Investment Strategies in the Shadow of Conflict*

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Abstract

How sensitive are countries to economic loss due to conflict? To what extent does global economic exchange deter conflict between countries? How do firms factor in the possibility of war when making their investment decisions?

Much of the previous research on this issue studies the relationship between trade and military conflicts. However, trade constitutes only a small part of the global economy. By shifting the focus to financial markets, which constitute a much larger portion of the global economy, this paper deepens our understanding of the relationship between global economic exchange and inter-state conflicts. Using a combination of a game theoretic model and empirical analysis, this paper re-examines the pacifying effect of economic ties between countries. The formal model in this paper accounts for the inherent endogeneity of investment flows to inter-state conflict. By modelling this endogeneity, this paper provides a framework that more accurately captures how foreign investments affect military conflicts. The empirical analysis builds on the framework provided by the formal model. Using data on mergers and acquisitions decisions of multinational firms, the empirical analysis validates the insights generated from the formal model and presents a more efficient valuation of the deterrence effect of foreign investments.

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1 Introduction

A number of studies have explored the relationship between global economic linkage and conflict (Morrow, 1999; Glick and Taylor, 2008; Keshk et al., 2004; and Oneal and Russet, 1997). Arguing from a rationalist perspective, these studies theorize the effect of economic exchange between countries on inter-state military disputes and vice-versa. However, most of the literature focuses on trade which constitutes only a small part of the global economy. The global capital markets, on the other hand, constitute a much larger portion. The question then follows - How does the risk of conflict affect foreign investments?

In this paper, I explore the relationship between cross-border investments and the risk of conflict. I employ a game theoretic model that provides a framework to understand how firms invest capital in the shadow of conflict. The model accounts for the endogeneity of foreign investments to conflict. The endogeneity arises from the understanding that countries considering initiating conflict will need to take into account the capital flight following the start of hostilites, however, firms are less likely to invest in countries that have a significant risk of experiencing (or are more likely to initiate) war, thus, negating some of the pacifying effect of investments. My model attempts to understand firms' investing strategies in lieu of this endogeneity. Specifically, do they increase their investment in an aggressive country hoping that the increase in costs owing to a potential loss of investment deters the country or do they, instead, invest in safer shores where the risk of war is non-existent? This is the puzzle that I attempt to solve in this paper using a game-theoretic model.

In addition to the endogeneity, another factor that complicates the study of the relationship between investments and conflict is the extra-dyadic nature of the system. There are two pathways through which conflict between two countries affect the non-combatant countries. First, since firms have a limited budget, any capital they allocate to a country becomes unavailable for investing in another country. Thus, the risk of conflict between two countries doesn't just determine the capital investment in the warring parties (prior to the start of hostilities) but also the investment to other countries in the system.

Second, a conflict between two countries affects the countries' alliance partner. Countries may form alliances with other countries in order to deter aggression against them (Leeds, 2003). Accordingly, alliance choices can potentially change the ex-ante risk of war. This then affects capital flows as countries, that are otherwise at risk of experiencing conflict in the absence of an alliance, will now have a lower probability of conflict and, as a result, become an attractive destination for foreign capital.

The formal model attempts to capture all these dynamics - the firm's investment choice, the decision to instigate war, and the alliance choice, as parsimoniously as possible. The paper proceeds as follows. In the next section, I provide an overview of the literature on investment, conflict and alliance formation. In section 3, I propose a formal model delineating the game. I explain the environment, the players, their actions, and the subsequent payoffs. I present the solution to the game in section 4. I work out the strategies of the players and present propositions based on their equilibrium behavior. I present my empirical analysis in section 5 and discuss the results in the context of the game. Finally, I conclude by discussing the future course of action.

2 Literature

The literature in politcal science has extensively studied the link between economic interdepndence and conflict. Interdependence is when one country is dependent on another for some essential goods or services (Keohane and Nye, 1987). This interdependence then gives rise to conflicts in the system. Scholars have proposed various mechanisms through which interdependence leads to hostilities. These range from diverging interests of subnational entities, such as firms, interest groups, or nations (Mansfield and Pollins, 2001). However, much of the focus of this literature is on the relationship between trade and conflict.

Proponents of the democratic peace theory propose trade as a mechanism for less fighting among democracies (Oneal and Russet, 1997). They argue that trade has a pacifying effect and democracies fight less because they trade more with each other. Other studies

also validate the pacifying effect of trade. Mansfield and Pollins, 2001 find that countries with preferential trade agreement are less likely to fight. Similarly, Jackson and Nei, 2015 claims that there can be no peace in the system without trade.

Other works question the pacifying effect of trade. Their argument stems from the simultaneity in trade and conflict(Reuveny, 2001, Reuveny and Kang, 1996). Morrow, 1999 uses a formal model to stress the need to account for the endogeneity of trade to conflict. The primary reason for the endogeneity is that countries are quite selective in choosing their trading partner. Gowa 1995, considers the effects of trade on military powers and, using a game-theoretic approach, demonstrates why countries will trade with their allies and not their rivals. This is because trade with rivals produces a negative externality in that it contributes to the rival's military power. Another reason why trade may appear to reduce conflict is that countries that sign trade agreements are also likely to sign security agreements, which results in lower risks of war (Long and Leeds, 2006). Empirical studies that account for this endogeneity find no effect between trade and conflict (Keshk et al., 2004).

Compared to the literature on trade and conflict, the relationship between global capital markets and conflict is relatively less studied. This despite the fact that capital markets account for a much larger portion of the global economy. Additionally, global capital is extremely sensitive to the risk of war. The current literature on investments and conflict explore how investments reduce conflicts. These papers theorize that capital markets promote peace by reducing the uncertainty pertaining to leaders' resolve. They argue that leaders are able to credibly commit resolve in the face of capital flight which reduces the uncertainty and thus, lowers the risk of conflict (Gartzke and Li, 2003, Gartzke et al., 2001, Gartzke, 2007).

While these studies greatly advance our understanding of how investments reduce conflict, these do not take into account the simultaneity between the two. The logic for investments being endogenous to conflict is the same as that of the arguments for endogeneity

between trade and conflict. While investments may deter conflict, firms are less likely to invest in countries that are at risk of getting involved in a conflict, which in turn, reduces the opportunity cost for a potential aggressor. This paper aims to develop a framework that takes into account this cyclical relationship between investments and conflicts.

3 Model

3.1 Setup

The game consists of a set of 3 countries- $\mathcal{N} = \{$*Instigator, Target, Rival*$\}$, and a set of firms, $\mathcal{S} := \{S_1, \cdots, S_M\}$. At the start of the game, nature assigns the instigator,I, a vector of payoff shocks, η, that she would receive if she instigates a war against the target (T). The vector comprises of two dimensions - one each for the alliance configuration between the target T and the rival R. Let η_0 denote the payoff shock that I receives if R and T are not in an alliance. Similarly, let η_1 denote the payoff shock to I if I and T are allied. Thus, $\eta = \{\eta_0, \eta_1\}$. This shock can understood as the war payoff for the instigator.

Each of the two payoff shocks are drawn from two seperate distributions. Let F_0 and F_1 denote the distributions from which η_0 and η_1 are drawn respectively. While the shock is private information, the distribution from which it is drawn, F_i, for $i = \{0, 1\}$ is public knowledge. Also, the distribution F_0 first order stochastic dominates F_1. That is, the war payoffs that I receives when T and R are non-aligned must stochastically dominate the payoffs it receives when they are aligned. This is to capture the notion that the instigating country must find it more difficult to attack the target country if it is aligned with the rival country R than when it remains non-aligned.

The target T and the rival R then decide if they want to form an alliance with each other. I denote this choice by $a_i = \{0, 1\}$ for $i = T, R$ where $a_{1i} = 0$ indicates a decision to not ally and $a_{1i} = 1$ implies a willingness for an alliance. The action profile $\mathbf{a}_1 = \{a_{1T}, a_{1R}\}$ represent players' choices. Every action profile denotes an alliance configuration. Note that

alliances are formed *mutually*, that is, T and R form an alliance only if both choose to form an alliance,i.e., $a_{1R} = a_{1T} = 1$.

In practice, countries can form different types of alliances. They can form defensive alliances in which they come to the aid of their allies only if they are attacked but are not obliged to join the war if their allies are the attackers. For now, I only focus on defensive alliances. This decision will become clearer as I explain the game further. Thus, if T and R form an alliance, then it joins the war if T is attacked. The alliance decision affects the probability of winning a war. A war where T is allied with R will be more difficult to win for I compared to the scenario wherein T remains non-aligned.

Following the alliance game, the firm makes its allocation decision. Firms decide how much they invest in any given country in a period. For now, suppose that the firm is multinational and doesn't have a home country. Hence, it invests in locations purely on the basis of anticipated returns. The total capital that firms can invest is limited. Thus, their decision involves deciding how they allocate their limited capital across all the countries. Let b_j denote the total capital available to the firm S_j and x_{ij} denotes the amount that the firm S_j invests in country i. Then,

$$b_j = \sum_{i \in \mathcal{N}} x_{ij} \tag{1}$$

Finally, we get to the war game wherein the instigator I decides if she wants to attack the target country T. Let a_{2I} denote the action that country I takes in the war stage. War occurs if either of the countries choose to attack. Then $a_{2I} = 1$ if country I decides to attack and $a_{2I} = 0$ if she chooses peace.

Payoffs: Let v_{ij} denote the payoff that the firm S_j receives in country i. For an investment of x in country i, the firm gets a payoff of,

$$v_{ij}(x) = \begin{cases} A_i x^{\alpha_j} & \text{If no war in country i} \\ 0 & \text{If war in country i} \end{cases}$$

If there is no war, then the firm gets a return that is a function of its productivity, denoted by α_j and the country-specific technology factor, A_i. Note that this payoff that the firm gets is after the costs are subtracted. Thus, a firm earns a payoff of $A_i x^{\alpha_j}$ after accounting for the cost of capital and the tax. However, the firm gets 0 in case of a war. This denotes a destruction of capital due to war. Thus, the payoff for the firm is,

$$v_j = \begin{cases} v_{Rj}(x_{Rj}) & \text{If war occurs} \\ \sum_{i \in \mathcal{N}} v_{ij}(x_{ij}) & \text{If no war occurs} \end{cases}$$

The expected payoff for the firm S_j is,

$$V_j = v_{Rj}(x_{Rj}) Pr(war) + \left(\sum_{i \in \mathcal{N}} v_{ij}(x_{ij}) \right) \cdot (1 - Pr(war)) \tag{2}$$

Each country gets a benefit from the investment they receive. I represent this benefit as a linear function of the inward investment, i.e., tx_i. This can be understood as a tax that the government collects on the investment with t being the tax rate. However, countries can collect this tax at the end of the game only if there is no war. War destroys the capital invested in the country and hence, countries earn zero tax if they are involved in a war. Thus, the benefit for a country i from any investment, x is,

$$b_i(x) = \begin{cases} tx & \text{If no war in country i} \\ 0 & \text{If war in country i} \end{cases}$$

The combatants - I & T get a direct payoff from war if it occurs. The instigator I's direct payoff from war is given by the shock η. Thus, the total war payoff for I- payoff if war occurs, for I is follows:

$$u_I(w) = \eta \tag{3}$$

Similarly, the target T also gets a payoff, r_T from war. However, they get an additional amount, δ from the rival R if they are in an alliance, i.e., $a_{1R} \cdot a_{1T} = 1$. Thus, T's payoff from war is,

$$u_T(w) = r_T + \delta \cdot \mathbb{1}\{a_{1R} \cdot a_{1T} = 1\} \tag{4}$$

The rival R is not directly affected by the conflict between I & T. Since R is not directly involved in the conflict, any capital invested in that country remains intact at the end of the game. However, R is affected by the conflict if they are allied with T in that they are required to transfer δ to their ally T as an alliance obligation. Thus, R's payoff from war is,

$$u_R(w) = t \cdot \sum_{j=1}^{M} x_{Rj} - \delta \cdot \mathbb{1}\{a_{1R} \cdot a_{1T} = 1\} \tag{5}$$

In peacetime, all countries get to keep the capital invested in them and earn a tax revenue on that investment. Thus, the peacetime payoffs are,

$$u_i(p) = t \cdot \sum_{j=1}^{M} x_{ij} \qquad i = I, T, R \tag{6}$$

Then the expected payoff for country i is,

$$U_i = u_i(w) \cdot Pr(war) + u_i(p) \cdot (1 - Pr(war)) \tag{7}$$

3.2 Sequence

1. Nature decides the vector of payoff shock that the instigator I receives from initiating a war against the target T.
2. Countries play the alliance formation game wherein the target T and the rival R decide if they want to ally ($a_{1i} = 1$) or not ($a_{1i} = 0$). They form an alliance only if $a_{1R} \cdot a_{1T} = 1$
3. Firms make their investment decision and choose the amount of capital, x_{ij} they want

to invest in country i.

4. The Instigator I decides if they attack the target (T) country ($a_{2I} = 1$) or not ($a_{2I} = 0$).

5. All players collect their payoffs

4 Equilibrium Behavior

I solve the game by backward induction. I first derive the optimal strategy for I in the war stage. Then I compute optimal capital allocation by firms given the ex-ante risk of war. Finally, I attempt to solve the alliance game for $R \ \& \ T$.

4.1 The Instigator's Choice

Since the instigator moves last, their choice is conditional upon the alliance choice of $R \ \& \ T$ and the investments made by the firm. The alliance decision affects the shock that I gets. Suppose I gets a private shock $\eta_l \sim F_l$, where $l = 0$ indicates no alliance between $R \ \& \ T$ and $l = 1$ denotes an alliance. Then, I chooses to instigate war, $a_{2I} = 1$ if the payoff shock it gets from instigating war is greater than the loss of tax revenue from investments. Formally,

$$a_{2I} = 1 \iff \eta_l > t \cdot \sum_{j=1}^{M} x_{Ij} \tag{8}$$

Then the probability of war is,

$$\begin{aligned} Pr(war) &= Pr(\eta_l > t \cdot \sum_{j=1}^{M} x_{Ij}) \\ &= 1 - Pr(\eta_l \leq t \cdot \sum_{j=1}^{M} x_{Ij}) \\ &= 1 - F_l(t \cdot \sum_{j=1}^{M} x_{Ij}) \end{aligned} \tag{9}$$

Assumption 1. *Assume that F_0 and F_1 are unifrom distributions where $F_1 \sim U[0, e_1]$, $F_0 \sim [0, e_0]$ and $e_0 > e_1$.*

Since, $e_0 > e_1$, F_0 stochastically dominates F_1. This assumption represents the notion that it should be difficult for I to insitigate war against T when it is in an alliance with R than when it is non-aligned.

Then, the probability of war is,

$$Pr(war) = \begin{cases} 1 & \sum_{j=1}^{M} x_{Ij} = 0 \\ 1 - \frac{t}{e_l} \cdot \sum_{j=1}^{M} x_{Ij} & \sum_{j=1}^{M} x_{Ij} \in \left(0, \frac{e_l}{t}\right) \\ 0 & \sum_{j=1}^{M} x_{Ij} \geq \frac{e_l}{t} \end{cases}$$

As, we can see from the above equation, the probability of war decreases as the amount invested in I, x_I increases.

4.2 Capital Allocation

Firms take a decision based on the alliance network they see and the risk of war they anticipate. As explained above, the alliance choice affects the payoff shock that the instigator I gets and the subsequent probability of war. From eqn.2, the firm's expected payoff is,

$$\begin{aligned} V &= v_R(x_R)Pr(war) + \left(\sum_{i \in \mathcal{N}} v_i(x_i)\right) \cdot (1 - Pr(war)) \\ &= A_R x_R^{\alpha} Pr(war) + \{A_R x_R^{\alpha} + A_I x_I^{\alpha} + A_T x_T^{\alpha}\}(1 - Pr(war)) \\ &= A_R x_R^{\alpha} + \{A_I x_I^{\alpha} + A_T x_T^{\alpha}\}(1 - Pr(war)) \end{aligned} \tag{10}$$

Then, the firm solves the following optimization problem,

$$\max_{x_{ij}} A_R x_{Rj}^{\alpha} + \{A_I x_{Ij}^{\alpha} + A_T x_{Tj}^{\alpha}\}(1 - Pr(war)) \tag{11}$$
$$\text{s.t. } b_j = \sum_{i \in \mathcal{N}} x_{ij}$$

s

For this version of the paper, I consider a simplified problem wherein there is just 1 firm in the system, i.e., $|S| = 1$. This simplification allows me to isolate the relationship between the risk of war and an individual firm's actions without that effect being distorted due to competition with other firms. Future versions of the paper will have the equilibrium analysis for N firms.

When there is a single firm, the probability of war is,

$$Pr(war) = \begin{cases} 1 & x_I = 0 \\ 1 - \frac{t}{e_l} \cdot x_I & x_I \in \left(0, \frac{e_l}{t}\right) \\ 0 & x_I \geq \frac{e_l}{t} \end{cases}$$

And the optimization problem for the firm becomes:

$$\max_{x_i} A_R x_R^{\alpha} + \{A_I x_I^{\alpha} + A_T x_T^{\alpha}\}(1 - Pr(war)) \tag{12}$$
$$\text{s.t. } b = \sum_{i \in \mathcal{N}} x_i$$

I first evaluate the relative investments to I & T as a function of the other parameters of the model. Specifically, I am interested in the relationship between x_I & x_T and the respective country specific productivity factor. The following proposition states the variation between relative investments to I & T and the country specific factors.

Proposition 1. *Let ρ be the ratio of of equilibrium investments in I and T,i.e., $\rho = \frac{x_I^*}{x_T^*}$.*

Then, ρ increases as $\frac{A_I}{A_T}$ increases.

The proof of this proposition follows from the implicit function theorem. This proposition indicates the effect of firm productivity and the relative country-specific returns factor on capital allocation. This is a fairly intuitive result since it says that the firm will invest more in a country if it is more productive. This proposition demonstrates the similarity between the investment patterns in a model with the risk of war and a model with no war distortions (no risk of war). Note that in the model without war, the ratio of investments to I & T is given by the ratio $\left(\frac{A_I}{A_T}\right)^{\frac{1}{1-\alpha}}$ and hence, is increasing in $\frac{A_I}{A_T}$. This proposition suggests that the increasing relationship holds despite the risk of the instigator country initiating conflict.

Note that the the risk of war distorts the firm's objective function. This is because in the event of a conflict between the instigator country I and the target country T firm loses all of its investment in both these countries. Thus, it is expected that this will affect the capital allocation to I & T. The following proposition demonstrates the extent of that distortion with regards to the capital allocation to I & T.

Proposition 2. *In any interior solution of the firm's equilibrium, the firm always allocates higher capital to the Instigator country than to the Target country. That is, $x_I^* \geq x_T^*$*

This condition denotes the optimal division of capital between the instigator and the target. It captures the distortions in the firm's investment strategy introduced due to the risk of conflict. As the proposition suggests, in equilibrium, the firm allocates higher capital to the target firm than to the instigator firm. The result obtained here is due to two mechanisms operating in the same direction vis-a-vis the effect on x_T. First, the return on investments for the firm in the target country is contingent upon the instigator not declaring war. This disincentivizes the firm from investing a large amount in T without mitigating the risk of war. Second, any investment to I not just provides a return (like any investment in other country), but it also creates deterrence for I as the instigator stands to lose this investment due to conflict. this deterrence protect its investment in both I & T. The

instigator I, thus, collects a "rent" for not declaring war. These two mechanisms combined pushes the firm to move its investments from T to I giving us the above result.

Another key factor to consider is the firm's productivity. Firms with different levels of productivity will be affected more or less depending upon how the productivity factor interacts with the distortion introduced due to conflict. The following proposition theorizes this interaction.

Proposition 3. *Let ρ be the ratio of of equilibrium investments in I and T,i.e., $\rho = \frac{x_I^*}{x_T^*}$. Then, in any interior solution of the firm's equilibrium, there exists a threshold for firm productivity $\bar{\alpha}$ such that ρ decreases as α increases when $\alpha \leq \bar{\alpha}$ but increases with α in the range $(\bar{\alpha}, 1)$.*

The proof of this proposition builds on the implicit function theorem and is similar to the proof for proposition 1. The idea here is that ρ is increasing in α when it lies in the interval $[r^{\frac{1}{1-\alpha}}, (r(1+\alpha))^{\frac{1}{1-\alpha}}]$. Using the implicit function theorem, we can show that while ρ is always less than $(r(1+\alpha))^{\frac{1}{1-\alpha}}$, there is an $\bar{\alpha}$ such that the corresponding ρ is equal to $r^{\frac{1}{1-\bar{\alpha}}}$. Additionally, ρ is continuous in α implying that ρ must be smaller than $r^{\frac{1}{1-\alpha}}$ for $\alpha < \bar{\alpha}$.

This proposition captures the heterogeneity in firms' responses to geopolitical risks. It demonstrates how firm strategies varies with their productivity. Firms that are more productive, that is, whose productivity α is higher than the threshold $\bar{\alpha}$ will increase their relative investments in the instigator country as they become more productive. Whereas a less productive firm will invest a lower share of their budget to the instigator country as they become more productive. To clarify, the firm increases its investment to both I and T as it becomes more productive. However, when its productivity is less than $\bar{\alpha}$, its increase in investments in the target country will be large enough so as to lower the ratio ρ. However, as the firm gets more productive ($\alpha > \bar{\alpha}$), the relative increase in investment in I is large enough so that ρ increases. Intuitively, this is because a more productive firm pays a lower cost for diverting money away from optimal allocation (under no war distortion) to the instigator country and hence, can allot more capital as it gets even more productive.

Next, I consider the effect of t, which can be understood as the tax rate on any inward investment, and e_l, which is the upper bound of the support of F on capital allocation. The two factors can be combined into a ratio - $\frac{t}{e_l}$ which essentially captures the payoff of investments relative to war for the instigator country. For ex, if t/e_l is increasing, it implies that the value of any investment to the instigator country is increasing relative to its war payoff. Subsequently, e_l/t can be understood as the *risk of war*. That is because an increase in the ratio of e_l/t indicates an increasing value of war payoff relative to investments. Note that the *risk of war* is different than the probability of war, which is a function of t, e_l as well as the investment x_I.

Lemma 1. *There is a threshold, $\bar{\tau}$, given by $\bar{\tau} = b\left\{\frac{A_I^{(\frac{1}{1-\alpha})}}{A_I^{(\frac{1}{1-\alpha})}+A_R^{(\frac{1}{1-\alpha})}+A_T^{(\frac{1}{1-\alpha})}}\right\}$, such that if $\frac{e_l}{t}$ is lower than the threshold then,*

- *The probability of war is 0.*
- *The firm's capital allocation is the same as in the scenario with no conflict,i.e., it satisfies the following condition:*

$$\alpha A_I x_I'^{\alpha-1} = \alpha A_R x_R'^{\alpha-1} = \alpha A_T x_T'^{\alpha-1} \tag{13}$$

Note that the equation for optimal allocation in the above lemma is the solution for a firm's capital allocation problem in the setting when no country can initiate conflict. This is because when e_l/t goes down sufficiently, then the optimal investment under no war scenario, x_I' is large enough so that tx_I' is greater than e_l which implies that $F(tx_I') = 1$, which in turn, drives down the probability of war, given by $1 - F(tx)$, to 0. Intuitively, this lemma states that when the war payoff to the instigator country are not as high, then firms can simply ignore the risk and invest as if the instigator country cannot initiate conflict.

The target country is the most vulnerable in this setting since it is the most affected by the instigator country's actions. The following proposition characterizes the effect of the risk of war, e_l/t on the captial allocation to the target country.

Proposition 4. *In equilibrium, the amount of investments to the target country, x_T increases as the ratio $\frac{e_l}{t}$ decreases.*

The proof for this proposition follows from analyzing the firm's payoff function. Since the probability of war decreases with the investment in the instigator country, the firm's payoff function is not concave in x_I. This distortion in the payoff function results in the firm getting increasing marginal returns over some interval of x_I. Since the firm has budget constraints, the firm is incentivized to decrease x_T in order to inrease either x_I or x_R. Thus, as the risk of war increases the investment to the target country decreases.

There are two forces driving down investment in the target country. First, as the risk of war increases, firms have a higher incentive to divert more money to the instigator country with the goal of pacifying it. The returns on investment in the target and the instigator country is contingent upon the instigator country not initiating conflict, and thus, firms will invest more in the instigator country to protect their returns in both the affected countries. Second, as the cost of pacifying the instigator country goes up, the firm will divert investments away from both the target and instigator countries towards the safe shore, which is R. Thus, the investment in the target country goes down as the risk of war increases.

Next, I characterize the equilibrium investment to the instigator country. However, we need to know the relationship between the equilibrium allocation to I and R before we can theorize about the relationship between x_I and the risk of war.

Lemma 2. *x_I and x_R are inversely related. As, x_I increases, x_R decreases and vice-versa.*

I prove this by contradiction. Suppose there is an interval of e_l/t wherein x_I and x_R are both increasing as e_l/t increases. Then, that implies that in that interval, x_T must be decreasing. The only region where x_T is decreasing and x_I is increasing is when the firm is diverting money towards the instigator country in order to maintain peace and deter it from initiating conflict. However, the optimal way of allocating additional capital to I in order to keep the probability of war at 0 is to divert money from both R and T according to the country-specific factor. Thus, it cannot be that x_R is also increasing in this region.

Intuitively, this lemma states that when there is a possibility of conflict, the firm essentially has to choose between investing in the instigator country or the safe country, which is the rival R. This highlights the choice available to the firm. It can either use its capital to deter the instigating country or to invest in a "safe" country where their returns won't be affected. It can't do both since it has a limited budget.

Finally, the next describes the relationship between the investment to the instigator country and the risk of war.

Proposition 5. *In equilibrium, the amount of investments to the instigator country, x_I^* follows the following path:*

- *When $e_l/t \leq \bar{\tau}$, $x_I^* = b\left\{\frac{A_I^{\frac{1}{1-\alpha}}}{A_I^{\frac{1}{1-\alpha}}+A_T^{\frac{1}{1-\alpha}}+A_R^{\frac{1}{1-\alpha}}}\right\}$.*
- *When $e_l/t \in [t', z]$ for some $t' \in [\bar{\tau}, b]$, $x_I^* = e_l/t$.*
- *x_I^* is decreasing with e_l/t in the region $[b, z]$, where $z \geq b$.*
- *$x_I^* = 0$ when $e_l/t \geq z$*

Fig. 1 graphs the equilibrium allocation to the instigator cuntry as the risk of war increases. The proof for this follows by analyzing the relationship on intervals of e_l/t. As noted in Lemma 1, when $e_l/t \leq \bar{\tau}$, then the problem is an undistorted one and the firms invest as if there is no war. At $e_l/t = \bar{\tau}$, we reach the frontier and the firm increases its investment in the instigator country such that x_I stays at the frontier and is equal to e_l/t. However, as the risk of war increases further, the optimal allocation starts decreasing again because it becomes costly for the firm to divert capital from other profitable locations, specifically the safe country, R. Finally, after a certain point, the risks increase to such an extent that the firm reduces its investment in I to 0.

This proposition demonstrates the complexity of the distortion introduced by I's ability to initiate conflict. We can see that this ability creates 'rent' seeking opportunities for the instigator countries. Also, as we can see, it is not always true that an increasing risk of war leads to a decrease in investments. On the contrary, this proposition highlights

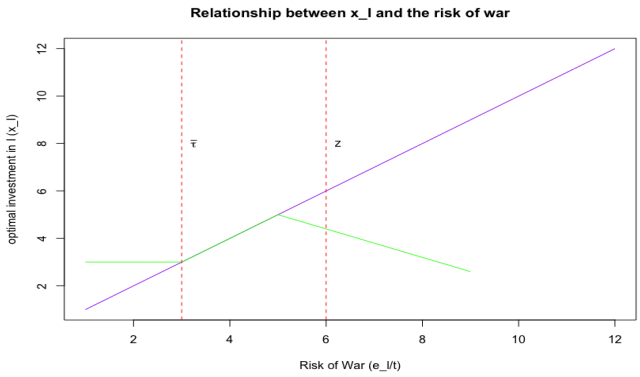

Figure 1: Green:Optimal Investment; Purple: No War frontier, b = 4.5

a mechanism wherein an increase in the risk of war over some interval can actually bring in more investments.

4.3 Alliance Game

The game is set up in such a way that the target country T always has an incentive to form an alliance. Thus, alliance formation depends on whether R wants an alliance ($a_{1R} = 1$). Let $x_R^{(1)}, x_I^{(1)}$, & $x_T^{(1)}$ denote the optimal capital allocation if $a_{1R} = 1$ and $x_R^{(0)}, x_I^{(0)}$, & $x_T^{(0)}$ be the optimal allocation when $a_{1R} = 0$. Then R's payoff from alliance is,

$$\begin{aligned} U_R(1) &= k \cdot x_R^{(1)} - \delta \cdot Pr(war) \\ &= k \cdot x_R^{(1)} - \delta\left(1 - \frac{t}{e_1} x_I^{(1)}\right) \end{aligned} \tag{14}$$

where k is the tax rate for R.

Similarly, R's payoff from no alliance is,

$$U_R(0) = k \cdot x_R^{(0)} \tag{15}$$

Then, R chooses an alliance only if $U_R(1) \geq U_R(0)$. That is,

$$
\begin{aligned}
a_{1R} = 1 &\iff U_R(1) \geq U_R(0) \\
a_{1R} = 1 &\iff k \cdot x_R^{(1)} - \delta \frac{t}{e_1} x_I^{(1)} \geq k \cdot x_R^{(0)} && (16) \\
&\implies k \cdot x_R^{(1)} - k \cdot x_R^{(0)} \geq \delta \frac{t}{e_l} x_I^{(1)} && (17) \\
&\implies x_R^{(1)} - x_R^{(0)} \geq \frac{\delta}{k} \frac{t}{e_l} x_I^{(1)} && (18)
\end{aligned}
$$

Now, it is that $\frac{t}{e_l} x_I < 1$. Also, this eqn implies that for the alliance to be viable, the investments that R receives when it is allied should be greater than the investments it receives when there is no alliance. When there is no alliance, there are twq strategies available to the firms. The first is to exit the market altogether from both I and T which would mean that R doesn't really have an incentive to ally with T since any alliance will make T relatively safer which would divert investments away from R. The second strategy is to invest in I in order to pacify it. In that case, an alliance between TR will drive down the probability of war which would result in reallocation of capital away from I. However, R has to get a significant chunk of that capital for it to consider an alliance. Otherwise, it won't ally.

I am in the process of working out the alliance game. The full characterization of the equilibrium of the alliance game will be a part of the future version of the paper.

5 Empirical Analysis

5.1 Data

I test the insights from the formal model in the Merger and Acquisitions behavior of foreign firms using empirical analysis. I compile data on Merger and Acquisitions from the SDC M & A dataset. The dataset consists of all mergers and acquisitions deals from 1980 to 2022. It contains information about the details of the deal, such as, the location of the target

firm, and the date when the acquisition was complete. I combine the $M \ \& \ A$ deals data with the geopolitical risk data (Caldara and Iacoviello, 2022). Caldara and Iacoviello present an index for geopolitical risk based on a text search of newspaper articles. Their index relies on the frequency of words typically associated with geopolitical risk, such as nuclear, war, and military mentioned in association with any country. I use their recent geopolitical risk index, which cover events in the period 1985 - 2022, since it is more relevant to the time period I am studying. Furthermore, the GPR index is a monthly average. However, I aggregate it into a yearly average in order to cover a wider period for investment deals. For the country specific economic indicators, I use data from the IMF.

5.2 Mergers and Acquisition and Geopolitical Risk

In this section, I investigate the relationship between $M \ \& \ A$ deals and geopolitical risks using data I meantioned above. Using the $M \ \& \ A$ data, I get the number of deals in any country in a given year. The idea is to analyze the variation in the number of deals with risk. I start with the following linear regression

$$Deals_{it} = \beta Risk_{it} + \gamma GDPgrwth_{it} + \nu_i + \lambda_t + \epsilon_{it} \tag{19}$$

where, $Deals_{it}$ is the total number of completed $M \ \& \ A$ deals received by a country i in time period (year) t. $Risk_{it}$ is the geopolitical risk index for country i for year t. The variable $GDPgrwth_{it}$ control for the GDP growth rate for the country. ν_i and λ_t refer to country and time fixed effects respectively.

As Table 1 shows, the coefficient in the model without any fixed shows a positive and significant correlation between the geopolitical risk of a country and the number of M & A deals it receives. However, once we control for country and time fixed effects, the correlation turns negative and remains significant. This implies that once we control for country and time varying effects, number of deals that a country receives decreases as the risk index increases. The model with both country and time fixed effects indicates that the

Table 1: M & A Deals and Geopolitical Risk

	Dependent variable:		
	deals		
	(1)	(2)	(3)
gpr_avg_100	24.293***	−2.107**	−2.475***
	(0.558)	(0.818)	(0.805)
GDPgrwth	7.504	−8.236*	−3.144
	(5.679)	(4.306)	(4.513)
Constant	50.284	116.205	−362.059***
	(32.282)	(107.423)	(134.107)
Observations	1,703	1,703	1,703
Country Fixed Effects	No	Yes	Yes
Time Fixed Effects	No	No	Yes
R^2	0.528	0.789	0.831
Adjusted R^2	0.527	0.783	0.822
Residual Std. Error	986.254 (df = 1700)	668.263 (df = 1657)	605.571 (df = 1619)
Note:			*p<0.1; **p<0.05; ***p<0.01

the number of deals drops by an average of 2.475 for every unit increase in the risk index.

This result is consistent with the findings of Glick and Taylor (2008) and Keshk et. al.(2004) that indicate a negative correlation between economic activity and conflict. Particularly, this result is inline with the theories proposed by Gartzke and Li (2003) that suggest a negative correlation between investment and conflict, albeit via a different mechanism.

However, the game theoretic model I presented above suggests that while the investments to the instigator country goes down *generally* as the risk of war increases. Connecting that to the empirical model, it should be the case that over some intervals of the risk the investments should go up as the risk increases. In order to do that, I stratify the data according to their risk levels. I stratify the deals into 4 levels - in country-year with risk less than 100, risk less than 200, risk less than 300, and all risk levels. Then, I run the linear model given by eqn. (19). In effect, I am running a simple version of a piecewise regression to unearth the relationship betwewn investments and risk for different intervals of risk. Table 2 shows the results of the regression.

As we can see from Table 2, the coefficients for the risk for the model fitted on data with risk level less than or equal to 100 shows a positive and significant correlation between investment deals and risk. The model fitted on risk less than 200 also shows similar results, albeit the coefficient is smaller than the coefficient for the model with risk less than 100. As I increase the length of the interval under study and consider the full sample (model 4), we get the result where the number of M & A deals is negatively correlated with risk.

The results in Table 2 indicate that there is indeed an interval for the risk of conflict where the country receives more investment as the geopolitical risk increases. This is in line with the insights generate from the model I presented in section 3. The formal model suggests that firms will invest more as the risk of war increases over some interval (relatively lower) in order to maintain peace. While I need to perform some more analysis in order to pin down the relationship of inward investment with risk, these initial results indicate that relationship between investments and the risk of war may be non-monotonic as theorized in the formal

Table 2: M & A Deals For Different Risk Levels

	Dependent variable:			
	Deals given risk level			
	$Risk \leq 100$	$Risk \leq 200$	$Risk \leq 300$	*All Risk Levels*
	(1)	(2)	(3)	(4)
gpr_avg_100	9.869^{***}	4.702^{***}	-1.609	-2.475^{***}
	(1.156)	(0.994)	(1.141)	(0.805)
GDPgrwth	-1.210	-0.735	-2.649	-3.144
	(2.910)	(3.387)	(4.395)	(4.513)
Constant	-320.912^{***}	-303.743^{***}	-367.956^{***}	-362.059^{***}
	(85.105)	(99.608)	(128.712)	(134.107)
Observations	1,641	1,676	1,694	1,703
Country Fixed Effects	Yes	Yes	Yes	
Time Fixed Effects	Yes	Yes	Yes	
R^2	0.670	0.843	0.825	0.831
Adjusted R^2	0.652	0.835	0.816	0.822
Note:				*p<0.1; **p<0.05; ***p<0.01

model.

6 Conclusion and Future Course of Action

In this paper, I explore the relationship between investments and the risk of conflict. Specifically, I attempt to study how the possibility of war affects firms' investment pattern and vice-verse. The relationship between investments and conflict is made complicated by the endogeneity between the two. I use a formal model to model this endogeneity and provide a framework that characterizes the relationship between investments and conflict. I follow up my formal model with an empirical analysis to test the insights generated from the theoretical model. Using data on mergers and acquisitions, I present some preliminary analysis that supports the equilibrium characterization of my formal model.

I am still in the process of solving the game. Specifically, I want to compute the trade-off between capital invested in R and I as that will govern not just if I goes to war but also whether R forms an alliance with T. Additionally, the relationship between x_R & x_I will inform us about how the firm solves its dilemma about investing in the instigator country to deter it from instigating conflict versus investing in a safer country. Furthermore, I am currently working on a model that extends the single player game into a multi-player game with N firms. The presence of multiple firms complicates the model since it introduces coordination problems among the multiple players.

Furthermore, I need to build on the preliminary empirical findings in this paper in order to pin down the relationship between investments and geopolitical risks. For this purpose, I am currently analyzing firm level decisions to check how their investment patterns are affected by the possibility of conflict. I am using the firm level data M & A data from SDC and combining it with the conflict data from Miltarized Interstate Dispute dataset (Palmer et al., 2022) to understand this relationship better.

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