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ICADE

TRADE WARS AS STRATEGIC GAMES: APPLYING GAME THEORY TO TARIFFS AND INTERNATIONAL CONFLICT

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MADRID | Mayo 2026

Abstract

Game theory has previously been applied to international trade negotiations and tariff policy, however, the conditions under which countries cooperate or escalate conflict have not been systematically tested through direct experimental methods in a trade-framed setting. This TFG investigates how game theory explains the strategic behaviour of countries in trade wars and identifies the conditions under which cooperation emerges or deteriorates. The analysis combines three complementary approaches: a theoretical framework based on the Prisoner's Dilemma, Nash equilibrium and repeated game theory; a case study of the US-China trade war from 2018 to 2025; and a controlled experiment in which participants made repeated trade policy decisions as simulated countries. While game theory predicts zero cooperation, participants cooperated in 48.7% of experimental decisions, with cooperation patterns consistent with reciprocity rather than formal enforcement. The US-China trade war confirmed the tit-for-tat escalation logic of repeated game theory, though cooperation emerged conditionally through the Phase One agreement and the Geneva deal when escalation costs became unsustainable. The endgame effect was directionally consistent across both sources, though it did not reach statistical significance in the experimental data. The evidence also suggests that escalation causes lasting damage to trade flows and bilateral trust that standard models do not capture. The comparison across all three sources reveals that the behavioural capacity for cooperation exists, but that domestic political pressures, electoral cycles and the absence of credible enforcement mechanisms prevent governments from acting on it.

Key Words

Game Theory	Prisoner’s Dilemma	International trade
Tariffs	Nash equilibrium	US-China Trade War

Resumen Ejecutivo

La teoría de juegos ha sido aplicada previamente a las negociaciones comerciales internacionales y a la política arancelaria; sin embargo, las condiciones bajo las cuales los países cooperan o escalan conflictos no han sido sistemáticamente testadas mediante métodos experimentales directos en un contexto de toma de decisiones comerciales. Este TFG investiga cómo la teoría de juegos explica el comportamiento estratégico de los países en las guerras comerciales e identifica las condiciones bajo las cuales la cooperación emerge o se deteriora. El análisis combina tres enfoques complementarios: un marco teórico basado en el Dilema del Prisionero, el equilibrio de Nash y los juegos repetidos; un estudio de caso sobre la guerra comercial entre Estados Unidos y China entre 2018 y 2025; y un experimento controlado en el que los participantes tomaron decisiones repetidas de política comercial en el rol de países simulados. Aunque la teoría de juegos predice una cooperación nula, los participantes cooperaron en el 48,7% de las decisiones experimentales, con patrones de cooperación consistentes con la reciprocidad más que con la aplicación de normas formales. La guerra comercial entre Estados Unidos y China confirmó la lógica de escalada tit-for-tat de la teoría de juegos repetidos, aunque la cooperación surgió de forma condicional a través del acuerdo de la Fase Uno y el acuerdo de Ginebra cuando los costes de la escalada se volvieron insostenibles. El efecto de juego final fue direccionalmente consistente en ambas fuentes, aunque no alcanzó significación estadística en los datos experimentales. La evidencia también sugiere que la escalada causa un daño duradero a los flujos comerciales y a la confianza bilateral que los modelos estándar no capturan. La comparación entre las tres fuentes revela que la capacidad conductual para la cooperación existe, pero que las presiones políticas domésticas, los ciclos electorales y la ausencia de mecanismos de cumplimiento creíbles impiden que los gobiernos actúen en consecuencia.

Palabras Clave

Teoría de Juegos	Dilema del prisionero	Comercio internacional
Aranceles	Equilibrio de Nash	Guerra comercial Estados Unidos-China

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1. Introduction

1.1 Context and Motivation

International trade is one of the foundations of the modern global economy. Countries trade because they cannot efficiently produce everything they need. Each has different resources, skills and productive capacities, meaning specialisation and the exchange of goods and services raise living standards for all involved. While one country may be more efficient in producing certain goods, it is through trade that it can access what it cannot produce itself competitively (Mughwai, 2020). The economic argument for free trade is therefore well established, open exchange generates mutual gains that closed economies cannot achieve.

However, countries do not always choose free trade. Despite the collective benefits of cooperation, governments frequently impose tariffs, quotas and subsidies to protect domestic industries. When one country does this, trading partners often retaliate. A decision that begins as a unilateral policy decision can escalate into a trade war. The US-China trade war, which began in 2018, illustrates this dynamic on a large scale. The United States (U.S.) imposed tariffs on approximately $350 billion of Chinese imports, while China retaliated with tariffs on $100 billion of U.S. exports, representing one of the largest and most abrupt shifts in U.S. trade policy in modern history (Fajgelbaum & Khandelwal, 2022). This resulted in significant economic consequences, including a rise in prices for domestic consumers, disruptions to global supply chains and welfare losses for both economies, despite each side's belief that the tariffs served their national interests.

This raises a fundamental question, if free trade benefits both sides, why do countries still impose tariffs and escalate into conflict? While trade wars are well-documented empirically, less is known about the strategic decision-making processes that drive them. Understanding not just the consequences of trade wars but also the underlying logic that drives them requires a framework capable of capturing strategic interdependence, where the outcomes of one country's decisions depend on the actions of others. Game theory, formally introduced into economics by Neumann and Morgenstern in 1944 and subsequently applied to contexts ranging from arms races to trade negotiations, provides exactly this (Mughwai, 2020).

This Trabajo de Fin de Grado (TFG) applies game theory to examine strategic behaviour in international trade conflicts, testing whether its predictions hold in both real-world and experimental settings. It argues that the same logic that leads rational players to make individually sensible but collectively harmful choices in a strategic game can help explain why trade wars emerge, persist and sometimes give way to cooperation.

1.2 Research Objectives

1. **Apply game theory to real-world trade conflicts**: Analyse the strategic behaviour behind countries' tariff decisions by applying game theory models, particularly the Prisoner's Dilemma and Nash equilibrium, to understand why countries choose to impose tariffs even when mutual cooperation would produce better outcomes for both sides.
2. **Design and conduct an experiment simulating trade war dynamics**: Develop a repeated Prisoner's Dilemma experiment in which participants act as countries making trade policy decisions and analyse how behaviour evolves across rounds in response to repetition, partner history and the approach of the game's endpoint.
3. **Compare theoretical predictions with real-world and experimental evidence:** Evaluate how accurately game theory models reflect observed behaviour by comparing predictions from the Prisoner's Dilemma and repeated game theory against both the patterns identified in the US-China trade war case study and the results of the experiment.
4. **Identify the conditions that promote cooperation or escalation:** Assess under what circumstances countries, or experimental participants, choose to cooperate rather than defect. Evaluate whether game theory can offer practical insights for policymakers seeking to understand and manage trade conflicts, and identify what the evidence presented suggests about the conditions under which cooperation is most likely to be sustained.

Together, these objectives are captured in the central research question this TFG aims to answer: *How can game theory explain the strategic behaviour of countries in trade wars and under what conditions do countries cooperate or escalate conflicts?*

1.3 Structure of the TFG

This TFG is divided into three main sections. The first section establishes the analytical foundations of the study, combining theoretical frameworks with a review of existing literature. It introduces game theory, presenting its core assumptions, the logic of strategic interdependence and the key models used to analyse trade conflicts. Key models include the

Prisoner's Dilemma, Nash Equilibrium and repeated games. Following this is an examination of how these frameworks have been applied in the academic literature on international trade, tariff retaliation and cooperation. This first section aims to demonstrate the ability of game theory to model trade policy decisions and to identify the research gap that this TFG seeks to address.

The second section complements the theoretical framework with empirical reality through two complementary approaches. First, a case study of the US-China trade war is examined in depth, tracing patterns of tariff escalation, retaliation and partial cooperation by evaluating them against game-theoretic predictions. Second, an experimental simulation is conducted, allowing patterns of cooperation and defection to be observed directly across rounds, capturing endgame effects, retaliation behaviour and the influence of partner history on decision-making. Together, these two approaches generate the empirical evidence against which the theoretical models can be tested.

The third section brings all areas of analysis together. The findings from the case study and the experiment are compared against one another and with the predictions of game theory, identifying where they align and where they diverge. From this, the conditions under which cooperation emerges or deteriorates are explored. The TFG closes by summarising its key findings, acknowledging its limitations and suggesting directions for future research.

2. Game Theory and Strategic Interaction in Trade

2.1 Strategic Interaction in International Trade

Modern game theory was developed by von Neumann and Morgenstern (1944) and linked its application to economics. A game is defined as an interaction between agents governed by a set of rules, where the strategies pursued by players determine the possible moves available and the payoffs associated with each combination of moves (Osborne, 2003). Game theory studies situations in which the outcome for each actor depends not only on its own decisions but also on the actions of others. It provides, in the words of Battigalli, Catonini and De Vito (2022), "the formal analysis of the behaviour of interacting individuals."

This logic applies directly to international trade. Although international trade produces winners and losers, overall, trading nations are better off compared to non-trading countries (Alexa & Toma, 2012). However, governments do not always pursue free trade. Countries often adopt protectionist measures such as tariffs, quotas and subsidies to protect domestic industries, which make imports more expensive and locally produced goods more attractive. However, such measures harm trading partners and distort the wider benefits of trade (Mughwai, 2020). Global economies are interconnected and therefore these choices do not happen in isolation. What one country does affects the incentives and welfare of others, meaning governments must anticipate their trading partners' responses when setting policy (Khurana, 2022). International trade is therefore best understood as a strategic environment, where each country's optimal policy depends on what it expects others to do.

2.2 Assumptions of Game Theory

Game theory assumes players are rational actors who make decisions aimed at maximising their own outcomes (Osborne, 2003). Additionally, players form expectations about what others will do, meaning decisions are not made independently but depend on the anticipated actions of others, creating strategic interdependence where each player's optimal choice depends on the choices of others (Battigalli et al., 2022; Osborne, 2003). Finally, players form beliefs about others' beliefs, creating multiple layers of reasoning (Battigalli et al., 2022). Together, these assumptions form the basis for a structured analysis of strategic situations.

2.3 The Prisoner's Dilemma

The Prisoner's Dilemma, introduced in 1950 by Professor Albert W. Tucker (Huang, 2010), describes a situation in which two players choose between cooperation and defection, where each player's outcome depends on the other's decision (Osborne, 2003). In the classic version of the model, two suspects are arrested and held in separate cells without communication. Each must decide whether to cooperate (remain silent) or defect (confess). If one confesses and the other does not, the confessor is released and the other receives ten years. If both stay silent, both receive two years. If both confess, both receive six years in prison.

The possible actions and corresponding sentences of the criminals are given in Figure 1.

	Player B: Cooperate	Player B: Defect
Player A: Cooperate	-2,- 2	-10, 0
Player A: Defect	0, -10	-6, -6

Figure 1: Prisoner's Dilemma Payoff Matrix (Huang, 2010)

To solve this game, it is necessary to identify the dominant strategy of each player, which is the best response regardless of what the other player does (Huang, 2010). From Player A's perspective, if Player B cooperates, A is better off defecting ($0 > -2$). If Player B defects, A is still better off defecting ($-6 > -10$). The same logic applies to Player B. Both players, therefore, conclude that defection is the best decision and both receive six years. This outcome is worse for both, than if they had both cooperated (Huang, 2010). This illustrates how individually rational decisions can lead to collectively suboptimal results (Osborne, 2003).

This framework applies directly to trade policy. Countries can be modelled as players choosing between free trade (cooperate) and tariffs (defect) with national welfare outcomes as the corresponding payoffs. Since each country gains a short-term advantage by imposing tariffs regardless of what the other does, defection is the dominant strategy for both, resulting in a trade war that reduces overall welfare despite the existence of a mutually beneficial alternative (Khurana, 2022).

2.4 Nash Equilibrium and Dominant Strategies

The Nash equilibrium, developed by John Nash, is a situation in which no player can improve their payoff by unilaterally changing their strategy. Each player's strategy is the best response to what others are doing (Osborne, 2003). In the Prisoner's Dilemma, mutual defection is the Nash equilibrium. Both players defect because defection is the dominant strategy, switching to cooperation while the other defects makes you worse off. The resulting outcome $(-6, -6)$ is individually rational but collectively inefficient, since mutual cooperation would produce $(-2, -2)$, a better result for both (Huang, 2010; Osborne, 2003). Huang (2010) confirms that no mixed-strategy Nash equilibrium exists in this game, making defection the only rational outcome under standard assumptions.

Applied to a trade context, the Nash equilibrium occurs when two countries each set tariffs independently to maximise national welfare. Both end up worse off than under free trade, yet neither has an incentive to reduce tariffs unilaterally (Khurana, 2022). In practice, however, countries sometimes sustain cooperation through repeated interaction or institutional frameworks. This gap between theory and observed behaviour is what this TFG tests empirically.

2.5 Repeated Games

While the Prisoner's Dilemma predicts defection in a one-shot game, outcomes may differ when the game is repeated. In a repeated game, the same players interact multiple times, observing previous actions and payoffs before making subsequent decisions (Battigalli et al., 2022). Repeated interactions create reputation effects, where players who consistently cooperate may encourage others to do the same, while defection can trigger punishment. This creates the possibility of cooperation as a player may cooperate today to sustain mutually beneficial outcomes in future rounds. Strategies such as Tit-for-Tat, where a player replicates the opponent's previous action, or trigger strategies, where cooperation continues until a deviation occurs, can sustain cooperative equilibria when punishment mechanisms are credible (Hui, 2022). When strong punishment mechanisms are present, cooperation can be sustained even within a Prisoner's Dilemma framework.

However, standard game theory predicts that cooperation should not arise in finitely repeated games due to the endgame effect. Since defection is rational in the final round, there is no future retaliation to fear. It becomes rational in the second-to-last round too and this logic unravels all the way back to round one (Osborne, 2003). In practice, however, this full unravelling rarely occurs. Cooperation is frequent in finitely repeated games and declines as the endpoint approaches, a pattern known as the endgame effect, which is a reliable finding across experimental studies and directly relevant to this TFG's design of three blocks of ten rounds with a known endpoint (Dijkstra & van Assen, 2017). Repeated games provide a more realistic representation of international trade, where countries interact continuously and must consider long-term strategic consequences (Khurana, 2022; Mughwai, 2020).

2.6 Theoretical Predictions and Research Hypotheses

The framework detailed in this section generates four testable predictions. Standard game theory predicts universal defection in a finite Prisoner's Dilemma, but repeated interaction, reputation effects and endgame dynamics can all shift behaviour away from this baseline. This TFG tests these predictions through two approaches, a case study of the US-China trade war and a controlled experiment.

Case Study Hypothesis

H1: The escalation and retaliation patterns observed in the US-China trade war will follow the strategic logic of repeated game theory, characterised by cycles of reciprocal defection with limited and conditional periods of cooperation.

Experimental Hypotheses

H2: Despite the incentive to defect, cooperation will emerge among participants in the opening rounds of each block.

H3: Cooperation will decline toward the final rounds of each block as the known endpoint approaches.

H4: Participants who receive information that their new partner cooperated frequently in the previous block will be more likely to cooperate in the first round of the new interaction.

3. Literature Review: Game Theory Applied to International Trade

3.1 Game Theory in International Trade

Building on the theoretical framework of Section 2, this section reviews how existing literature has applied game theory to international trade. Khurana (2022) demonstrates this using a two-country model in which mutual free trade produces total welfare of 200 units, but unilateral tariff imposition raises the defecting country's welfare to 120 while reducing the other's to 70. When both impose tariffs, national welfare in each country falls to just 90 units. Khurana (2022) extends this to a repeated tariff game, showing that cooperation can only be sustained when the long-term cost of permanent punishment outweighs the short-term gain from defecting. The more both countries value their future trading relationship, the more likely cooperation is to hold. This explains why cooperation sometimes persists between long-run trading partners and why it tends to break down when time horizons shorten or trust erodes. The framework has an important limitation, however, it assumes governments behave as single rational actors maximising national welfare. In practice, trade policy decisions are shaped by domestic political pressures, perceptions of rivals' intentions and strategic signalling rather than pure welfare calculations (Buckley & Casson, 2019). The gains from trade are also distributed unequally, meaning domestic pressure from import-competing industries can push governments toward protectionism even when aggregate welfare favours free trade

(Fajgelbaum & Khandelwal, 2022), making the effective payoff structure more complex than a simple two-by-two matrix captures.

3.2 Trade Wars and Tariffs

The empirical literature broadly supports the game-theoretic prediction that tariffs generate welfare losses and trigger retaliation. Fajgelbaum and Khandelwal's (2022) analysis of the US-China trade war finds that US tariffs were largely passed through to domestic import prices. Therefore, the burden fell primarily on American consumers rather than Chinese exporters, contrary to the political justification for the measures. While aggregate welfare losses were modest relative to Gross Domestic Product (GDP), costs were concentrated in specific industries and income groups, making the distributional impact considerably more severe than aggregate figures suggest (Fajgelbaum & Khandelwal, 2022).

Macroeconomic research reinforces these findings. International Monetary Fund (IMF) research finds that tariffs are contractionary in the long run and that any initial gains disappear once trading partners retaliate. Additionally, tariffs generate inflationary pressure that forces central banks to raise interest rates, amplifying the economic cost beyond what simple trade models suggest (Auray et al., 2025). European Central Bank (ECB) research similarly finds that tariff escalation generates significant output losses and inflationary pressures across the global economy, not only limited to the countries directly involved (Jouvanceau et al., 2025). A Federal Reserve working paper on the EU's 2018 response to U.S. steel and aluminium tariffs shows that the EU deliberately targeted products where it could easily switch to alternative suppliers, minimising its own costs while maximising political pressure on the US. However, a significant finding is that even after the retaliatory tariffs were eventually lifted, trade flows in the affected categories did not recover to pre-tariff levels. The disruption left lasting effects that could not simply be reversed (Fisgin et al., 2026). This contradicts the assumption in standard game-theoretic models that tariff escalation is reversible.

At the global level, trade wars tend to reshape rather than reduce trade. When tariffs are imposed, firms adjust sourcing strategies and redirect flows toward third countries rather than stopping trading altogether (Bekkers & Schroeter, 2020). However, an ECB working paper on trade diversion during 2018-2019 suggests this adjustment is slower than theory predicts, particularly for complex goods (Cigna et al., 2020). More recent Bruegel analysis finds that despite sharp falls in bilateral trade following the 2025 tariff escalation, both China and the EU maintained their overall export volumes by diversifying to other markets. However, this came at a significant cost to global economic efficiency (Darvas & Lappe, 2026). Collectively, the evidence confirms that trade wars generate welfare losses for both sides, but with costs that are unevenly distributed, persistent beyond the tariffs themselves and accompanied by structural trade shifts that standard Nash equilibrium models do not fully capture.

3.3 Cooperation vs Conflict

The more important question is not whether defection occurs, but why cooperation sometimes holds and sometimes collapses. Repeated game theory predicts that cooperation is sustainable when both parties value their future relationship enough that defecting today is not worth the punishment tomorrow. The World Trade Organisation (WTO) supports this by establishing rules and a dispute resolution system, which raises the cost of defecting from free trade and lowers the cost of staying cooperative (Bekkers & Schroeter, 2020). Despite this, Tarlea and Weiler's (2026) study, published in the World Trade Review, analysed 1,567 documents from the WTO Doha Round negotiations and found that cooperation depends primarily on the strength of the trading relationship between countries. The more countries trade with each other the greater the domestic pressure to protect and expand that relationship, making cooperation more rational. Buckley and Casson (2019) add that cooperation is most durable when time horizons are long and commitments are credible. Electoral cycles, domestic nationalism and strategic competition all shorten time horizons and erode credibility, making defection more attractive even between long-standing trade partners.

The experimental literature shows that individuals cooperate more than theory predicts, particularly in early rounds. Heuer and Orland (2019) find that when players can observe their partner's past behaviour, cooperation rates are higher, showing that reputation shapes cooperation when information is available. This is directly relevant to this TFG's experimental design, where partner history information is provided between blocks to test whether reputation effects shape cooperation in an experimental trade context. Hui (2022) confirms that Tit-for-Tat and related strategies can sustain cooperation in repeated games, but that the endgame effect is consistent in finite settings.

3.4 Research Gap

Three strands of literature are directly relevant to this TFG, yet none integrates all three into a single framework. The game theory literature provides a clear theoretical baseline, defection is dominant, mutual defection is the Nash equilibrium and trade wars follow from individually rational choices producing collectively harmful outcomes. However, this literature is largely theoretical and does not test whether real decision-makers behave this way. It also does not account for the behavioural regularities that experiments consistently find, such as early round cooperation and the endgame effect. The empirical macroeconomic literature from the IMF, ECB and Federal Reserve confirms that trade wars are costly and that retaliation eliminates any gains from unilateral tariffs, but measures consequences rather than the strategic reasoning behind decisions. The experimental literature shows that people deviate from Nash predictions in predictable ways, but uses abstract settings with no trade framing, leaving open whether the same patterns hold when decisions are explicitly framed as trade policy choices. This TFG addresses that gap by combining a case study of the US-China trade war with an experiment in which participants choose between maintaining low tariffs (cooperate) or imposing high tariffs (defect), testing whether the behavioural regularities documented in the experimental literature translate into a trade context.

4. Methodology

4.1 Research Design

This study uses a mixed-methods approach, combining qualitative case study analysis with a quantitative experiment. It begins with established theoretical predictions from game theory, specifically the Prisoner's Dilemma and repeated game models and tests them against both real-world evidence and observed experimental behaviour. The qualitative component analyses the US-China trade war as a case study, using secondary data to identify patterns of cooperation, retaliation and escalation. The quantitative component consists of a controlled in-person experiment in which participants simulate repeated trade decisions using a payoff matrix consistent with a Prisoner's Dilemma. Together, these approaches allow the experimental hypotheses set out in Section 2.6 to be tested from two different angles.

4.2 Qualitative Method: Case Study Approach

The case study examines the US-China trade war, which began escalating in 2018 and involved multiple rounds of tariff increases and retaliatory measures. This conflict is selected because it is well-documented and directly reflects the strategic interaction structure described by game theory, each country's policy decisions were made in response to the other's actions (Bown, 2026a). Data is drawn from secondary sources, including reports from international organisations (IMF, WTO, ECB, Federal Reserve, European Parliament), peer-reviewed academic literature and policy documents. Key events, tariff announcements, retaliatory actions and negotiation attempts are identified and organised chronologically.

The analysis focuses on identifying recurring strategic patterns, cooperation (such as negotiation attempts or tariff reductions), retaliation (reciprocal tariff increases) and escalation (progressive intensification of the conflict). These patterns are then compared with the predictions of repeated game theory to assess whether real-world behaviour aligns with or deviates from theoretical expectations, providing evidence for or against H1.

4.3 Quantitative Method: Experimental Design

The quantitative component is a controlled in-person experiment simulating strategic trade decisions using a Prisoner's Dilemma framework. The Prisoner's Dilemma is chosen because, as established in Section 2.3, it directly captures the strategic tension between individual tariff incentives and collective welfare losses. Alternative models, such as coordination games, assume aligned incentives and do not reflect the conflict structure observed in real trade disputes.

Participants

The experiment involves 20 participants of varying backgrounds, each representing a country making trade policy decisions. This sample size is consistent with standard experimental economics methodology and is appropriate for testing whether the behavioural patterns predicted by game theory emerge under controlled conditions.

Structure

Participants are randomly assigned to pairs and play a repeated simultaneous-move game. The experiment consists of three blocks of ten rounds, giving 30 rounds in total per participant and 600 decisions across the full dataset. Within each block, participants remain with the same partner. Between blocks, partners rotate, meaning each participant interacts with three different opponents across the experiment.

In Block 1, participants receive no information about their partner's history. From Block 2 onwards, each participant receives a summary of their new partner's actions from the previous block, specifically, the number of times the partner chose the high-tariff (H) and low-tariff (L) strategy, before play begins. This allows for a direct test of whether reputation information influences cooperation at the start of a new interaction (H4).

Each round, participants simultaneously choose between two strategies on paper: L (low tariff, or cooperation) or H (high tariff, or defection). Decisions are revealed to both players after each round, allowing participants to observe their partner's choice and adjust their strategy accordingly. Communication between participants was prohibited throughout the experiment and all decisions were made individually and simultaneously to ensure outcomes reflected independent strategic reasoning rather than negotiation or coordination outside the game structure.

Payoff Matrix

The payoff structure follows a standard Prisoner's Dilemma (Huang, 2010), as shown in Table 3. Defection (H) is the dominant strategy for both players regardless of what the other chooses, making mutual defection (1, 1) the Nash equilibrium. Mutual cooperation (3, 3) produces a higher joint payoff but is individually unstable. A positive payoff matrix is used rather than negative values to ensure clarity for participants and consistency with existing experimental literature (Huang, 2010).

	Partner: Low Tariff		**Partner: High Tariff**	
You: Low Tariff	**You: 3 points**	Partner: 3 points	**You: 0 points**	Partner: 5 points
You: High Tariff	**You: 5 points**	Partner: 0 points	**You: 1 point**	Partner: 1 point

Figure 2: Experimental payoff matrix (Prisoner's Dilemma)

The game has a known finite endpoint of ten rounds per block, therefore, backward induction predicts defection from round one, as established in Section 2.5. In practice, however, cooperation is frequently observed even in finitely repeated games before declining as the endpoint approaches (Dijkstra & van Assen, 2017). The design therefore allows for a direct test of H2 (early-round cooperation above the Nash prediction) and H3 (end-game decline in cooperation) when decisions are framed explicitly as trade policy choices.

4.4 Data Collection

Qualitative data consists of chronological records of trade policy decisions, tariff changes, retaliatory measures and economic reports drawn from institutional and academic sources.

Quantitative data consists of each participant's choice (L or H) in every round, their payoff per round and any changes in strategy across rounds and partner rotations. All decisions were recorded manually on paper during the experiment and subsequently compiled into a dataset of 600 decisions (20 participants × 30 rounds each) for statistical analysis. The dataset includes each participant's choice per round, their partner's choice, the payoff received, the block number, the round number and the partner history information provided at the start of Blocks 2 and 3.

4.5 Data Analysis Strategy

The Case Study analysis identifies strategic patterns in the US-China trade conflict, cooperation, retaliation and escalation and compares them against the predictions of repeated game theory, particularly tit-for-tat dynamics and the conditions under which cooperation holds or deteriorates. This provides evidence for or against H1.

The experimental data are analysed using descriptive statistics, data visualisations and inferential statistical tests. All statistical tests were conducted using Jamovi (Version 2.4). All cooperation variables are coded as binary indicators: 1 = cooperate (chose L, low tariff) and 0 = defect (chose H, high tariff). The analysis addresses three experimental hypotheses:

For H2, a one-sample binomial test was used to compare the observed early-round cooperation rate against the Nash equilibrium prediction of zero cooperation. This is the theoretically appropriate benchmark, since backward induction predicts that rational players should never cooperate in a finite game. A statistically significant result above zero, therefore, constitutes evidence against the Nash prediction.

For H3, a chi-square test of association was used to examine whether cooperation rates differed significantly across three round groups, early (rounds 1-3), middle (rounds 4-7) and late (rounds 8-10). This test is appropriate because both variables are categorical. The cooperation rate by round is also presented descriptively using a line graph to visualise the pattern across all ten rounds.

For H4, two complementary analyses were conducted. First, a chi-square test of association examined whether a partner's previous choice in a given round predicted the participant's choice in the following round. This tests for round-level tit-for-tat behaviour. Second, an independent samples t-test compared round 1 cooperation rates at the start of Blocks 2 and 3 between participants facing a partner with a cooperative history (Partner History $H \leq 4$, indicating the partner cooperated in the majority of previous rounds) versus a defective history (Partner History $H \geq 5$). This tests whether the reputation information provided between blocks influenced initial cooperation decisions.

4.6 Limitations and Ethical Considerations

Limitations

The case study focuses on a single trade conflict, which limits the extent to which findings can be generalised to other trade relationships or geopolitical contexts. Several policy-oriented sources used in the case study reflect institutional perspectives and are not based on peer-reviewed methodologies. Findings drawn from such sources are therefore triangulated against institutional sources from the IMF, ECB and WTO where possible. Additionally, much of the academic literature focuses on earlier phases of the trade war, while more recent developments remain insufficiently captured in peer-reviewed research, reflecting the inherent challenge of studying a conflict that is still unfolding.

The experiment was conducted with 20 participants, which limits the extent to which the findings can be applied to broader contexts. Additionally, participants did not have real economic or political stakes in their decisions, meaning their behaviour may not fully reflect the pressures that shape actual government trade policy. Laboratory conditions necessarily simplify the complex political and institutional environment in which real trade decisions are made. Finally, the partner history information provided between blocks was limited to aggregate counts of H and L choices and did not include contextual information about why partners made those decisions. The small sample size meant that some tests did not reach statistical significance despite showing patterns in the predicted direction. Additionally, the 40 observations available for the H4 reputation test were unevenly distributed between groups (30 cooperative history vs 10 defective history), further reducing statistical power for that comparison.

Ethical Considerations

All participants took part voluntarily and gave informed consent before the experiment began, they were told the purpose of the study, what participation involved and how their data would be used. No compensation was provided. While participants were known to the researcher during data collection, all data was anonymised at the analysis stage so that individuals could not be identified directly or indirectly from the results. No personal or sensitive information was recorded.

5. Case Study Analysis: Real-World Trade Wars

5.1 Overview and Timeline

The U.S. and China have a long history of economic rivalry. Trade between the two countries has grown greatly in recent decades and is crucial for both countries. Today, China is one of the largest export markets for U.S. goods and services and the U.S. is the top export market for China. Since 2018, the U.S. and China have imposed various restrictive measures on trade flows between the two countries, of which increases in tariffs have been most prominent. This poses a significant threat to global economic stability and the two economies are increasingly in danger of decoupling (Bown, 2026a; Fong, 2026). The conflict is well-documented and directly reflects the strategic interaction structure described by game theory, as each country's policy decisions were made explicitly in response to the other's actions.

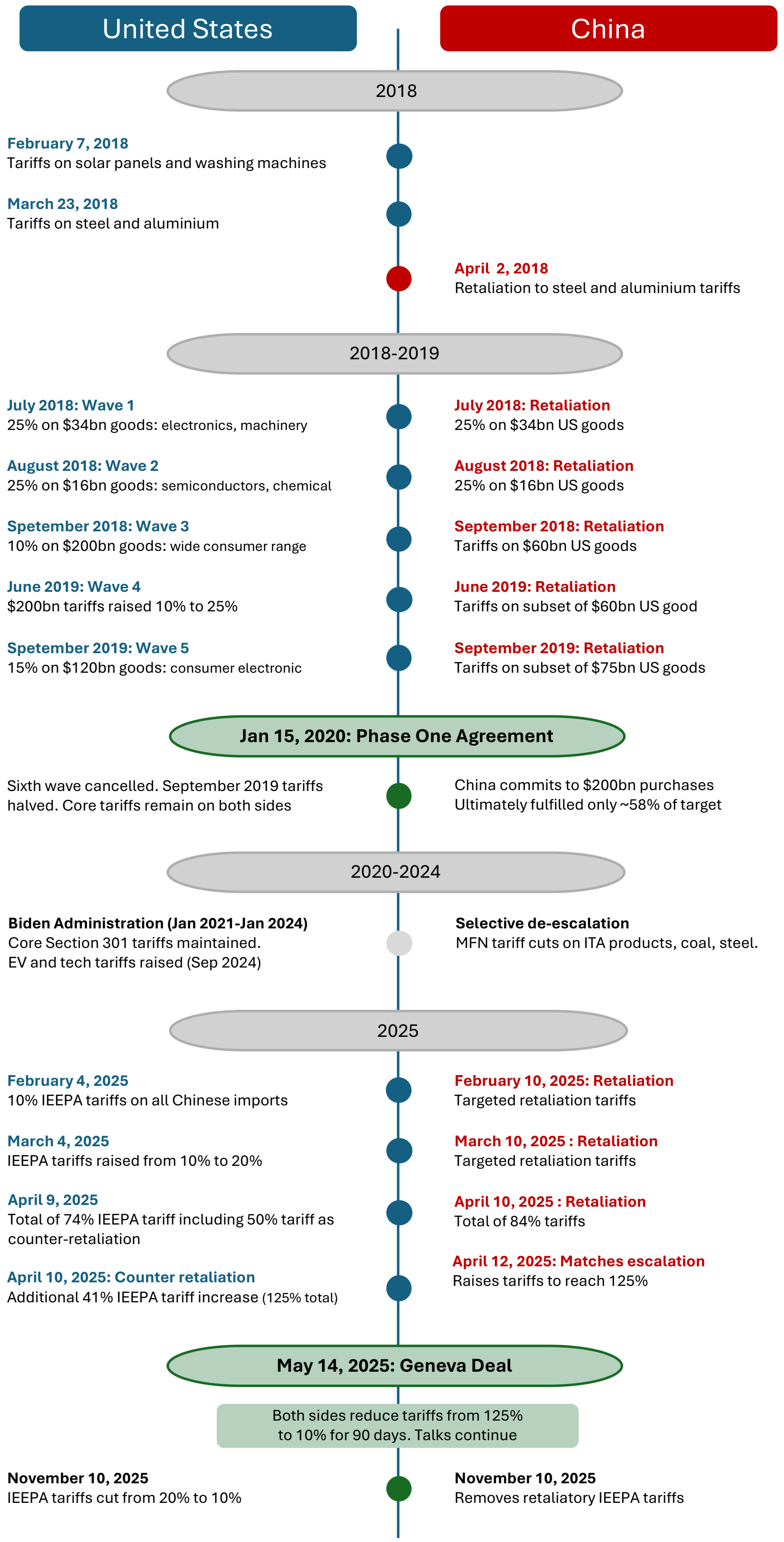

Figure 3: US-China trade war escalation timeline, 2018-2025. Sources: Fajgelbaum & Khandelwal (2022); Bekkers & Schroeter (2020); Bown (2025); Feingold & Botwright (2025); Darvas & Lappe (2026). Note: Timeline shows key tariff actions and retaliatory responses. Cooperative moments shown in green, US actions shown in blue and Chinese retaliations shown in red.

Tensions first escalated in early 2018, when the U.S., under the Trump administration, raised tariffs on a range of imported goods, including washing machines, solar panels, steel and aluminium. These measures initially targeted multiple countries but quickly became focused on China. Between 2018 and 2019, tariffs were introduced in five successive waves, in July 2018, August 2018, September 2018, June 2019 and September 2019, with China retaliating at each stage (Fajgelbaum & Khandelwal, 2022). This confirms that the tit-for-tat pattern was present and as predicted by repeated game theory, each defection triggered a matching response. The scale of these measures was historically large. The U.S. average tariffs on Chinese imports rose from 3.7% to 25.8% across the five rounds of escalation, while Chinese retaliatory tariffs rose from 7.7% to 20.8%. Together, the U.S. and Chinese tariffs targeted imports and exports amounting to 3.6% of U.S. GDP and 5.5% of China's GDP, based on pre-conflict trade and output levels (Fajgelbaum & Khandelwal, 2022).

A temporary pause came with the signing of the Phase One agreement, in which the two parties agreed to halt further tariff escalations in January 2020. Both sides cancelled a planned sixth tariff wave and China committed to purchasing an additional $200 billion of U.S. goods and services over two years, an almost 50% increase compared to pre-trade conflict import levels of approximately $210 billion in 2017 (Bekkers & Schroeter, 2020). The U.S. reduced tariffs from the September 2019 wave by half, but existing tariffs remained in place on both sides (Fajgelbaum & Khandelwal, 2022). From a repeated game perspective, this can be interpreted as a temporary shift toward more cooperation. The cumulative costs of escalation had outweighed the short-term benefits of continued defection. However, cooperation proved fragile. In previous rounds, China's strategy had focused on delay and making vague commitments it did not intend to fulfil and the Phase One agreement, followed this pattern (New York Life Investments, 2026). China ultimately fulfilled only 58% of its purchase commitment (Bown, 2026b). This illustrates a core limitation of repeated game theory. It predicts cooperation will emerge when escalation costs are high enough, but does not account for the credibility problem that arises when there is no binding mechanism to enforce compliance (Buckley & Casson, 2019).

Following the Phase One agreement, the Biden administration retained around $360 billion worth of tariffs from Trump, even increasing the levy for certain competitive industries. Biden quadrupled tariffs on electric vehicles made in China, tripled those on steel and aluminium and doubled the duty on semiconductors (Fong, 2026). During this period, China made selective reductions to its tariff rates on products including industrial goods, coal and Information Technology Agreement (ITA) products, while core bilateral tariffs on both sides remained broadly stable (Bown, 2025). This period is best characterised as neither full cooperation nor renewed escalation, as both sides preserved their leverage while avoiding further provocation. From a repeated game perspective, this reflects conditional cooperation as both parties cooperated while keeping core tariffs in place as a credible threat. However, the tariffs were never removed, which reflects domestic political constraints rather than strategic incentives, a distinction repeated game theory cannot capture.

The cooperation period ended abruptly with the return of the Trump administration in January 2025. Tariffs were imposed in rapid successive rounds, 10% in February 2025 under the International Emergency Economic Powers Act (IEEPA), raised to 20% in March and escalated to 125% by mid-April as both sides counter-retaliated at each stage (Feingold & Botwright, 2025; Bown, 2025). At their peak in April 2025, the IEEPA tariffs on both sides reached 125%, though when measured as trade-weighted averages across all tariff measures combined, the rates reached 124.8% for the U.S. and 147.6% for China (Bown, 2025). U.S. imports from China fell by 45% in the twelve months to November 2025, signalling an accelerated decoupling between the two economies (Darvas & Lappe, 2026). A temporary truce was reached at the Geneva meeting in May 2025, with both sides reducing their IEEPA tariffs from 125% to 10% for 90 days pending negotiations (Feingold & Botwright, 2025). A further bilateral deal in November 2025 reduced IEEPA tariffs to 10%, with China committing to remove retaliatory tariffs (Bown, 2025). These moments of conditional de-escalation mirror the Phase One pattern. Cooperation was driven by the mounting costs of defection rather than a genuine resolution of the underlying structural tensions. Both agreements reflect trigger strategy logic in repeated game theory as the costs of continued mutual defection at 125% tariffs made a temporary truce individually rational for both sides.

5.2 Strategic Interaction and Tariff Escalation

The economic evidence on the US-China trade war is consistent across institutional and academic sources, showing that both sides experienced welfare losses and the tariffs largely failed to achieve their stated objectives. The most fundamental finding is that tariffs were almost entirely passed through to domestic import prices. This means that consumers and firms in the tariff-imposing country, not the targeted country, bore the majority of the cost (Fajgelbaum & Khandelwal, 2022). Both countries experienced reductions in real income, however, aggregate welfare losses were modest relative to the size of their economies. From the 2018-2019 measures, the total economic cost was equivalent to approximately 0.10% of GDP for the U.S. and 0.29% for China (Fajgelbaum & Khandelwal, 2022). IMF research reinforces the welfare loss findings, tariffs are contractionary in the long run and any short-run gains disappear once trading partners retaliate. Tariffs also generate an indirect cost through inflation, which forces central banks to raise interest rates and further depresses economic activity beyond what a simple trade model would suggest (Auray et al., 2025). An ECB working paper similarly finds that the 2025 tariff escalation generated significant output losses and inflationary pressures across the global economy, with effects reaching well beyond the bilateral relationship at the centre of the dispute (Jouvanceau et al., 2025). This confirms a core game theory prediction, once retaliation occurs, the initial gains from defecting are eliminated and both sides end up worse off than under free trade. This demonstrates that the Nash equilibrium logic of mutual defection has real and measurable economic consequences (Khurana, 2022).

Figure 4 shows how trade-weighted average bilateral tariff rates evolved between 2018 and 2025, capturing the initial five-wave escalation under Trump's first term, the period of relative stability under the Biden administration and the re-escalation under Trump's second term. The Phase One agreement and the Geneva deal mark the two moments of conditional cooperation. The shaded areas reflect the three US presidential administrations, highlighting the role of domestic politics in shaping the conflict's trajectory. In contrast, Chinese trade policy was conducted under continuous leadership throughout this period, with Xi Jinping serving as General Secretary of the Chinese Communist Party and President since 2012 (Thomas & Tsering, 2025).

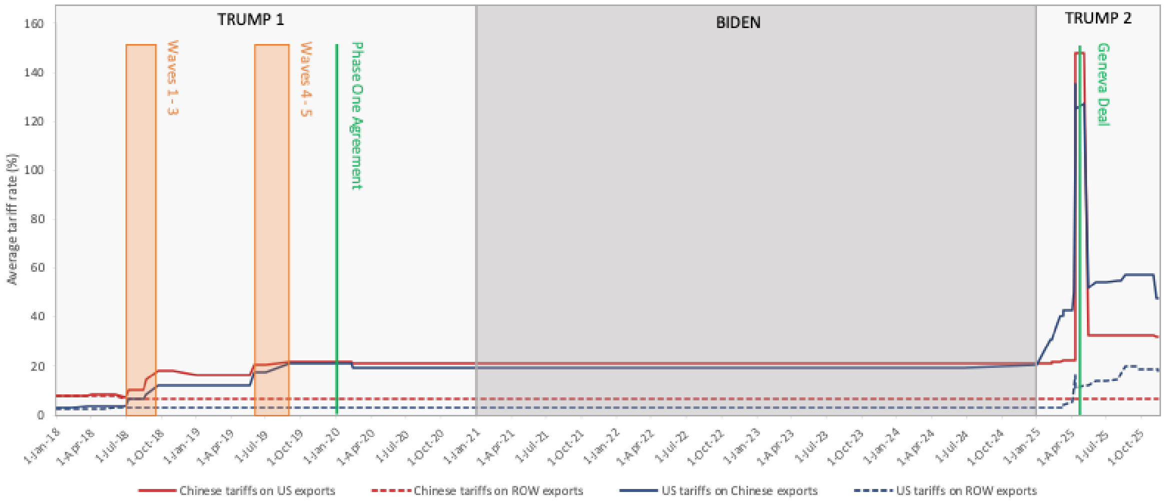

Figure 4: US-China trade-weighted average bilateral tariff rates, 2018-2025 (%). Adapted from Bown (2025). Note: Trade-weighted averages computed from product-level tariff and trade data, weighted by 2017 trade volumes. Shaded areas indicate U.S. presidential administrations.

Beyond the aggregate welfare losses, the costs of the trade war were not evenly distributed. Approximately 27% of Chinese retaliation tariffs were strategically concentrated on U.S. agricultural goods, causing significant income declines for farming communities and requiring government subsidy programmes in response (Fajgelbaum & Khandelwal, 2022). The 2025 escalation intensified these effects further, with U.S. manufacturing exports falling more than 16% below 2017 levels (Bown, 2026b). The design of retaliation also matters strategically. A Federal Reserve working paper examining the EU's 2018 retaliation against U.S. steel and aluminium tariffs shows the EU deliberately targeted products where it could easily switch to alternative suppliers, minimising its own costs while maximising political pressure on the U.S. (Fisgin et al., 2026). The same pattern of strategic escalation is visible in the US-China conflict. The U.S. imposed semiconductor export controls while China introduced export restrictions on rare earth materials, of which it controls the majority of the global supply (Epoch Investment Partners, 2026). This is consistent with strategic punishment strategies in repeated game theory, where the goal is to make defection costly for the opponent while limiting self-harm. Even after the retaliatory tariffs were lifted, bilateral trade flows in the affected categories did not recover to pre-tariff levels (Fisgin et al., 2026).

The Phase One agreement illustrates the limits of cooperation without enforcement. The absence of a credible compliance mechanism meant there was no effective punishment when China fell short of its purchase commitment (Bown, 2026b). This reflects the difficulty of sustaining cooperation in a finite repeated game when both parties know the interaction will eventually end and neither has a credible mechanism to enforce compliance (Buckley &

Casson, 2019). At the global level, the trade war restructured rather than simply reduced trade, as firms redirected flows toward other markets. China maintained its overall export volumes through diversification (Bekkers & Schroeter, 2020; Darvas & Lappe, 2026). In terms of its stated policy objectives, the trade war had limited success. While tariffs reduced U.S. imports from China, contributing to a narrowing of the bilateral trade deficit, this was substantially offset by increased imports from other countries, so the overall U.S. trade deficit was not resolved (Bekkers & Schroeter, 2020; Bown, 2026b).

5.3 Economic Consequences and Game Theory in Practice

Across both phases of the conflict, the broader pattern of escalation is consistent with tit-for-tat dynamics. Each tariff wave prompted a countermeasure of equivalent scale, showing that reciprocal defection is as individually rational in real trade disputes as the model predicts. As Khurana (2022) details, when both countries set tariffs independently to maximise national welfare without coordinating, both end up worse off than under free trade. The US-China trade war broadly supports the core predictions of game theory. Both countries defected from free trade despite clear evidence that cooperation would produce higher collective welfare. The Phase One agreement, described in Section 5.1, reflects the type of conditional, cost-driven cooperation that repeated game theory anticipates.

Research from WTO negotiations also reveals factors the standard model does not capture, including domestic political incentives, electoral pressures and strategic competition for technological dominance. All of these factors shaped decisions in ways that go beyond simple welfare maximisation (Tarlea & Weiler, 2026; Buckley & Casson, 2019). Furthermore, bilateral trade is projected to decline to less than half its pre-2017 level by 2030 (Epoch Investment Partners, 2026). This reflects the structural damage that a simplified Prisoner's Dilemma model cannot fully capture. Taken together, the evidence suggests that game theory provides a useful but incomplete framework for understanding trade wars. It correctly predicts the logic of escalation and the conditions under which cooperation can emerge, but it cannot account for the irreversibility of tariff damage, the role of domestic political pressures, or the enforcement problems that undermine even formally agreed cooperation. Despite these limitations, the core prediction of H1 is supported. The US-China trade war followed cycles of reciprocal defection, with each tariff wave met by equivalent retaliation. The two moments of cooperation, the Phase One agreement and the Geneva deal, were driven by the mounting costs of escalation rather than any genuine resolution of the underlying tensions.

6. Experimental Simulation Results

6.1 Overview of Experimental Results

The case study in Section 5 revealed that real-world trade conflict is shaped by political pressures, institutional constraints and domestic incentives that game theory alone cannot fully capture. The controlled experiment conducted in this TFG addresses this by removing these factors from the decision-making environment, which allows a cleaner test of whether the behavioural patterns predicted by game theory emerge from the game structure alone. This section presents the findings of the repeated tariff game experiment. The analysis focuses on the frequency of cooperation and defection, behavioural changes across rounds, potential endgame effects and the impact of partner rotation and action-history information. While the payoff structure follows a Prisoner's Dilemma, the repeated nature of the interaction allows for the emergence of cooperation.

Across all 600 decisions, participants chose the cooperative low-tariff strategy (L) on 292 occasions, resulting in an overall cooperation rate of 48.7% and therefore a defection rate of 51.3%. Despite the theoretical prediction of universal defection, cooperation occurred in nearly half of all decisions, indicating that repeated interaction influenced behaviour. Cooperation rates declined across blocks from 51.5% in Block 1 to 50.0% in Block 2 and 44.5% in Block 3. This suggests a gradual erosion of cooperative behaviour as participants gained experience and updated their expectations about others' actions. However, it should be noted throughout this section that the experiment involved only 20 participants, which limits statistical power. Where results do not reach statistical significance, findings should be interpreted as inconclusive rather than as evidence against the hypothesis.

MEASURE	VALUE
TOTAL DECISIONS	600
COOPERATIVE CHOICES (L)	292
DEFECTION CHOICES (H)	308
OVERALL COOPERATION RATE	48.7%
BLOCK 1 COOPERATION RATE	51.5%
BLOCK 2 COOPERATION RATE	50.0%
BLOCK 3 COOPERATION RATE	44.5%

Figure 5: Summary of Experimental Outcomes Across All Decisions (N = 600)

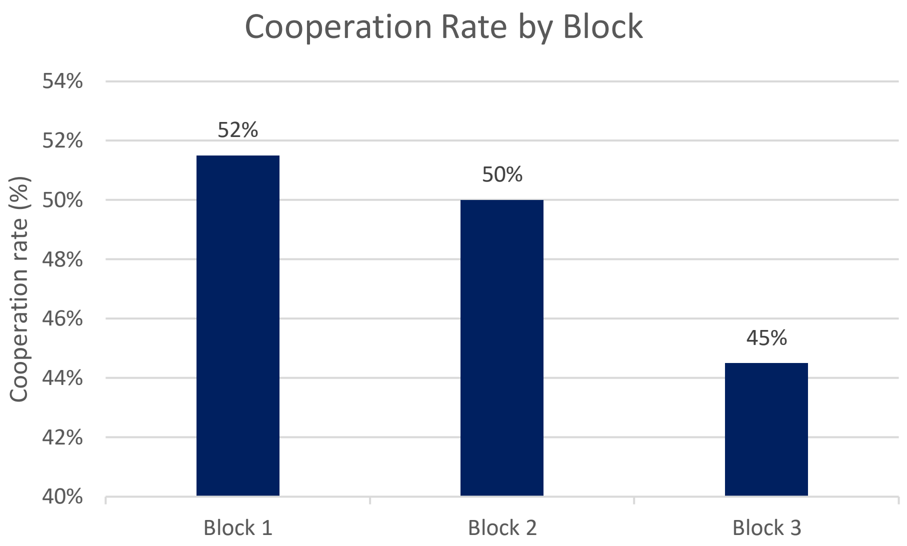

Figure 6: Cooperation rate by block (N = 200 decisions per block)

6.2 Emergence of Cooperation in Opening Rounds

H2 predicted that cooperation would emerge in the opening rounds of each block despite the incentive to defect. The null hypothesis for this test was that the cooperation rate in opening rounds would equal zero, consistent with the Nash equilibrium prediction that rational players in a finite game should always defect. A binomial test was conducted to assess whether the observed cooperation rate significantly exceeded the Nash equilibrium prediction of zero cooperation.

The results show that cooperation in opening rounds (Rounds 1-3 across all blocks) was 48.9%, which is significantly greater than zero ($p < 0.001$, 95% CI [0.414, 0.564]). Out of 180 early-round decisions, participants chose the cooperative strategy on 88 occasions. The null hypothesis is therefore rejected (see Appendix B.1 for full Jamovi output). This finding indicates that participants did not follow the backward induction prediction of immediate defection. Instead, cooperation emerged consistently at the start of interactions. H2 is therefore supported, consistent with the repeated game prediction that cooperation tends to emerge before participants have experienced repeated defection from their partner, though the external validity constraints discussed in Section 6.6 limit how far this translates to government behaviour.

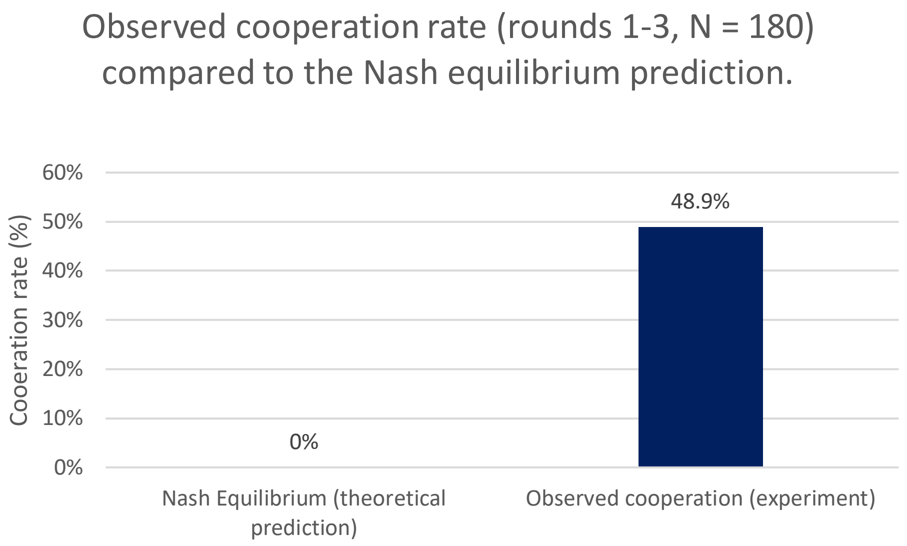

Figure 7: Early-round cooperation rate by block. H2 analysis based on rounds 1–3 across all three blocks (n = 180 decisions)

6.3 End-Game Effects and Cooperation Decline

H3 predicted that cooperation would decline toward the final rounds of each block as the known endpoint approached, consistent with the backward induction prediction that anticipation of the final round erodes cooperative incentives. The null hypothesis for this test was that cooperation rates would be equal across early, middle and late round groups, regardless of where a round fell within a block.

A chi-square test of association was conducted comparing cooperation rates across early (Rounds 1-3), middle (Rounds 4-7) and late (Rounds 8-10) stages. The result was not statistically significant, $\chi^2(2) = 4.24$, $p = 0.120$ (see Appendix B.2 for full Jamovi output), meaning the null hypothesis cannot be rejected. However, the descriptive pattern shown in Figure 6 is consistent with the predicted end-game effect. Cooperation was highest in middle rounds (52.9%), remained elevated relative to late rounds in early rounds (48.9%) and fell to its lowest in late rounds (42.8%). Round 10 recorded the lowest cooperation rate of any individual round across the entire experiment at 38.3%.

H3 cannot be confirmed on the available evidence. The directional pattern is consistent with the prediction, but with only 20 participants, the sample was too small to detect the effect reliably and the non-significant result (p = 0.120) means the null hypothesis of no difference across round groups cannot be rejected.

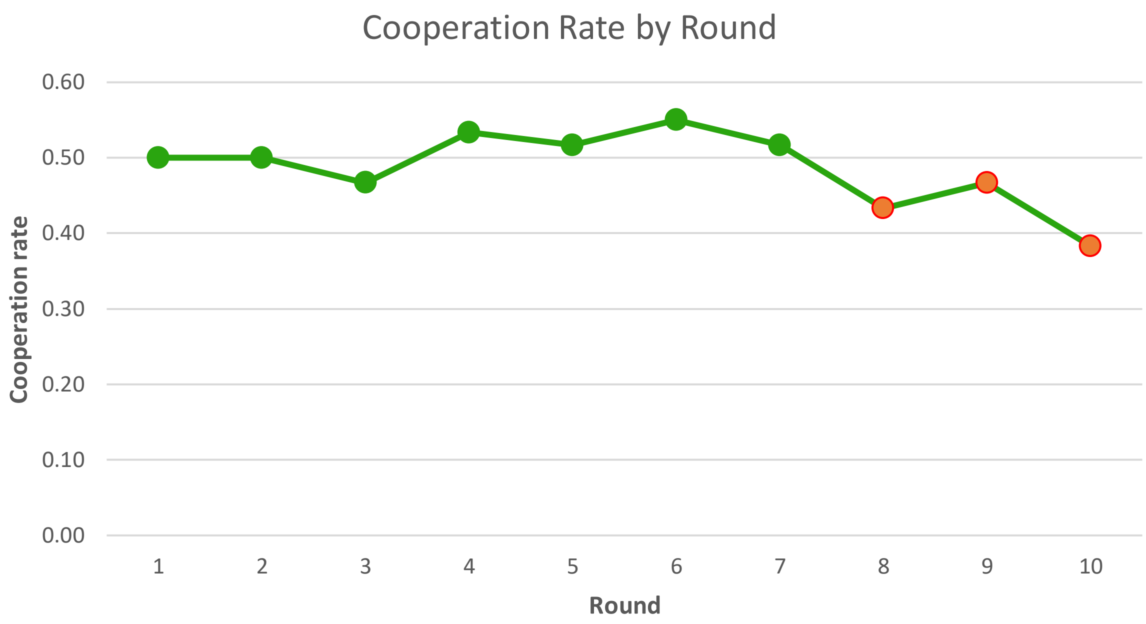

Figure 8: Cooperation Rates Across Rounds: Evidence of Endgame Decline

6.4 Retaliation Patterns and Reciprocal Behaviour

To examine whether participants conditioned their decisions on their partner's previous behaviour, a chi-square test of association was conducted between a partner's previous choice and the participant's subsequent decision. This analysis captures round-level retaliation within the game rather than the block-level reputation effect specifically. The result was significant, $\chi^2(1) = 54.5$, $p < 0.001$, N = 580, meaning the null hypothesis is rejected (see Appendix B.3 for full Jamovi output). There is a statistically significant association between a partner's previous choice and the participant's subsequent decision. When a partner cooperated in the previous round, participants cooperated 64.2% of the time in the following round. In contrast, when a partner defected, cooperation fell to 33.6% (Figure 7).

This pattern is consistent with a tit-for-tat strategy, where players reciprocate their opponent's previous move, rather than following a fixed dominant strategy regardless of context. The findings provide evidence of conditional cooperation, with participants rewarding cooperative behaviour and retaliating against defection. This deviates from the Nash equilibrium prediction of universal defection and aligns closely with repeated game theory. This is broadly consistent with the dynamics observed in trade disputes such as the US-China trade war, where tariff increases are often met with reciprocal countermeasures, however, the controlled experimental setting limits direct comparison.

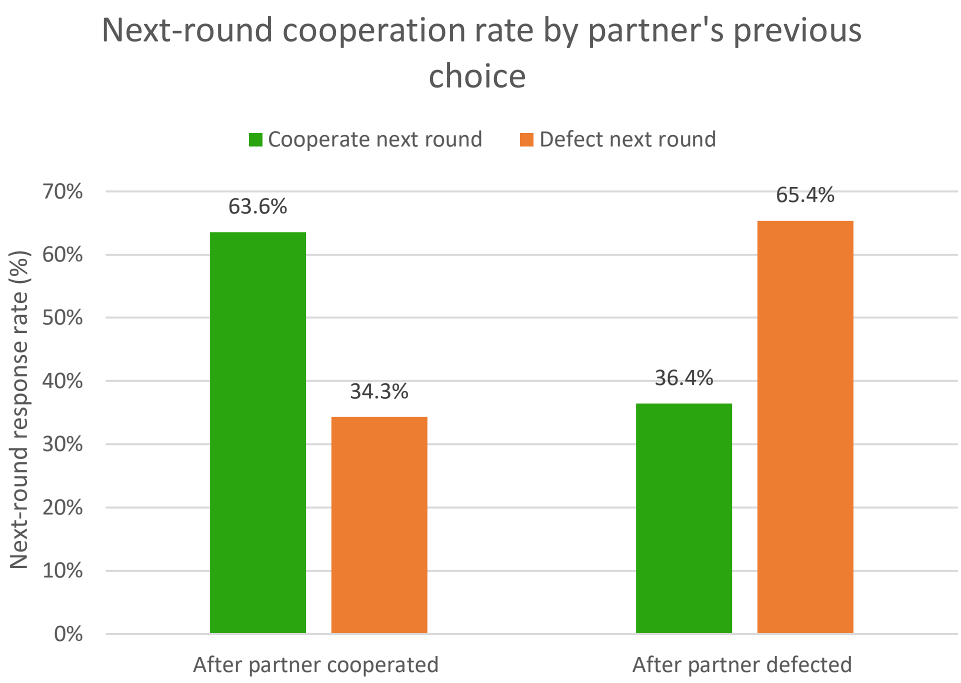

Figure 9: Next-round cooperation rate by partner's previous choice (N = 580 decisions).

6.5 Partner History and Reputation Effects

H4 predicted that participants would be more likely to cooperate in the opening round of a new block when their partner had a cooperative history. The null hypothesis was that partner history would not affect opening-round decisions.

An independent samples t-test was conducted comparing round 1 cooperation rates at the start of Blocks 2 and 3 between participants whose new partner had a cooperative history (cooperated in the majority of previous rounds, n = 30) and those whose new partner had a defective history (defected in the majority of previous rounds, n = 10). The relevant benchmark for this comparison is the overall cooperation rate observed across the experiment as a whole (48.7%), since game theory predicts zero cooperation regardless of partner history. H4 is therefore concerned with whether information about a partner's reputation shifts behaviour above or below this baseline, rather than against the Nash prediction of zero. Against this benchmark, participants informed that their partner had a majority cooperative past cooperated slightly above the overall rate (53.3%), while participants informed that their partner had a majority defective past had a lower cooperation rate (40.0%), as shown in Figure 8. This difference shows that participants were more willing to cooperate when they knew their incoming partner had cooperated more often than not, however, it was not statistically significant, $t(38) = 0.717$, $p = 0.478$, meaning the null hypothesis cannot be rejected.

Despite the absence of statistical significance, the observed pattern is directionally consistent with repeated game theory, where past actions serve as signals of future behaviour. However, the small and unequal group sizes (n = 30 vs n = 10) substantially reduced statistical power, making it impossible to draw reliable conclusions about the effect of partner history on cooperation. H4 must therefore remain unconfirmed.

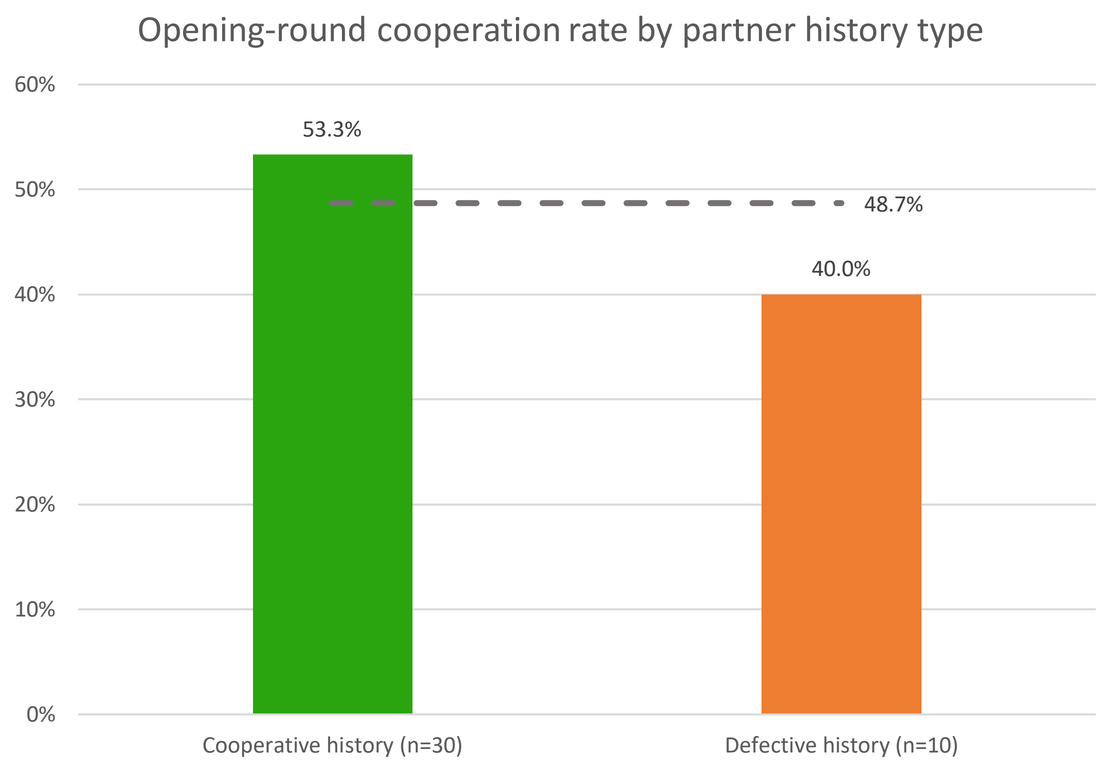

Figure 10: Opening Round Cooperation by Partner History Type

6.6 External Validity and Limitations

While the experimental findings reported in this section provide behavioural patterns predicted by game theory, the external validity of these experiments is important to acknowledge. External validity refers to the extent to which findings from a controlled setting generalise to real-world behaviour (Levitt & List, 2007). Several important differences exist between the experimental setting and the geopolitical environment the case study describes. Participants in this experiment were making decisions with abstract payoffs, facing no electoral pressure, no domestic political constituencies, no ideological or nationalist motivations and no reputational consequences beyond the immediate interaction. Real trade policy decisions, by contrast, are made by governments operating under uncertainty about rivals' intentions, subject to domestic lobbying, electoral cycles and strategic competition that extends well beyond any single tariff negotiation (Buckley & Casson, 2019; Tarlea & Weiler, 2026). The experiment also uses a two-player design in which both participants face identical payoffs and rules, whereas real trade disputes involve countries with unequal economic size, bargaining power and domestic political constraints.

These limitations mean that the results should be interpreted as evidence of behavioural tendencies under controlled conditions rather than direct predictions of government behaviour. Importantly, the gap between laboratory behaviour and real-world trade policy is itself a finding. The experiment removes political constraints entirely, the divergence between what participants did in the lab and what governments did in the trade war provides a measure of how much real-world trade conflict is driven by the strategic logic of the game itself and how much is driven by the political and institutional forces that the standard model does not capture.

7. Comparative Discussion

Before drawing comparisons across the three sources, it is worth noting the external validity constraints of the experimental findings outlined in Section 6.6 The behavioural patterns observed in the experiment reflect decision-making under controlled conditions, free from the political and institutional pressures that shape real government trade policy and should be interpreted accordingly.

7.1 Alignment Between Theory, Case Studies and Experiment

The central research question asks how game theory can explain the strategic behaviour of countries in trade wars and under what conditions countries cooperate or escalate. Combining theory, case study and experiment reveals both where game-theoretic models hold and where they fall short when applied to real and simulated trade decisions. Game theory predicts that in a finite Prisoner's Dilemma, mutual defection is the only rational equilibrium with backward induction predicting defection from round one, as detailed in Section 2.5 The US-China trade war partially confirms this prediction. The five successive tariff waves, the pattern of tit-for-tat and the fact that defection left both sides worse off than under free trade are all consistent with the Nash equilibrium logic the theory anticipates (Fajgelbaum & Khandelwal, 2022). However, cooperation did emerge through the Phase One agreement in 2020 and the Geneva deal in 2025. This demonstrates that real-world actors do not behave as the pure theory predicts, even in a conflict that otherwise mirrors the Prisoner's Dilemma closely.

The experiment deviates from the backward induction prediction. Cooperation emerged significantly above zero at 48.7% of all decisions ($p < 0.001$), far above the zero cooperation the theory requires. Cooperation did decline toward the endpoint of each block, with round 10 recording the lowest cooperation rate at 38.3%, directionally consistent with the endgame effect, though this decline did not reach statistical significance and cannot be confirmed on this evidence alone. Across all three sources, it was found that defection is individually rational and the pressure toward defection as an endpoint approaches is consistent with repeated game theory. However, the strength of this conclusion varies by source. It is predicted by theory, consistent with the case study evidence and directionally present in the experiment. The experiment suggests that individuals cooperate more than theory predicts, particularly in early stages of an interaction. However, these results should be interpreted with caution, given the sample size constraints outlined in Section 6.6 and that the result did not reach statistical significance.

The divergence between the case study and the experiment reveals what standard game theory cannot explain. Theory predicts cooperation is difficult to sustain without credible enforcement. This is shown in China's fulfilment of only 58% of its Phase One commitments, as the absence of any binding enforcement mechanism made the agreement structurally vulnerable from the beginning (Bown, 2026b; Buckley & Casson, 2019). Additionally, China's compliance deteriorated as the agreement's deadline approached. This is consistent with the endgame logic that finite horizons erode cooperative incentives as the endpoint approaches. Regarding the experiment, cooperation was sustained not by formal enforcement but by the behaviour of the participants themselves. Participants who experienced cooperation from their partner tended to cooperate in return, preserving a mutually beneficial relationship, while those who were defected against responded in kind. No formal rules, penalties or agreements were needed. The gap between the two, therefore, reflects the difference between strategic interaction under political and institutional constraints and strategic interaction in a clean behavioural setting. Both deviate from the theoretical prediction, but in opposite directions and for different reasons and understanding why is the central analytical contribution of this TFG.

7.2 Conditions Promoting Cooperation

Cooperation emerges when both parties can observe each other's behaviour, the future cost of losing the relationship outweighs the immediate gain from defecting and commitments are credible enough to be trusted. All three sources confirm these conditions, but reveal important differences in how they operate in practice. In the experiment, cooperation was highest in early rounds before participants had accumulated evidence of their partner's willingness to defect and was sustained through conditional reciprocity rather than unconditional generosity, consistent with Heuer and Orland (2019) and Hui (2022). When partner history was visible between blocks, participants with a cooperative-history partner cooperated at a higher rate than those with a defective-history partner (53.3% vs 40.0%), suggesting that transparency about past behaviour may reinforce the reciprocal dynamic across new interactions, though this difference did not reach statistical significance ($p = 0.478$) and should be interpreted with caution.

The Phase One agreement emerged when escalation costs became tangible for both sides, consistent with the trigger strategy logic that cooperation becomes rational once continued defection exceeds its returns (Khurana, 2022). The Geneva deal of May 2025 followed the same logic, both sides reducing tariffs from 125% to 10% when the costs of continued escalation became unsustainable (Feingold & Botwright, 2025). Tarlea and Weiler (2026) add that deeper trade ties make cooperation more likely by raising the stakes of mutual defection. Buckley and Casson (2019) highlight that cooperation is most durable when time horizons are long and commitments are credible. This is the function the WTO serves by raising the cost of defection through enforceable rules. When one country bypasses those rules, as the U.S. did by imposing tariffs outside WTO dispute resolution channels, the conditions that make cooperation predictable break down, making it harder for even long-standing trading partners to sustain cooperative behaviour (Bekkers & Schroeter, 2020).

7.3 When and Why Escalation Occurs

Escalation occurs when the immediate political cost of conceding exceeds the long-term economic cost of continued conflict. In both the case study and the experiment, the dominant trigger for escalation was reactive defection. Once one party defected, the other retaliated. The results from the experiment regarding the tit-for-tat analysis showed that defection reduced the partner's cooperation rate by 30% points in the following round. This is consistent with the tit-for-tat logic established in Section 2.5. The case study of the US-China trade war shows that each tariff wave was met with equivalent retaliation. The theory, experiment and case study all show that once started, defection produces more defection. This was the strongest finding in the experimental data as the endgame effect and partner history hypotheses were directionally consistent but did not reach statistical significance.

Where the case study diverges from both theory and the experiment is in the strategic design of escalation. The theory models retaliation as symmetric. In reality, China concentrated its retaliatory tariffs on U.S. agricultural exports to maximise political pressure. Additionally, both sides imposed non-tariff measures, semiconductor export controls and rare earth restrictions, as additional instruments (Fajgelbaum & Khandelwal, 2022; Epoch Investment Partners, 2026). The experiment removes political constraints entirely, showing that reactive defection emerges from the game structure alone, while the case study reveals the additional layer that governments introduce through targeted and politically motivated retaliation. Electoral cycles and domestic pressures further shorten government time horizons, making the future relationship secondary to immediate political pressures (Buckley & Casson, 2019). The endgame effect observed in the experiment maps onto this dynamic, when a relationship is perceived to be nearing its end, the short-term gain from defection outweighs the cost of damaging it further. The standard game theory model does not capture either of these factors.

7.4 Implications for Trade Policy

Three insights follow from the comparison of theory, case study and experimental findings. First, reciprocity sustains cooperation more reliably than formal agreements, but only when political constraints are absent. Under controlled conditions, where participants faced no electoral pressure, no domestic political constraints and no reputational consequences beyond the immediate interaction, cooperation reached 48.7% through reciprocity alone, with no formal rules or enforcement mechanism required. In the real-world, even a formal signed agreement, the Phase One deal, proved insufficient to sustain cooperation. China's failure to fulfil its purchase commitments in the absence of any binding compliance mechanism confirmed this (Bown, 2026b). The contrast is not between two cooperation rates but between two different foundations for cooperation. Reciprocity sustains cooperation naturally in the experiment because participants have no incentive to defect beyond the game itself, as there are no domestic political pressures, electoral incentives or competing interests affecting their decisions. For governments, these external forces constantly undermine the reciprocal logic, making defection politically attractive even when it is economically harmful to both sides. Institutional frameworks such as the WTO are designed to compensate for this by making each side's behaviour transparent and ensuring defection is costly enough to deter it. As the US-China case demonstrates however, when one party bypasses these channels entirely, the reciprocal logic deteriorates and cooperation becomes structurally fragile regardless of any formal agreement in place.

Second, finite time horizons undermine cooperation across all three sources. Theory predicts it through the concept of backward induction. The experiment is consistent with this prediction as cooperation fell to 38.3% in round 10, the lowest of any individual round. However, the decline across rounds did not reach statistical significance. In terms of the case study, China's compliance with the Phase One agreement deteriorated as the agreed deadline approached and without a renewal mechanism, the underlying tensions were never resolved (Bown, 2026b). Trade agreements with fixed end dates are therefore vulnerable to the same cooperation breakdown that finite games produce, as both parties begin to weigh short-term gains over the long-term relationship once the end is in sight.

Third, escalation has lasting and unequal costs. The standard game theory model underestimates the irreversibility of escalation. Theory treats tariffs as a reversible negotiating tool. The evidence from the case study contradicts this, trade flows in tariff-affected categories did not recover after tariffs were lifted and bilateral US-China trade is projected to decline to less than half its pre-2017 level by 2030 (Fisgin et al., 2026; Epoch Investment Partners, 2026). Trade policy should recognise that once escalation begins, the damage it causes to trade flows and bilateral trust is unlikely to be fully reversed even if tariffs are eventually removed.

8. Conclusion

The aim of this TFG was to understand how game theory explains the strategic behaviour of countries in trade wars and under what conditions countries choose to cooperate or escalate conflict. The analysis approached international trade through the lens of game theory and more specifically, the Prisoner's Dilemma, combining a theoretical framework, a case study of the US-China trade war and a controlled experiment that replicated the structure of a bilateral trade relationship. The conclusion that emerges is that game theory correctly identifies the logic of defection and the conditions under which cooperation can be sustained. However, it underestimates the political forces that prevent those conditions from being met in practice.

The three sources together allow for a thorough analysis of the hypothesis presented at the beginning of this TFG. The US-China trade war largely supported H1. The conflict followed the tit-for-tat logic of repeated game theory as each tariff wave was met by equivalent retaliation, while cooperation emerged conditionally when escalation costs became unsustainable. The partial nature of this support should be noted as China only fulfilled 58% of its Phase One commitments, illustrating that even when cooperation emerged, the absence of a credible enforcement mechanism undermined the clean reciprocal logic that H1 assumes. The experiment supported H2 as cooperation emerged above the Nash equilibrium prediction, sustained by reciprocity rather than formal enforcement. The evidence for H3 and H4 was inconclusive. The pattern observed was consistent with the prediction, but the sample size was insufficient to draw firm conclusions. The hypotheses cannot therefore be confirmed on this evidence alone.

The original contribution of this TFG lies in the contrast and comparison of all three sources. The gap between the cooperation observed in the experiment and the predominantly defection-driven behaviour of the trade war, with the exception of the Phase One agreement and the Geneva deal, is itself an important finding. It suggests that the behavioural capacity for cooperation exists and is consistent across the experimental decisions, but the small sample limits how far this can be generalised. Domestic political pressures, electoral cycles and the absence of credible enforcement mechanisms appear to prevent governments from acting on this capacity for cooperation, at least in the context of the US-China trade war. The tendency toward defection as a known endpoint approaches is observable across all three sources, in the theoretical prediction, in the directional pattern of the experiment, though it did not reach statistical significance and in the deterioration of the Phase One agreement as its deadline approached. This suggests that finite time horizons create pressure toward defection, whether the decision-makers are individuals in a controlled experiment or governments managing a bilateral trade relationship. It is important to note that the three-source comparison is itself constrained by the experimental limitations. As the experiment was only conducted with 20 participants, two of the four hypotheses remained statistically inconclusive, meaning the experimental contribution to this comparison is directional rather than confirmatory.

These findings have practical implications for trade negotiators and policymakers. Formal rules and enforcement mechanisms are not merely bureaucratic formalities, without them, governments struggle to sustain the cooperation that individuals manage naturally through reciprocity alone. Agreements with fixed deadlines and no renewal mechanism are structurally vulnerable, as the Phase One experience confirms. Once escalation begins, the damage to trade flows and bilateral trust is unlikely to be fully reversed even if tariffs are eventually removed (Fisgin et al., 2026).

Several limitations constrain the findings of this TFG. The experiment involved only 20 participants, limiting statistical power and the generalisability of the findings. The case study focuses on a single bilateral conflict and several sources reflect institutional rather than peer-reviewed perspectives. Given that the case study covers 2018–2025, peer-reviewed literature on the later years has not yet been published. As previously discussed, participants also faced none of the political, electoral or reputational pressures that shape real government trade decisions.

This TFG contributes to the existing literature by providing experimental evidence that individuals have a genuine capacity for cooperation and by showing that the gap between laboratory behaviour and real-world trade policy is itself an important finding. Game theory correctly identifies the logic of trade conflict, but its explanatory power is constrained by its inability to account for the political pressures, domestic incentives and institutional constraints that shape real government decisions. Future research with larger samples, payoff structures that better reflect the unequal bargaining power between countries and applying the comparative framework to trade disputes beyond the US-China case could test whether these findings hold beyond the bilateral two-player framework used here.

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Appendices

Appendix A: Participant sheet

Name: ___________________________

	Partner: Low Tariff		Partner: High Tariff	
You: Low Tariff	**You: 3**	Partner: 3	**You: 0**	Partner: 5
You: High Tariff	**You: 5**	Partner: 0	**You: 1**	Partner: 1

In the boxes below, please write:
H = High Tariff
L = Low Tariff

After each round, your partner's decision will be revealed.

Your goal is to earn as many points as possible.

Block 1 Partner's name:________________________

Round	Your Choice (H/L)	Partner's Decision (H/L)	Your Points
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Block Total Points			/50

I chose High Tariff	/10	I chose Low Tariff	/10

Block 2 Partner's name:_____________________

Your new partner's decisions in the previous block:

They chose High Tariff	/10	They chose Low Tariff	/10

Round	Your Choice (H/L)	Partner's Decision (H/L)	Your Points
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Block Total Points			/50

I chose High Tariff	/10	I chose Low Tariff	/10

Block 3 Partner's name:_____________________

Your new partner's decisions in the previous block:

They chose High Tariff	/10	They chose Low Tariff	/10

Round	Your Choice (H/L)	Partner's Decision (H/L)	Your Points
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Block Total Points			/50

I chose High Tariff	/10	I chose Low Tariff	/10

Final Total Points Across All Blocks: _________ /150

Appendix B: Raw Experimental Data

Appendix B.1

Proportion Test (2 Outcomes)

Binomial Test

	Level	Count	Total	Proportion	p	95% Confidence Interval	
						Lower	Upper
Cooperate you	0	92	180	0.511	.	0.436	0.586
	1	88	180	0.489	.	0.414	0.564

Note. H_a is proportion ≠ 0

Appendix B.2

Contingency Tables

Contingency Tables

		Round Group			
Cooperate you		Early	Late	Middle	Total
0	Observed	92	103	113	308
	% within column	51.1 %	57.2 %	47.1 %	51.3 %
1	Observed	88	77	127	292
	% within column	48.9 %	42.8 %	52.9 %	48.7 %
Total	Observed	180	180	240	600
	% within column	100.0 %	100.0 %	100.0 %	100.0 %

χ^2 Tests

	Value	df	p
χ^2	4.24	2	0.120
N	600		

Appendix B.3

Contingency Tables

Contingency Tables

Cooperate partner		Next decision 0	1	Total
0	Observed	196	99	295
	% within row	66.4 %	33.6 %	100.0 %
1	Observed	102	183	285
	% within row	35.8 %	64.2 %	100.0 %
Total	Observed	298	282	580
	% within row	51.4 %	48.6 %	100.0 %

χ^2 Tests

	Value	df	p
χ^2	54.5	1	< .001
N	580		

Appendix B.4

Independent Samples T-Test

Independent Samples T-Test

		Statistic	df	p
Cooperate you	Student's t	0.717	38.0	0.478
	Welch's t	0.710	15.2	0.488

Note. H_a $\mu_{Cooperative} \neq \mu_{Defective}$

Group Descriptives

	Group	N	Mean	Median	SD	SE
Cooperate you	Cooperative	30	0.533	1.00	0.507	0.0926
	Defective	10	0.400	0.00	0.516	0.163

Appendix C: Declaración de Uso de Herramientas de Inteligencia Artificial Generativa en Trabajos Fin de Grado

ADVERTENCIA: Desde la Universidad consideramos que ChatGPT u otras herramientas similares son herramientas muy útiles en la vida académica, aunque su uso queda siempre bajo la responsabilidad del alumno, puesto que las respuestas que proporciona pueden no ser veraces. En este sentido, NO está permitido su uso en la elaboración del Trabajo fin de Grado para generar código porque estas herramientas no son fiables en esa tarea. Aunque el código funcione, no hay garantías de que metodológicamente sea correcto, y es altamente probable que no lo sea.

Por la presente, yo, Amy Louise Corbett, estudiante de Grado en Administración y Dirección de Empresas doble titulación internacional de la Universidad Pontificia Comillas al presentar mi Trabajo Fin de Grado titulado "Trade Wars As Strategic Games, Applying Game Theory To Tariffs And International Conflict", declaro que he utilizado la herramienta de Inteligencia Artificial Generativa ChatGPT u otras similares de IAG de código sólo en el contexto de las actividades descritas a continuación:

1. **Brainstorming de ideas de investigación:** Utilizado para idear y esbozar posibles áreas de investigación.
2. **Corrector de estilo literario y de lenguaje:** Para mejorar la calidad lingüística y estilística del texto.
3. **Sintetizador y divulgador de libros complicados:** Para resumir y comprender literatura compleja.
4. **Generador de problemas de ejemplo:** Para ilustrar conceptos y técnicas.
5. **Revisor:** Para recibir sugerencias sobre cómo mejorar y perfeccionar el trabajo con diferentes niveles de exigencia.
6. **Traductor:** Para traducir textos de un lenguaje a otro.

Afirmo que toda la información y contenido presentados en este trabajo son producto de mi investigación y esfuerzo individual, excepto donde se ha indicado lo contrario y se han dado los créditos correspondientes (he incluido las referencias adecuadas en el TFG y he explicitado para que se ha usado ChatGPT u otras herramientas similares). Soy consciente de las implicaciones académicas y éticas de presentar un trabajo no original y acepto las consecuencias de cualquier violación a esta declaración.

Fecha: 24/05/2026

Firma: