15 points	≈7 points
EXO-High	Peace	32 points	18 points
EXO-High-NS	Peace	35 points	15 points
ENDO	Peace (High)	32 points	18 points

7 Exclusion Criteria

- Subjects who fail comprehension quizzes after multiple attempts.

- Sessions with technical failures.

8 Ethics Approval

This study has been approved by the IRB of the Center for Economic Research of Shandong University.

This document serves as the pre-registration plan to be filed with the AEA RCT Registry prior to data collection.