Trade and War

Bachelor Thesis International Economics

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by

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The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

Credit title image: A painting by Hendrik van Minderhout (1665), depicting the battle of Lowsoft (Suffolk, East England) on June 3th 1665, which was the first fleet action of the Second Anglo-Dutch War. The two ships depicted on the foreground are the English HMS 'Royal Charles' and the Dutch 'Eendracht'. The battle ended in a Dutch defeat after the Eendracht blew up, killing all but five of its 400 man crew including the Fleet Commander Lieutenant-Admiral Jacob van Wassenaer Obdam.

The war was the second of a series of naval wars between England and the Netherlands. England wanted to end the Dutch domination of world trade by gaining control over marine trade routes. In spite of some initial English successes, the war ended in a Dutch victory. It all took place at a time of intense European commercial rivalry.

Abstract

In this thesis the relationship between trade and war is researched, in particular the possible pacifying effect of trade. Most data is obtained through the Correlates of War project. A panel dataset of state-dyads is constructed which contains information on militarized interstate disputes, international trade, contiguity, capabilities, interstate alliances, distance, GDP, trade system membership, religion and language. Various case studies will be discussed alongside a panel-wide analysis. Causality is inferred through a series of (panel data) vector autoregressive models and Granger Causality tests. The relationships are quantified using a probit model on conflict and an ordinary least squares regression on real bilateral trade. Evidence for the pacifying effect of trade is found, for a 1% decrease in the probability of conflict real bilateral trade has to increase by 81.16% on average. This effect can be enhanced through a higher intensity of bilateral trade. The reliability of the models that are used is questionable however. Endogeinity and multicollinearity impede the probit model, whilst heteroscedasticity and serial autocorrelation impede the panel data vector autoregressive model. Relevant and genuine exogenous instruments for real bilateral trade could possibly solve these issues.

Contents

1

Introduction

There is an unresolved debate among scholars in the international sciences about the effect of trade on conflict. On one side of the argument there are the classical economic liberals who argue that trade deters conflict through opportunity costs: trade creates bonds of mutual benefit that are costly to disrupt through war. Among the classics are enlightenment figures such as: Charles de Montesquieu[1], Jean-Jacques Rousseau[2], Adam Smith[3], Thomas

[1] Charles de Montesquieu (1750): *"The natural effect of commerce is to bring peace. Two nations that negotiate between themselves become reciprocally dependent, if one has an interest in buying and the other in selling. And all unions are based on mutual needs."* (book. XX, ch. 2).

[2] Jean-Jacques Rousseau, as well as Immanuel Kant, were influenced by the earlier French author Charles-Irénée Castel de Saint-Pierre who, in his essay *"Project for Perpetual Peace in Europe"*, argued that greater converse and increased trade among nations would make war less attractive (Saint-Pierre, 1713). In *"A Lasting Peace and the State of War"* Jean-Jacques Rousseau (1755), in his turn, argues that European unity will bring about peace and that the following is a necessity in doing so; *"Perfect freedom of trade for all time whether between state and state, or between any of them and the more distant regions of earth"* (p. 88), thereby recognizing the pacifying effect of trade.

[3] Adam Smith (1776), a passionate defender of free trade, in his essay *"Wealth of Nations"*, argues; *"nations have been taught that their interest consisted in beggaring all their neighbours. Each nation has been made to look with an invidious eye upon the prosperity of all the nations with which it trades, and to consider their gain as its own loss. Commerce, which ought naturally to be, among nations, as among individuals, a bond of union and friendship, has become the most fertile source of discord and animosity."* (Book. IV, ch. 3). While underlining the importance of free trade Smith also warns for the abrasive effect of commerce that arises when leaders approach international trade as a zero-sum game and, in effect, apply all kinds of trade impediments upon each other (Smith's statements and their relevance to date are discussed in a recent article by Paganelli and Schumacher (2019)).

Paine[4], Immanuel Kant[5] and somewhat later thinkers like: Jeremy Bentham[6], John Stuart Mill[7] and Richard Cobden[8]. Nowadays, their argument can be backed by a decent body of empirical research e.g. the articles of Lupu and Traag (2012), Dorussen and Ward (2010), Hegre, Oneal and Russett (2010), Gartzke and Hewitt (2010), Lektzian and Souva (2009), Polachek and Seiglie (2007), Gartzke (2007) and many more[9]. In fact, most empirical research finds evidence in favor of the liberal argument (Gartzke and Zhang, 2015).

Yet, on the other side of the argument, there are the economic realists. They believe in another line of reasoning based on many historical examples such as the mercantilist wars for foreign markets (17^{th}–18^{th} century), where competition over marine trade routes and monopolies actually caused states to go to war (a naval battle from such a war is depicted on the title image). After the period of imperialism in the 19^{th} century John Hobson (1902) and Charles Conant (1898) developed the theory of imperialism, which basically states that

[4]Thomas Paine (1791): *"In all my publications, where the matter would admit, I have been an advocate for commerce, because I am a friend to its effects. It is a pacific system, operating to cordialise mankind, by rendering nations, as well as individuals, useful to each other. As to the mere theoretical reformation, I have never preached it up. The most effectual process is that of improving the condition of man by means of his interest; and it is on this ground that I take my stand. If commerce were permitted to act to the universal extent it is capable, it would extirpate the system of war, and produce a revolution in the uncivilized state of governments."* (pt. II, ch. 5).

[5]In his essay: *"Perpetual Peace: A Philosophical Sketch"* Kant (1795) introduces a peace program to be implemented by governments based on a tripod of perpetual peace, the ultimate goal is to reach world peace. The tripod consist of three legs. The first leg is about republican constitutions, the second leg is about commercial spirit and the third one is about international law. The second leg is based on the assumption that economic interdependence and trade will reinforce liberal norms and create transnational ties that encourage accommodation and cooperation rather than conflict (Davis, Oneal and Russett, 1998).

[6]Jeremy Bentham (1843): *"All trade is in its essence advantageous—even to that party to whom it is least so. All war is in itself ruinous; and yet the great employments of government are to treasure up occasions of war, and to put fetters upon trade"* (p. 552). In part four of his essay *"Principles of International Law"* (named: *"Plan for an Universal and Perpetual Peace"*) Bentham makes the argument, similar to Smith, that free trade between nations is the ultimate breakthrough on the way to peace, yet leaders of nations do not realize this and view international trade as a zero-sum game (I am paraphrasing) and thus impose all kinds of trade restrictions. Moreover, he argues, that it are actually these kind of trade restrictions that provoke armed conflict (Joas and Knöbl, 2013)

[7]John Stuart Mill (1848) *"The economical advantages of commerce are surpassed in importance by those of its effects which are intellectual and moral. [...] Commerce first taught nations to see with goodwill the wealth and prosperity of one another.* (book. III, ch. 17)

[8]Richard Cobden (1868): *"But when I advocated Free Trade, do you suppose that I did not see its relation to the present question, or that I advocated Free Trade merely because it would give us a little more occupation in this or that pursuit? No; I believed Free Trade would have the tendency to unite mankind in the bonds of peace, and it was that, more than any pecuniary consideration, which sustained and actuated me, as my friends know, in that struggle. And it is because I want to see Free Trade, in its noblest and most humane aspect, have full scope in this world, that I wish to absolve myself from all responsibility for the miseries caused by violence and aggression, and too often perpetrated under the plea of benefiting trade."* (vol. II, peace. I).

[9]See: Berbaum, Oneal and Russett (2003), Chang, Polachek and Robst (1999), Oneal and Russett (1999), Copeland (1996), Moaz, Oneal, Oneal and Russet (1996) and Oneal and Russett (1997).

competition for export markets can lead to interstate conflicts. The American School of economics (i.e. Alexander Hamilton[10]), inspired by earlier mercantilist thinkers such as Jean-Baptiste Colbert[11], argues that trade also increases states' capacity to wage war, since trade flows are easy to tax. The extra government income increases states' capabilities and can thus instigate conflict between nations.

In more recent times, some realists argue that trade does not influence conflict at all since it is subordinate to many other political considerations (Blainey, 1973; Blanchard and Ripsman, 1994; Levy, 1989). Other realists argue that economic interdependence creates the means for states to demonstrate resolve without resorting to military violence (Boehmer, Gartzke and Li, 2001). Todays neorealists, much like Hobson and Conant, argue that trade can actually cause conflicts since tensions may arise over the relative distribution of the gains from trade between two nations (Waltz, 1979; Mastanduno, 1993; Snidal, 1993). There is both theoretical (Morrow, 1999) and empirical (Li and Reuveny, 2011; Cao, Siverson and Ward, 2007; Hoff and Ward, 2007; Keshk, Pollins and Reuveny, 2004) evidence for the realist argument and even some studies have found empirical evidence for the neorealist argument (Barbieri, 1996; Barbieri and Levy, 1999).

In this debate scholars have argued for years based on theory and a minimal amount of empirical research, mainly due to the absence of both trade and conflict data and rigorous econometric tools. Furthermore, most research has been performed by political sci-

[10] Although Alexander Hamilton, a dedicated advocate of the infant industry thesis, was in favor of limited protectionism and believed its benefits could help nations wage war (or protect marine trade routes), he did not oppose the liberal argument about the benefits of free trade on the cultural and political relationship between states. He simply deemed its effect subordinate to the increased capability of weak economies that, according to him, arise from protectionism. Economic liberals and economic realists are often portrayed as two tightly unified opposing schools, that view, however, is oversimplified. This is also pointed out by Smith's warning about the potential abrasive effect of commerce. Just like Smith points out limitations of the liberal argument in favor of free trade, Hamilton acknowledges the benefits of free trade on political and cultural facets (Hamilton (1791); Smith (1776); Harlen (1999)).

[11] Jean-Baptiste Colbert (1666): *"Commerce is the source of finance, and finance is the sinews of war."* (vol. III, pt. 1, p. 37). Colbert makes this offhand statement as if it is so obvious that no further explanation is needed, without discussing issues such as transnational ties and economic interdependence. He argues that the sole purpose of fiscal policies is to increase royal revenues, which come from taxes payed by nationals. According to Colbert the only way to lighten the tax load is to attract cash from other countries, keep it in the local economy and hinder its export (Wolfe, 1966). Colbert does not consider the pacifying effect of economic interdependence but simply argues that larger economies can finance war better and will thus be more conflict prone. On itself this seems to be a reasonable argument, in this research it is also found that larger economies are more conflict prone (see table 3.3 and 5.5). International trade, however, is not the most important factor that determines a nation's GDP, the population size, for example, is far more important (this can also be seen in table 3.3).

entists who often overlook the important nuanced aspects of international trade. Much political research has, for example, not differentiated between multilateral and bilateral trade, which have different effects on conflict. This is proven both theoretically and empirically (Martin, Mayer, and Thoenig, 2008). Economists are mostly interested in the reverse causality: the effect of war on trade (Glick and Taylor, 2010; Blomberg and Hess, 2006; Anderton and Carter, 2001). However, there are also some economists who have studied both the causality running form war to trade and the causality running from trade to war (Martin, Thierry and Thoenig, 2007).

In the last 20 years, empirical research has been gaining ground in the discussion. However, the quality of the data that was used during that period is questionable. Gilber, Little and Miller (2016) found large errors in the commonly used Militarized Interstate Disputes database from the Correlates of War project. Although the researchers note that these problems probably do not affect our current understandings of what predicts the onset of interstate conflict, they do find that dispute escalation, duration and reciprocation all change substantially when the corrected data is used. Moreover, the researchers found that changes in the data had substantial effects on the results of existing studies. All these errors are corrected in the new Correlates of War dataset that will be used in this research.

Furthermore, in the debate between liberals and realists, some scholars argue that too many arguments are based on assumptions rather than data (Barbieri and Keshk, 2011). Assumptions are necessary in scientific research, but assumptions are not facts, neither do they represent reality. In science, there are no sacred truths, in fact, it is scientific tradition to question conventional wisdom. It is worrisome that researchers in this field take a stand point in the debate between liberals and realists. Science is not about proving a point, it is about gaining knowledge. Researchers should leave their opinion behind and let the data and econometrics tell them what to believe a posteriori. Besides, it cannot be a coincident that supporters of the realist claim keep finding a positive to moderate effect of trade on conflict and supporters of the liberal argument invariably find a negative effect, whilst studying the same data (to a large extend). In my opinion, this puts into question the credibility of these researchers and their scientific independence.

This thesis contributes to the growing body of empirical research in this field, based

on the most recent and updated databases from the Correlates of War project. The matter will be analyzed from an economic perspective, incorporating the most relevant aspects of international trade, in particular the gravity variables. In this thesis no stand point in the debate between the realists and the liberals will be taken, the data will be examined without prejudice, accepting whatever conclusion may result from it.

The relationship between war and trade is researched through a panel dataset of state-dyads. First, causality will be inferred through a series of (panel data) vector autoregressive models and Granger Causality tests. Next, the relationship will be quantified using different types of regressions. A unilateral causality is found running from trade to conflict. In addition, support for the liberal claim is found. The marginal effect of trade is that an 81.16% increase in trade volumes will decrease the likelihood of conflict by 1%. Furthermore, the relationship between absolute trade volumes and the likelihood of conflict is particularly non-linear, meaning that the pacifying effect can be optimally utilized when trade flows are initially low.

Implications for the world are numerous, policy makers could take these findings into account when negotiating over tariffs or dealing with economic sanctions. More generally, whenever the interplay between trade in conflict comes up, these findings can be useful. Although, in my opinion, the research question is already quite captivating in its own right.

In the next chapter the research question and hypotheses will be discussed, in chapter three a description of the datset will be provided, chapter four outlines the methodology, the empirical findings will be presented in chapter five, further results are given in chapter six, and finally, the hypotheses will be answered in chapter seven, where the thesis will also be concluded by answering the main research question.

2

Research Question and Hypotheses

The main question that is addressed in this thesis is:

Can international trade reduce interstate conflicts?

This question will be answered through deductive testing of five hypotheses that are formulated based on theory and recent empirical research. The research question implies that there is a certain causality between trade and conflict in general. Specifically, that there is causality running from trade to conflict. As mentioned, a large body of research has found that trade has pacific effects (Gartzke and Zhang, 2015). So, the first hypothesis is:

1. There is an identifiable causality running from trade to conflict.

Once causality has been established, the effect of trade on conflict should be quantified. Where both the sign and magnitude of the effect are of interest. This could be extended to an estimate of the marginal effect at different levels of trade volume. The next hypothesis follows:

2. Real bilateral trade will reduce the likelihood of interstate conflict.

Previous research has found that it is critical to include the gravity variables in any models on trade and war (Hegre, Oneal, and Russett, 2010). The researchers mention that both trade and conflict are influenced by nations' sizes and the distance separating them. By including the variables Gross Domestic Product (GDP) and distance, the effect of trade on conflict can be estimated with higher precision. Because you control for the fact that large, proximate states fight more and trade more, which will otherwise lead to spurious results on the relationship between trade and war. The next hypothesis follows:

3. The gravity variables significantly influence the effect of trade on conflict.

The world trade organization (WTO) states that one of the benefits of trading systems is that they contribute to peace and stability (World Trade Organization, 2019, p. 46). It would be interesting to find out whether any empirical support for this claim can be found. Based on the assumption that membership of the WTO will lead to more trade and thus a higher degree of economic interdependence between members, it is expected that this claim is true. The next hypothesis follows:

4. Members of the World Trade Organization are less likely to engage in conflict.

Another interesting aspect of trade to be researched is the difference between the effect of bilateral and multilateral trade on interstate conflict, which should -theoretically- have opposite signs (Martin, Mayer, and Thoenig, 2008). The underlying assumption is that economic interdependence deters states from military conflict. The next hypothesis follows:

5. A higher intensity of bilateral trade will lower the probability of conflict.

3

Data

In this chapter a description of the dataset will be provided, including all decisions made in processing the variables. A summary of the data can be found in table 3.1. The research period is set from 1960 to 2010. Most data is gathered from the Correlates of War (COW)[12] project, which is an academic study of the history of warfare started in 1963 by David J. Singer at the University of Michigan. The project seeks to collect reliable quantitative data on international relations and makes this freely available to the research community. In this research only interstate data is considered, "states" are defined as sovereign states within the international system when they are recognized as such by the COW project, a complete list can be found on their website.

3.1. Militarized Interstate Disputes

The dependent variable is the level of Militarized Interstate Dispute (MID) within each dyad, retrieved from the dataset of Johnson, Kaplan, Moaz, Ogunkoya and Shreve (2019). The researchers define a MID as "*a set of incidents involving the deliberate, overt, government-sanctioned, and government-directed threat, display, or use of force between two or more states*". These are not necessarily bilateral disputes. When multiple states are involved in a dispute, this will result in multiple entries in the dataset at each of the dyads involved. MID's are coded in five different levels according to the highest level of hostility within the dispute:

1. None

[12] http://www.correlatesofwar.org/

2. Threat to use force
3. Display of force
4. Use of force
5. Interstate war

A "threat to use force" is broadly defined as a threat to; blockade, occupy terrain, declare war, join a war or use force. A "display of force" is defined as a show of troops, ships or planes, an alert, a mobilization or the fortification of a border. A "use of force" is defined as a border violation, a blockade, the occupation of territory, a seizure, a clash, a raid or a declaration of war. The highest level of hostility, an "interstate war", is reached when armed forces of two or more states suffer at least 1000 battle-deaths in a series of sustained battles. A state is considered a participant in the war when it suffered at least 100 battle-deaths or deployed at least 1000 troops in battle-related activities, or both. Note that a declaration of war is not coded as an interstate war but rather as a use of force. Once chemical, biological or radiological (CBR) weapons are used, the dispute is also defined as an interstate war.

The dataset consists of 4926 unique entries in the time period 1816-2010. A multilateral dispute between four states that lasts three years will have $4 * 3 = 12$ entries, so not all of the entries are unique disputes. After filtering the dataset to the appropriate research period and matching the MID's to the available trade data a total of 734 disputes remained (0.43% of the total observations). The absence of a MID is interpreted as an absence of conflict and is thus coded as "1", meaning that for the majority (170.221) of the observations no dispute is found. This is good news because it implies that states are generally not at war with each other. For some statistical analyses in this research a dummy variable "MIDNumer2" is used, which yiels a value of either "0" when no dispute is observed, or "1" when a dispute is observed.

3.2. Real Bilateral Trade

The most important independent variable is the amount of bilateral trade. The dataset of Barbieri, Keshk and Pollins (2009) is used for the collection of the trade data. The researchers obtained the data from the International Monetary Fund's (IMF) Direction of Trade Statistics (DOTS) database in October 2015 (Barbieri and Keshk, 2016).

Real bilateral trade is calculated by taking the imports of State A from State B, in millions of current U.S. dollars and then adding that to the imports of State B from State A. Next, a GDP deflator from the World Bank[13] is used to convert the current trade to real trade (in 2010 dollars) as is described in equation 3.1.

$$Real\ Bilateral\ Trade = (trade\ flow_{a\to b} + trade\ flow_{b\to a}) * GDP\ Deflator \quad (3.1)$$

The dataset was filtered on the selected research period and all missing variables were removed since we are only interested in the specific effect of trade on militarized interstate disputes (in that sense, all other variables in the statistical analysis of the onset of interstate conflict are subordinate to the effect of real bilateral trade). This results in an unbalanced panel dataset with gaps and a total of 170.955 observations over 12.982 panels. Each panel contains a unique country pair (dyad) that is listed only once, so [Russia, Germany] = [Germany, Russia]. All the other variables in the dataset were added in the columns next to dyadic trade.

For the statistical analysis the natural logarithm of dyadic trade was taken, in order to interpret the percentage change. Because some states reported trade flows of less than one million U.S. dollar the dyadic trade was first multiplied by one million to return the approximate dollar amount of trade so that all values were greater than one and the natural logarithm could be interpreted. Some states reported no trade which resulted in missing values since ln(0) is undefinded, these missing values were replaced with zeros.

3.3. Intensity of Bilateral Trade

For this variable the dataset of Barbieri, Keshk and Pollins (2009) will be used again. It contains state-level data on total annual imports and exports in current U.S. dollars. The variable is calculated using equation 3.2.

$$Intensity\ of\ bilateral\ trade = \frac{trade\ flow_{a\to b} + trade\ flow_{b\to a}}{total\ imports_a + total\ exports_a + total\ imports_b + total\ exports_b} \quad (3.2)$$

The idea behind this variable is that it puts a kind of "weight" on the absolute amount

[13] https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS

of real bilateral trade. Therefore, it will also be interacted with bilateral trade in the probit model (discussion follows in 4.2). The rationale behind a possible causality between trade and war, in both the liberal and realists arguments, is grounded in the political ties that arises from the economic interdependence that exists between trading nations. The absolute value of bilateral trade can only be interpreted in that sense when it is placed in the international context. A relatively high amount of bilateral trade does not say much about economic interdependence when both states hold large trading economies. Economic interdependence is relative, it always depends on the amount traded between two states relative to the amount these states trade with the rest of the world. That intensity, is what this variable describes.

Although trade flow$_{a\rightarrow b}$ and trade flow$_{b\rightarrow a}$ only contain import data, export data is also considered when calculating the intensity of bilateral trade. The reason is that we want to control for the difference between exporting and importing economies. A large exporting economy might depend heavily on one state for its imports, but imports are relatively unimportant to their economy. Their economy depends much more on countries to which they export, which influences economic interdependence within the dyad, since that is always relative. By including exports in equation 3.2, this effect is taken into account accordingly.

3.4. Contiguity

This variable describes the direct contiguity within each dyad, the dataset of Diehl, Gochman, Schafer, Stinnett and Tir (2016) is used. It describes the contiguity in five categories, one for land contiguity and four for water contiguity. One final category is added when there is no direct contiguity:

1. Intersection of homeland territory
2. Separated by 12 miles of water or less
3. Separated by 24 miles of water or less
4. Separated by 150 miles of water or less
5. Separated by 400 miles of water or less
6. No direct contiguity

The intersection of homeland territory can consist either of a land boundary or a river. The water categories are not arbitrarily chosen. The separation of 12 miles of water reflects the widely recognized 12-mile limit for territorial waters. The 24 mile limit reflects the maximum distance at which two states' 12-mile territorial limits can intersect. The 150 miles is a kind of historical limit, reflecting the average distance a sailing ship could travel in a day. Lastly, the 400 mile limit reflects the distance at which two 200-mile exclusive economic zones can interact.

Because contiguity can change over time, annual data was used in constructing this variable. In 3731 observations direct contiguity was found, all the other observations are coded as "6". This amount might seem trivial on a dataset of 170.955 observations in total, but in 410 out of the total 734 militarized disputes (55.9%) direct contiguity was observed. So, the majority of observed conflicts take place between neighboring states, which implies that conflicts are probably more likely to arise among bordering nations.

3.5. Composite Indicator of National Capability

The dataset of Bremer, Singer and Stuckey (1972) which was later expanded by Singer (1987) is used to describe the "power" of nations. The dataset contains a Composite Indicator of National Capability (CINC) which is defined annually through their material capabilities. The researchers define power as "*the ability of a nation to exercise and resist influence*", they emphasize that material capabilities are not identical to power. But also state that, given their association, material capabilities can be defined in operational terms in order to better understand power.

Demographic, industrial and military indicators were selected by the researchers as the most effective measures of a nation's material capability. Moreover, they state that these indicators reflect best both the breadth and depth of resources that a nation could bring to bear in the case of a militarized dispute. The researchers have deliberately left out other indicators such as geography and natural resources, which clearly affect material capabilities. They did this because the effects of these indicators on power are too dyad-specific and thus permit valid cross-national comparison. These kind of indicators pertain to the relationship between nations rather than the characteristics of any given nation. The indi-

cators that actually were used are:

- Military expenditures (in thousands of current U.S. Dollars)
- Military personnel (in thousands)
- Iron and steel production (in thousands of tons)
- Primary energy consumption (in thousands of coal-ton equivalents)
- Total population (in thousands)
- Urban population (In thousands)

For urban population, in the period from 1816-2001 inhabitants of cities with a population greater than 100.000 are counted, and in the period from 2002-2012 inhabitants of cities with a population greater than 300.000 are counted. All of the individual components along with the composite indicator itself are included in the probit model. Because all the variables are defined at a state-level they are added together in order to construct a dyadic value. This means that a dyad that consists of two average size states could end up with the same indicator as a dyad that consists of a large and a small sized state, this is a logical consequence of dealing with a dyadic dataset.

3.6. Formal Interstate Alliance

For these dummy variables on international military alliances the dataset of Gibler (2009) was used, which is an expansion of the original dataset assembled by Singer and Small (1966). It contains data on different alliance types, which all represent a different level of support that is pledged to other alliance members.

The first type of alliance is a defense pact which the researchers define as a pact that "*commit states to intervene militarily on the side of any treaty partner that is attacked*" (Gibler and Sarkees, 2004). The exact obligations and provisions required for each alliance treaty is detailed in a paper by Leeds, Long, McLaughlin Mitchell and Ritter (2002).

The second type of alliances are neutrality and non-aggression pacts, which the researchers define as a pact that "*specifies that parties remain militarily neutral if any co-signatory is attacked*". Furthermore, they note that a neutrality pact is usually more specific than a non-aggression pact. A separate dummy is added to the dataset for both neutrality and non-aggression pacts.

The final type of alliances are the so called "ententes" which the researchers define as a pledge of "*consultation and/or cooperation in a crisis, including an armed attack*". They also note that broad statements of eternal friendship or any other similar observations do not qualify as ententes in the dataset.

In a total of 11.642 observation an alliance pact was found, this is only a fraction (6.8%) of the complete dataset. However, in 210 out of the 734 disputes (28.6%) data on alliance pacts were found. The assumption is made that when no data is present, no alliance pacts are in place, these missing values are thus coded as "0". These kind of assumption are often made within this field of research and it is a heavily debated topic, e.g. the articles of Keshk, Pollins and Reuveny (2011) and Barbieri and Keshk (2011).

3.7. Distance

This variable marks the distance between the capitals of each dyad in miles. The published data from Hegre, Oneal and Russett (2010) was used. As the researchers discuss, contiguity and distance are two different variables that should both be included in the regression. In previous research both contiguity and distance were found to be very significant in the conflict equations. As can be seen in section 3.4, bordering states are particularly prone to conflict. Furthermore, the researchers note that, non-contiguous states in the same region are more likely to fight than remote pairs. However, two states may be contiguous but also have very distant capitals. These kind of states should thus be less prone to conflict than states that have more proximate political and economic centers.

Because the research period of Hegre, Oneal and Russett (2010) only runs until 2000, part of the data is missing. These variables could easily be replaced under the assumption that states' capitals did not move in the period from 2000-2010. They are, however, not replaced because, in this research, distance will always be implemented together with GDP data. The GDP data is obtained from that same publication and the missing values in GDP cannot be replaced under such mild assumptions. In the period 1960-2000 a total of 36 missing values were found, these were also left as such.

3.8. Gross Domestic Product

As mentioned, the GDP data will be obtained from the published dataset of Hegre, Oneal and Russett (2010), who obtained their GDP data from Gleditsch (2002). Gleditsch provides an extensive discussion on the treatment of missing values. The researcher uses two different data sources; the Penn World Table (PWT)[14] (76.16%) and estimates based on the World Factbook[15] (12.7%). The researcher also creates estimates of some remaining missing values based on lags of non-missing observations (11.14%).

The GDP data is provided on a state-level in real U.S. dollars (base 1985). For this research, the GDP's of both states within a dyad are added together to create the dyadic GDP. Missing values in the period from 2000-2010 are left as missing values. In the period 1960-2000 a total of 1496 missing values were found, these were also left as such.

3.9. Trade System Membership

For these dummy variables on trade system membership the data of Nordstrom, Pevehouse and Warnke (2004) is used. The dataset contains annual information on states' membership of International Governmental Organizations (IGO's). For this research we are only interested in two IGO's namely; the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization. The WTO was officially commenced on January 1st 1995 under the Marrakesh Agreement and was a replacement of the GATT. From that moment on, all 128 GATT contracting parties officially became known as WTO members. So, for this research, GATT contracting parties will be used for the period 1960-1994 and WTO membership for the period 1995-2010.

The IGO dataset only runs until 2005, so some missing observations were found, all these observations were left as missing values. Two dummy variables are created from the data. The first variable takes on the value "1" when both states in a dyad are a members of GATT/WTO, the second variable takes on the value "1" when only one state is a member of GATT/WTO. Logically, these variables are to be interpreted relative to the nominal case were both states are not a member of GATT/WTO.

[14] see Heston and Summers (1991).
[15] see Central Intelligence Agency (1998)

3.10. Religion

For this variable the dataset of Henderson and Moaz (2013) was used, the dataset is named the World Religion Project (WRP). It contains half-decade state-level information on adherents by religion, which is also provided as percentages of the state's population. The researchers list a set of specific criteria a belief system has to meet in order to be defined as a religion. From this research 14 major religions emerged, some major religions consist of multiple religious families of which data is also provided.

For this research only the percentage values of the 14 major religions are considered with an additional category for all non-religious citizens. First, the half-decade data is converted to annual data based on the assumption that the composition of religious adherents did not change in the extended four years. Next, an overlay is created marking the percentage of common religion within each dyad, resulting in a percentage value running from zero to one. All missing observations were left as such.

3.11. Language

For this variable the Centre d'Études Prospectives et d'Informations Internationales (CEPII) dataset of Melitz and Toubal (2014) was used. It contains time-invariant dyadic data on common official languages (COL), common spoken languages (CSL) and common native languages (CNL). The researchers used the World Factbook (Central Intelligence Agency, 1998) definition for COL, a dummy variable is created which takes on the value "1" when the states in the dyad have a common official language. CSL and CNL have to be spoken by at least 4% of the population in order to be recognized as native/spoken languages. These last two variables result in a percentage value running from zero to one.

Because this dataset does not originate from the COW project matching the data is challenging. Some countries where separated in the COW dataset but where united in the CEPII dataset, for example: Germany and the German Democratic Republic and also North and South Korea. Other countries were named differently such as Côte d'Ivoire and Ivory Coast. All these kind of differences were matched as well as possible, but still some countries in the COW dataset could not be found in the CEPII dataset namely: Botswana, Equato-

rial Guinea, Ethiopia, Kosovo, Lesotho, the Maldives, Montenegro, Mongolia, Myanmar, Namibia, Palau and Swaziland. All missing observations were left as missing values. These gaps cannot be filled without extended research on languages, which is beyond the scope of this research.

3.12. Data Summary

See table 3.1 for a summary of the dataset, table 3.2 for descriptive statistics and table 3.3 for the correlation matrix.

Table 3.1: Data summary

Name	Label	Sort of Variable	Description	Source
Militarized Interstate Dispute	MIDNumber	ordinal	The highest level of hostility in an observed militarized dispute on a scale from 1 to 6.	Johnson et al. (2019)
Militarized Interstate Dispute	MIDNumber2	dummy	Returns "1" when a dispute is observed, "0" otherwise.	Johnson et al. (2019)
Real Bilateral Trade	RealBiTrade1	continuous	Real bilateral trade in 2010 U.S. dollars.	Barbieri et al. (2009)
Intensity of Bilateral Trade	IOBT_NX	ratio	$\frac{Current\ bilateral\ trade}{current\ import_{a+b} + current\ export_{a+b}}$	Barbieri et al. (2009)
Contiguity	Direct_contiguity	ordinal	The level of contiguity on a scale from 1 to 6.	Diehl et al. (2016)
Military Expenses	milex_t	continuous	Dyadic military expenditures in thousands of current U.S. dollars.	Bremer et al. (1972)
Military Personnel	milper_t	continuous	Dyadic military personnel in thousands.	Bremer et al. (1972)
Iron and Steel Production	irst_t	continuous	Dyadic iron and steel production in thousands of tons.	Bremer et al. (1972)
Primary Energy Consumption	pec_t	continuous	Dyadic primary energy consumption in thousands of coal-ton equivalents.	Bremer et al. (1972)
Total Population	tpop_t	continuous	Dyadic total population in thousands.	Bremer et al. (1972)
Urban Population	upop_t	continuous	Dyadic urban population in thousands.	Bremer et al. (1972)
CINC	cinc_t	ratio	Dyadic composite indicator of national capabilities.	Bremer et al. (1972)
Defense Pact	defense	dummy	Returns "1" when the dyad signed a defense pact, "0" otherwise.	Gibler (2009)
Neutrality Pact	neutrality	dummy	Returns "1" when the dyad signed a neutrality pact, "0" otherwise.	Gibler (2009)
Non-aggression Pact	nonaggression	dummy	Returns "1" when the dyad signed a non-aggression pact, "0" otherwise.	Gibler (2009)
Entente Statement	entente	dummy	Returns "1" when the dyad signed an entente statement, "0" otherwise.	Gibler (2009)
Distance	Distance	continuous	Distance between the dyad's capitals in miles.	Hegre et al. (2010)
GDP	GDP	continuous	Dyadic gross domestic product in real 1985 U.S. dollars.	Hegre et al. (2010)
Common GATT/WTO Membership	trade_common	dummy	Returns "1" when both states in the dyad are a GATT/WTO member, "0" otherwise.	Nordstrom et al. (2004)
One GATT/WTO Member	trade_one	dummy	Returns "1" when one state in the dyad is a GATT/WTO member, "0" otherwise.	Nordstrom et al. (2004)
Religion	Religion_Overlay	ratio	Marks the percentage overlap of religious adherents within the dyad.	Henderson and Moaz (2013)
Common Official Language	col	dummy	Returns "1" when the dyad has a common official language, "0" otherwise.	Melitz and Toubal (2014)
Common Spoken Language	csl	ratio	Marks the percentage overlap of spoken languages.	Melitz and Toubal (2014)
Common Native Language	cnl	ratio	Marks the percentage overlap of native languages.	Melitz and Toubal (2014)

Table 3.2: Descriptive statistics

Name	Label	Sort of Variable	Observations	Missing Observation	Mean	Standard Deviation	Minimum	Maximum	Variance	Kurtosis
Militarized Interstate Dispute	MIDNumber	ordinal	170.955	0	1,0117	0,1833	1	5	0,0336	227,1369
Militarized Interstate Dispute	MIDNumber2	dummy	170.955	0	0,0043	0,0653	0	1	0,0043	231,2308
Real Bilateral Trade	Trade	continuous	170.995	0	245,2694	5931,825	0	564263,5[1]	$3,52 * 10^7$	3615,90
Intensity of Bilateral Trade	IOBT_NX	ratio	170.591	364	0,0005	0,0040	0	0,2041[2]	0,00002	956,4055
Contiguity	Direct_contiguity	ordinal	170.955	0	5,9212	0,5865	1	6	0,3440	65,1491
Military Expenses	milex_t	continuous	156.307	14.648	$1,51 * 10^7$	$6,76 * 10^7$	0	$7,70 * 10^{8}$[3]	$4,57 * 10^{15}$	47,8764
Military Personnel	milper_t	continuous	166.700	4255	331,7776	656,116	0	7660[4]	430.488,1	19,2625
Iron and Steel Production	irst_t	continuous	170.859	96	8543,582	25.071,25	0	719.238[5]	$6,29 * 10^8$	29,9311
Primary Energy Consumption	pec_t	continuous	170.227	728	188.742,5	596.780,5	1	7.741.665[6]	$3,56 * 10^{11}$	20,5048
Total Population	tpop_t	continuous	170.995	0	52.649,91	112.850,7	109	1.672.068[7]	$1,27 * 10^{10}$	42,3596
Urban Population	upop_t	continuous	170.995	0	12.213,4	25.992,1	0	689.352[8]	$6,76 * 10^8$	43,6228
CINC	cinc_t	ratio	170.995	0	0,0156	0,03769	$2.83 * 10^{-6}$	0,3872[9]	0,0014	16,1865
Defense Pact	defense	dummy	170.995	0	0,0501	0,2181	0	1	0,0476	18,0171
Neutrality Pact	neutrality	dummy	170.995	0	0,001	0,0312	0	1	0,0010	1021,684
Non-aggression Pact	nonaggression	dummy	170.995	0	0,0597	0,2369	0	1	0,0561	14,8156
Entente Statement	entente	dummy	170.955	0	0,0611	0,2395	0	1	0,0574	14,4338
Distance	Distance	continuous	149.539	21.416	4967.726	2631,031	5	12347[10]	6.922.323	2,4586
GDP	GDP	continuous	142.704	28.251	372.436,2	1.164.006	465,1805	$1.39 * 10^7$[11]	$1.35 * 10^{12}$	30,6899
Common GATT/WTO Membership	trade_common	dummy	139.552	31.403	0,3416	0,4742	0	1	0,2249	1.4464
One GATT/WTO Member	trade_one	dummy	139.552	31.403	0,4997	0,5000	0	1	0,2500	1,0000
Religion	Religion_Overlay	ratio	163.902	7053	0,3974	0,3444	0	1	0,1186	1,5653
Common Official Language	col	dummy	154.264	16.691	0,1483	0,3554	0	1	0,1263	4,9179
Common Spoken Language	csl	ratio	154.264	16.691	0,0958	0,2099	0	1	0,0441	9,3542
Common Native Language	cnl	ratio	154.264	16.691	0,0277	0,1325	0	0,99	0,0176	32,7140

[1] U.S.A. - Canada, 2008 [2] U.S.A. - Canada, 1969 [3] U.S.A. - China, 2010 [4] U.S.A. - Russia, 1969 [5] U.S.A. - China, 2010 [6] U.S.A. - China, 2010 [7] U.S.A. - China, 2010
[8] U.S.A. - China, 2001 [9] U.S.A. - Russia, 1960 [10] Spain - New Zealand [11] U.S.A. - China, 2000

Table 3.3: Correlation matrix

	MIDNum~r	MIDNum~2	RealBi~e	IOBT_NX	Direct~y	milex_t	milper_t	irst_t	pec_t	tpop_t	upop_t	cinc_t
MIDNum~r	1											
MIDNum~2	0.9589	1										
RealBi~e	0.0364	0.0411	1									
IOBT_NX	0.0439	0.0454	0.6435	1								
Direct~y	-0.2475	-0.2474	-0.1113	-0.2240	1							
milex_t	0.0817	0.0896	0.2419	0.2315	-0.0343	1						
milper_t	0.1165	0.1290	0.1068	0.2040	-0.0645	0.6386	1					
irst_t	0.0895	0.0966	0.1871	0.2813	-0.0400	0.7876	0.8138	1				
pec_t	0.0895	0.0970	0.2249	0.2780	-0.0361	0.9283	0.7479	0.9186	1			
tpop_t	0.0876	0.1059	0.1168	0.1538	-0.0548	0.4472	0.7806	0.5195	0.5297	1		
upop_t	0.1070	0.1241	0.1960	0.2302	-0.0586	0.6620	0.8625	0.7766	0.7457	0.8774	1	
cinc_t	0.1073	0.1190	0.1684	0.2703	-0.0519	0.7855	0.9184	0.9402	0.9072	0.6928	0.8473	1
defense	0.0161	0.0162	0.1445	0.2445	-0.1019	0.2541	0.1604	0.2600	0.2902	0.0937	0.1727	0.2463
neutra~y	0.0313	0.0345	-0.0001	0.0020	-0.0592	0.0037	0.0074	0.0093	0.0080	0.0070	0.0152	0.0068
nonagg~n	0.0403	0.0433	0.0914	0.1776	-0.1546	0.1993	0.1226	0.1944	0.2244	0.0589	0.1252	0.1863
entente	0.0361	0.0393	0.0954	0.1838	-0.1452	0.2021	0.1259	0.2012	0.2300	0.0588	0.1268	0.1925
Distance	-0.0545	-0.0563	-0.0106	-0.0650	0.2087	0.0184	0.0385	0.0215	0.0273	0.0698	0.0819	0.0357
GDP	0.0810	0.0887	0.2663	0.2782	-0.0275	0.9515	0.6482	0.8366	0.9694	0.5061	0.7070	0.8328
trade_~n	-0.0222	-0.0225	0.0485	0.0640	0.0233	0.1023	-0.0099	0.0887	0.1141	0.0210	0.0389	0.0665
trade_~e	0.0098	0.0100	-0.0318	-0.0454	0.0209	-0.0572	-0.0083	-0.0410	-0.0554	-0.0146	-0.0221	-0.0359
Religio~y	0.0233	0.0214	0.0305	0.0721	-0.1206	0.0710	-0.0574	0.0603	0.0833	-0.0811	-0.0344	0.0247
col	0.0090	0.0108	0.0261	0.0613	-0.1291	0.0414	-0.0516	0.0100	0.0403	-0.0262	-0.0369	0.0039
csl	0.0196	0.0216	0.0663	0.1489	-0.1311	0.1444	0.0407	0.1322	0.1636	0.0020	0.0390	0.1158
cnl	0.0390	0.0412	0.0476	0.1158	-0.1684	0.0722	0.0180	0.0506	0.0761	-0.0071	0.0229	0.0502
	defense	**neutra~y**	**nonagg~n**	**entente**	**Distance**	**GDP**	**trade_~n**	**trade_~e**	**Religio~y**	**col**	**csl**	**cnl**
defense	1											
neutrality	-0.0012	1										
nonagg~n	0.7463	0.0604	1									
entente	0.7643	0.0072	0.9569	1								
Distance	-0.1986	-0.0196	-0.2481	-0.2480	1							
GDP	0.2909	0.0032	0.2210	0.2266	0.0366	1						
trade_~n	0.1128	-0.0102	0.0381	0.0398	-0.0257	0.1358	1					
trade_~e	-0.0843	0.0046	-0.1059	-0.0983	0.0261	-0.0632	-0.7200	1				
Religio~y	0.2799	0.0108	0.3448	0.3426	-0.1561	0.0841	0.1701	-0.1049	1			
col	0.1240	0.0028	0.2667	0.2705	-0.1437	0.0447	0.1196	-0.1046	0.2373	1		
csl	0.3264	0.0114	0.4950	0.4966	-0.1875	0.1658	0.0966	-0.0958	0.3966	0.5806	1	
cnl	0.2890	0.0091	0.5536	0.5505	-0.1993	0.0789	-0.0251	-0.0459	0.2848	0.4696	0.7178	1

4

Methodology

In this chapter the methodology will be discussed. First, some case studies will be examined using a vector autoregressive model (VAR) and a Vector Error Correction model (VEC). Thereafter, a panel data Vector Autoregressive model (pVAR) will be used to examine the panel-wide causation between conflict and trade. A Granger Causality test will be fitted onto all autoregressive models. After the pVAR, a probit model will be estimated to quantify the causal effect of trade on conflict and an ordinary least squares (OLS) regression for the effect of conflict on trade. For all analyses a p-value of 0.05 will be used.

4.1. Vector Autoregressive Model

4.1.1. Case Studies

First, some case studies from within the dataset will be examined in order to get a grasp of the different possibilities in which war and trade can be related. For this analysis only endogenous time-variant variables will be taken into account since we are dealing with time series data. Before moving to the VAR model the stationarity condition has to be tested, variables that are not stationary after the first difference is taken will be dropped from the model. An Augmented Dickey–Fuller test will be used (Dicky and Fuller, 1979), when a unit root is found the variable is not considered stationary. All variables in the model are of the same order of intergration. Since we are dealing with annual data either one or two lags will be taken depending on the Akaike Information Criterion (AIC).

When it is known which variables to include, the VAR model can be estimated. The model creates multiple OLS regressions on all endogenous variables, based on lagged val-

ues of all variables in the model, so that a K-vector matrix of equations is formed. The general large matrix notation of a VAR model is given in 4.1.

$$\begin{bmatrix} y_{1,t} \\ y_{2,t} \\ \vdots \\ y_{k,t} \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_k \end{bmatrix} + \begin{bmatrix} a^1_{1,1} & a^1_{1,2} & \cdots & a^1_{1,k} \\ a^1_{2,1} & a^1_{2,2} & \cdots & a^1_{2,k} \\ \vdots & \vdots & \ddots & \vdots \\ a^1_{k,1} & a^1_{k,2} & \cdots & a^1_{k,k} \end{bmatrix} \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ \vdots \\ y_{k,t-1} \end{bmatrix} + \cdots + \begin{bmatrix} a^p_{1,1} & a^p_{1,2} & \cdots & a^p_{1,k} \\ a^p_{2,1} & a^p_{2,2} & \cdots & a^p_{2,k} \\ \vdots & \vdots & \ddots & \vdots \\ a^p_{k,1} & a^p_{k,2} & \cdots & a^p_{k,k} \end{bmatrix} \begin{bmatrix} y_{1,t-p} \\ y_{2,t-p} \\ \vdots \\ y_{k,t-p} \end{bmatrix} + \begin{bmatrix} e_{1,t} \\ e_{2,t} \\ \vdots \\ e_{k,t} \end{bmatrix} \tag{4.1}$$

rewriting 4.1 to individual equations of $y_{k,t}$ gives us the system of equations in 4.2.

$$\begin{aligned} y_{1,t} &= c_1 + a^1_{1,1} y_{1,t-1} + a^1_{1,2} y_{2,t-1} + \cdots + a^1_{1,k} y_{k,t-1} + \cdots + a^p_{1,1} y_{1,t-p} + a^p_{1,2} y_{2,t-p} + \cdots + a^p_{1,k} y_{k,t-p} + e_{1,t} \\ y_{2,t} &= c_2 + a^1_{2,1} y_{1,t-1} + a^1_{2,2} y_{2,t-1} + \cdots + a^1_{2,k} y_{k,t-1} + \cdots + a^p_{2,1} y_{1,t-p} + a^p_{2,2} y_{2,t-p} + \cdots + a^p_{2,k} y_{k,t-p} + e_{2,t} \\ &\vdots \\ y_{k,t} &= c_k + a^1_{k,1} y_{1,t-1} + a^1_{k,2} y_{2,t-1} + \cdots + a^1_{k,k} y_{k,t-1} + \cdots + a^p_{k,1} y_{1,t-p} + a^p_{k,2} y_{2,t-p} + \cdots + a^p_{k,k} y_{k,t-p} + e_{k,t} \end{aligned} \tag{4.2}$$

Because the case studies have quite small sample sizes, a small-sample degrees-of-freedom adjustment will be applied (stata command "dfk"). Instead of the large-sample devisor $\frac{1}{T}$, the small-sample devisor $\frac{1}{(T-\overline{m})}$ will be used when estimating the covariance matrix of error terms. $\overline{m}$ is the average number of parameters in the functional form of y_t over all equations (K) and T the total number of observations.

Next, a Granger Causality test is fitted onto the VAR model in order to infer the (Granger) causality between the variables. In the case studies, special interest is payed to the unilateral causality that runs from trade to war. So, in the results, only one equation from the VAR model as represented in 4.2 will be considered, it will be the conflict equation with MIDNumber_t as the dependent variable. When the coefficient of a lagged value of an independent variable (x) is significant, it is inferred that this variable can help predict the dependent variable (y), and hence it can be stated that x "Granger causes" y.

After the VAR model is estimated, some diagnostic tests will be performed in order to determine whether the parameters of the models are Best Linear Unbiast Estimators (BLUE), this is done so that the results can be better interpreted. First, a test will be per-

formed to check if the VAR satisfies the stability condition. Stability of a variable implies that the variable is also stationary (Lutkepohl, 2005). A Lagrange multiplier (LM) test for autocorrelation will be used to look for autocorrelation in the residuals, as is proposed by Johansen (1995), this researcher also proposes a test for cointegration, which will also be estimated. When cointegration is found, a VEC model will be estimated in addition to the VAR model, this is done to correct for the long run effects in the model. Finally, the Jarque–Bera statistic (Bera and Jarque, 1987) will be used to test whether the residuals are normally distributed.

When cointegration among the variables is found adjustment terms have to be applied in addition to the short term effects from the VAR model. In cointegrated models, lagged values will deviate from a long-run equilibrium. This deviation, the error, influences the short-run dynamics of those lagged values. By including error correction features in the VAR model this effect is controlled accordingly. The adjustment term estimates the speed at which a dependent variable returns, or converges, to its equilibrium after a change in the other variables. A generalized example of an equation from a VAR model including an adjustment term is provided in equation 4.3.

$$y_{1,t} = c_1 + a^1_{1,1} y_{1,t-1} + \cdots + a^1_{1,k} y_{k,t-1} + \cdots + a^p_{1,1} y_{1,t-p} + \cdots + a^p_{1,k} y_{k,t-p} + b_1 \lambda_{1,t-1} + e_{1,t} \quad (4.3)$$

In this equation b_1 is the coefficient of the adjustment term $\lambda_{1,t-1}$. An example of the stata code that is used in the case studies can be found in appendix A.1 (the specific case is "the United States - China").

4.1.2. Panel Data

A pVAR will be used to research the causality between trade and war. The dataset is heavily unbalanced and contains gaps so the usual stata command "xtvar" cannot be applied, instead a user written program by Abrigo and Love (2016) will be used. The researchers use a generalized method of moments (GMM) framework to estimate the parameters. Because of limited processing capacity and the size of the dataset, not all time-varient variables in the dataset can be included in the pVAR. Four endogenous variables were chosen, namely: MIDNumber2, lnRealBiTrade1, cinc_t and lnGDP. Furthermore, one exogenous

variable will be added to the model: lnDistance. All variables will be tested for stationarity using the stata command "xtunitroot". Adding exogenous variables to the general VAR equation as given in 4.2 will result in equation 4.4. This is also sometimes referred to as a VARX model, where $d^s_{1,r}x_{r,s}$ are all exogenous variables with their coefficients. Note that these variables will not be used as dependent variables in the VAR model, only the endogenous variables get their own equation. Please also note that in regular VARX models the exogenous variables are lagged, but that is not the case in the user written pVAR program which is used.

$$y_{1,t} = c_1 + a^1_{1,1}y_{1,t-1} + \cdots + a^p_{1,k}y_{k,t-p} + d^1_{1,1}x_{1,1} + \cdots + d^s_{1,r}x_{r,s} + e_{1,t} \tag{4.4}$$

Two pVAR models will be estimated "L1" and "L2" with one and two lags respectively. A Granger Causality test will be fitted onto each model, so that Granger causality can be inferred. It is assumed that there is no cointegration among the variables, i.e. the variables have no long-run association among themselves, only short-run association. We are obliged to do so since there exists, to my knowledge, no stata command or program for testing cointegration in pVAR models. In all models the "td" function is used, it subtracts the cross-sectional mean from each variable in a model before estimation, thereby removing all time fixed effects from the variables.

Diagnostic tests in the user written pVAR program are quite limited, only the stability condition can be directly inferred. Although this is one of the most important tests, other diagnostics will also be estimated indirectly. In order to get a general idea of the quality of the estimators. Normality, serial autocorrelation and heteroscedasticity of the residuals will be tested. For this, manually constructed equations, which are similar to the equations of interest from the pVAR matrix, will be used. An example of the stata code that is used for the diagnostic tests can be found in appendix A.2.

4.2. Probit Model

A probit model will be used to quantify the effect of trade on war. Because in only a very small percentage (0.43%) of the observations a conflict is found, it will be very hard for

an ordered probit model (or ordered logit model for that matter) to differentiate between the different levels of conflict. So, the ordinal variable MIDNumber is replaced with the dichotomous variable MIDNumber2, which returns "1" when a conflict is observer and "0" otherwise and then a probit model is estimated. A probit model is chosen over a logit model based on Akaike's Information Criterion (displayed in the stata command "fitstat") as is proposed by Chen and Surumi (2010) in their paper about binary model selection for unbalanced datasets.

It is known that the political relations within a dyad are an important factor that influences both trade and conflict[16], since this is very difficult to measure, it is not included in the dataset and thus appears in the error term of the model. Therefore, endogenity is expected to be found in the real bilateral trade estimator. A Durbin–Wu–Hausman (DWH) (Durbin, 1954; Wu, 1973; Hausman, 1978) test will be used to test whether this is actually true or not. DWH first regresses the exogenous variables and the selected instruments on the expected endogenous variable, then it predicts the residuals of this regression. The predicted values are then added to the original regression and when the coefficient of the residuals is significant it tells us that the expected endogenous variable is indeed truly endogenous.

To solve the issue of endogenity a two-stage least squares (TSLS) approach is needed as is proposed by Newey (1987). His minimum chi-squared estimator is available under the stata command "ivprobit, twostep". In the first stage of the TSLS model it creates an OLS regression of the endogenous variable (real bilateral trade) on the instruments and all other (under assumption) exogenous variables . In the second stage it uses the residuals of the first stage regression instead of real bilateral trade. With this approach, only the variance in real bilateral trade that is not an effect of the political relations is taken into account when estimating the relationship, thereby making its estimator non-spurious.

However, a good instrument for bilateral trade is needed for this method to work. A good instrument is uncorrelated with the error term (instrumental exogeneity) and a decent predictor of real bilateral trade (instrumental relevance). We cannot use the gravity variables as instruments since they influence conflict through trade but not exclusively

[16] See: Blainey, 1973; Blanchard and Ripsman, 1994; Levy, 1989

through trade. GDP influences the likelihood of conflict through states' capabilities and distance influences conflict directly since it is known that proximate states are more conflict prone than distant ones. Finding good instruments is challenging.

Deciding which variables to include in the model and which not will depend on the McFadden's adjusted R^2 (equation 4.5), it can be found by running the stata command "fitstat" after a probit model. When adding a variable will increase the R^2_{adj} it will be included in the model, otherwise it will be excluded.

$$R^2_{adj} = 1 - \frac{\ln \hat{L}(M_{full}) - K}{\ln \hat{L}(M_{intercept})} \tag{4.5}$$

In equation 4.5, $\hat{L}$ is the estimated likelihood, M_{full} is the model with predictors and $M_{intercept}$ is the model without predictors. The log likelihood of $M_{intercept}$ is treated as the total sum of squares (SST) in the regular R^2 and M_{full} is treated as the sum of squared errors (SSE). the K term functions as a penalty that the model applies for every variable that is added. When the log likelihood ratio is not improved enough when a variable is added to the model, the R^2_{adj} will decrease, which tells us that this variable does not help explain part of the variance in the model.

After the probit model has been estimated the marginal effect of real bilateral trade will be examined (using the stata command "margins"), in addition some diagnostic tests will be estimated. The stata command "linktest" will be used to test whether the model is correctly specified as is proposed by Pregibon (1980). For goodness-of-fit we will simply look at the Likelihood ratio (LR) test that is reported in the standard stata output of probit models. Furthermore, because of the large amount of variables and their correlations (see table 3.3) a test for multicollinearity will be performed, a user written program will be used which is named "collin". Multicollinearity will not bias the estimators, but it will inflate standard errors. Moreover, it makes it more difficult to estimate the marginal effect of each individual variable since they are very interdependent.

4.3. Ordinary Least Squares Regression

An OLS regression will be used to estimate the effect of war on trade. Only variables that could have a logically explainable relationship with trade are included in the model, namely; MID, contiguity, alliance pacts, distance, GDP, the GATT/WTO dummies, religion and the language dummies. Deciding which of these to include will depend on the adjusted R^2. The goodness-of-fit and R^2 will be reported in the results, for simplicity, no further diagnostics will be estimated.

5

Empirical Results

5.1. Case Studies

Before moving to the panel data analysis, three case studies will be examined first. Only dyads containing the United States are studied since these time series do not contain gaps and both trade and conflict data is present. The case studies are included to get a grasp of the different possibilities in which war and trade can be related, the empirical results cannot be used to draw conclusions on the general relationship between war and trade. The external validity is, of course, very low and the sample size is too small. In order to answer the research question and the additional hypotheses, only the empirical results of the panel-wide analysis will be used.

5.1.1. The United States and Iran

The first case that will be analyzed is the situation between the United States and Iran[17]. The relation between trade and war is depicted in figure 5.1. The first years of the research period were conflict free and relatively low trade volumes are observed. In 1972 a deal was negotiated between president Nixon and the Iranian Shah[18] for Iran to buy large quantities of expensive American military hardware and ensuring political stability in order to fight off Soviet subversion throughout the region (Alvandi, 2014). The pro-American Shah ensured a good relationship between Iran and the United States in the following years during the Carter administration. This can be seen in the trade figures. A drastic increase in trade vol-

[17] Iran -officially; "the Islamic Republic of Iran"- is also known as Persia, the two names are synonymous (Fishman, 2010, p. 266). In this research, the state will be referred to as Iran.

[18] A title given to the emperors and kings of Iran.

ume is observed from 1974 to 1978, Iran's oil revenues grew considerably in the preceding years.

Trade flows diminished after the 1979 revolution when the pro-American Shah was replaced with the anti-American supreme leader Ayatollah Ruhollah Khomeini. Tensions were raised further when Iranian students occupied the American embassy in Tehran, 52 American diplomats were held hostage for 444 day. Due to the hostage crisis president Carter severed diplomatic relations between Iran and the United States and they have been frozen ever since. Economic sanctions from the United states on Iran have been more or less in effect in various forms until the end of the research period. The economic sanctions were most effective on Iran's non-oil exports and capital goods imports. The total effectiveness of American sanctions on Iran's economy is estimated to be as high as 1.1% of Iran's GDP (Torbat, 2005).

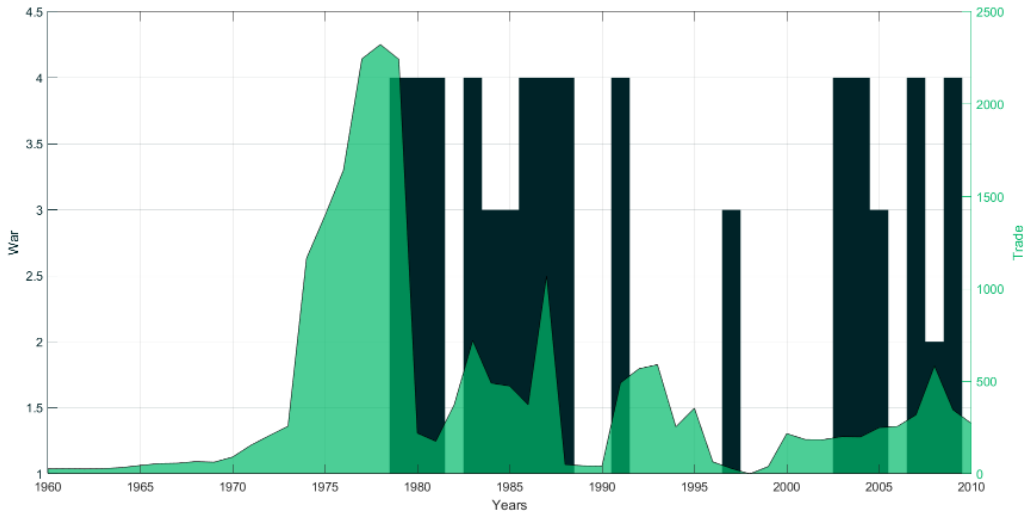

Figure 5.1: Trade and war between the United States and Iran.[a]

[a]The bright green graph (right y-axis) depicts the annual real bilateral trade in 2010 U.S. dollars (millions). The dark green bars (left y-axis) depict the annual level of militarized interstate dispute within the dyad on a scale from one to five; "1" indicates no dispute, "2" indicates a threat to use force, and so on (see section 3.1 for a complete description). This figure is provided for each case study in this chapter, it illustrates the relationship between war and trade within each dyad. The correlations between trade and war are provided in appendix A.4. In this specific case trade levels declined abruptly after 1979 and a period of intense militarized disputes followed, during which trade levels remained relatively low (compared to 1979).

The result of the VAR model can be seen in table 5.1. The optimal lag length was determined to be one lag. Cointegration among the variables could not be tested due to

collinearity among the variables in the VEC model. The resulting equation of the VAR model is depicted in 5.1. Looking at the United States - Iran situation the only variables that seem to be able to predict conflict are primary energy consumption, urban population and the capability index but no causality seems to flow from trade to conflict. The coefficients of these variables seem to make no sense however.

$$MIDNumber_t = lnpec\_t_{t-1} + lnupop\_t_{t-1} + cinc\_t_{t-1} + e_t \tag{5.1}$$

Table 5.1: Case study: United States - Iran

	VAR model	
	coef.	**P-value**
Militarized Interstate Dispute	-0.2646	0.122
Log of Bilateral Trade	0.0273	0.633
Intensity of Bilateral Trade	-66.0541	0.187
Log of Military Personnel	2.9540	0.083
Log of Iron and Steel Production	2.9066	0.134
Log of Primary Energy Consumption	-9.4544	0.037
Log of Total Population	-1.5950	0.821
Log of Urban Population	5.7324	0.000
CINC[1]	-88.5335	0.000
Constant	55.1790	0.275
Granger All:	0.001	
Observations:	50	
R^2:	0.4916	
Log likelihood:	807.7632	
P > chi^2:	0.0000	

[1] Composite Indicator of National Capability

5.1.2. The United States and China

The second case that will be examined relates to the trade flows and MID's between the United States and China, the relation is depicted in figure 5.2. In the beginning of the research period a lot of conflict is observed and trade flows are zero. During this period China supported Vietnam in its war against the United States. Mao Zedong[19] supplied 90.000 rifles and guns to Vietnam (free of charge) and China helped rebuilt railroads and performed engineering work after American bombings. This allowed hundreds of thousands of North Vietnamese army units to combat the United States in the south.

Tensions between both regimes relaxed after president Johnson decided to wind down

[19] Mao Zedong is the founder of the People's Republic of China and first General Secretary of the Communist Party of China.

the Vietnam war in 1968, meanwhile the Soviet Union became a more serious threat to China. The Chinese government believed that improved relations with the United States would be a useful counterbalance to the rising Soviet threat (Kent and Young, 2003, p255.). President Nixon and National Security Advisor Kissinger[20] put in effort to restore the relationship between China and the United States and relaxed trade restrictions and other impediments to bilateral contact. President Carter establish diplomatic relations in January 1979 and later that year a bilateral trade agreement was signed. Trade volumes have been growing ever since, up to the point that tensions were raised over the large trade deficit between the United States and China today. Although the trade relationship was disturbed by some incidents during the remaining years of the research period[21].

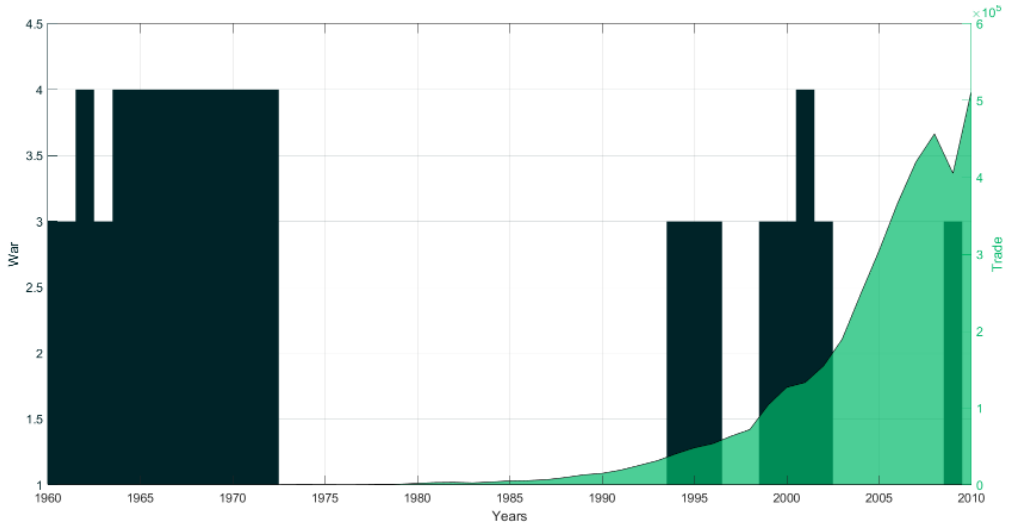

Figure 5.2: Trade and war between the United States and China.

The result of the VAR model and Granger Causality test can be seen in table 5.2. The optimal lag length was determined to be two lags. Cointegration among the variables could not be tested due to collinearity among the variables in the VEC model. Looking at the situation between the United States and China, only the total population seems to be a decent predictor of conflict, although the coefficient seems nonsensical. Furthermore, no causality seems to be flowing from trade to war in this study.

[20] Kissinger became U.S. Secretary of State only some time later, in 1973.

[21] Tiananmen Square protests in 1989, the bombing of the Chinese embassy in Belgrade in 1999 and the Hainan Island incident in 2001.

Table 5.2: Case study: United States - China

		VAR model		Granger Causality Test
		coef.	P-value	
Militarized Interstate Dispute	lag1	0.3494	0.040	
	lag2	-0.1895	0.244	
Log of Bilateral Trade	lag1	0.0504	0.373	0.358
	lag2	-0.0634	0.253	
Intensity of Bilateral Trade	lag1	-35.3486	0.678	0.096
	lag2	-128.0777	0.201	
Log of Military Expenses	lag1	0.9771	0.770	0.147
	lag2	2.0052	0.531	
Log of Military Personnel	lag1	-0.3366	0.927	0.873
	lag2	-1.5730	0.659	
Log of Iron and Steel Production	lag1	-3.9465	0.109	0.250
	lag2	2.7522	0.297	
Log of Primary Energy Consumption	lag1	1.9292	0.776	0.933
	lag2	-2.6283	0.713	
Log of Total Population	lag1	5.4851	0.015	0.016
	lag2	-2.4255	0.267	
CINC	lag1	79.0169	0.056	0.137
	lag2	0.6091	0.989	
Constant	-71.3455	0.200	**All:**	0.000
Observations:	48	**Log likelihood:**	787.1421	
R^2:	0.8501	**P > chi^2:**	0.0000	

5.1.3. The United States and Russia

The last case that will be examined is the case between the United States and Russia, the relationship between trade flows and MID's is depicted in figure 5.3. The research period begins during the cold war, two years before the Cuban Missile Crisis, which is the closest the cold war has ever been to a nuclear conflict (Hughes and Scott, 2015). In 1969 Nixon and Kissinger began relaxing tensions with the Soviet Union (simultaneous to the charm offensive with China mentioned in 5.1.2), although the accomplishment of this détente with the Soviets is questionable. It is in this period, however, that trade between the Soviet Union and the United States picked up. Political disagreement hurt the trade relation in the early 80's, when the Soviets invaded Afghanistan. In 1988 delegations of both countries met in Moscow to discuss the possibilities for expanded trade and trade flows increased thereafter. In 1989 Gorbachev[22] and president Bush (Senior) declared the cold war over, signed START I[23] and even partnered against Iraq in the gulf war in 1991.

[22] Mikhail Sergeyevich Gorbachev was Secretary General of the Communist Party of the Soviet Union at the time.
[23] Strategic Arms Reduction Treaty.

After the dissolve of the Soviet Union in 1991 relations between Russia under Yeltsin[24] and the United States under Bush and, later, Clinton remained generally warm[25], trade and diplomatic relations from the Soviet era remained intact, at least until the NATO bombing of Yugoslavia in 1999. Political issues between Russia and the United States remained present throughout the first decade of the 21st century[26], although this did not result in military conflicts. Remarkably, trade flows increased during this period. An explanation could be that economic ties play only a minor role in the relationship between Russia and the United States compared to political and security issues and hence cannot be employed to resolve conflict.

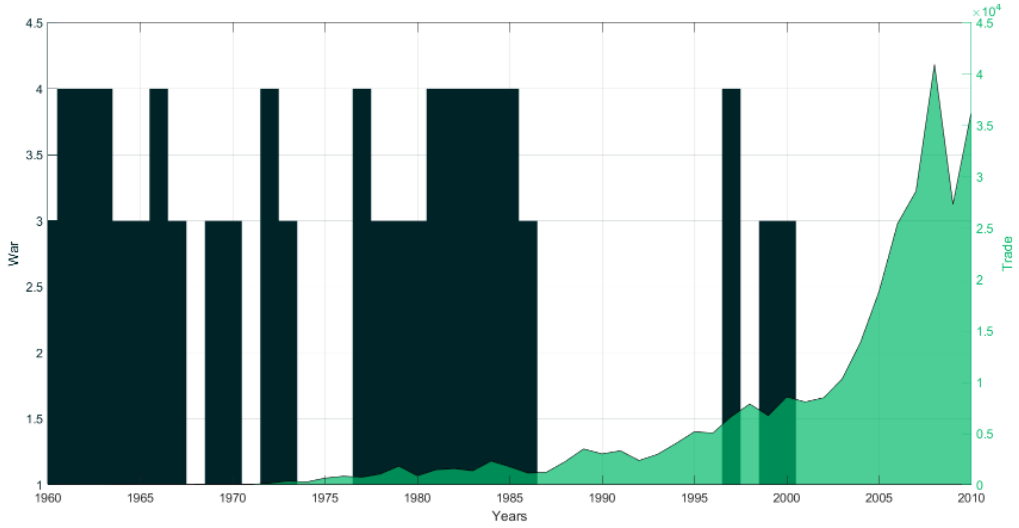

Figure 5.3: Trade and war between the United States and Russia.

The result of the VAR model and Granger Causality test can be seen in table 5.3. The optimal lag length was determined to be two lags. Cointegration among the variables was found but the adjustment term of the MID equation was not significant so it will not be considered here. None of the coefficients in the model come close to being significant, so no causal relationship between trade and conflict seems to be present in this case study.

[24] Boris Nikolayevich Yeltsin became the first president of the Russian Federation.
[25] In this period Russia also joined the World Bank and the IMF with help from the United States whose aid also helped Russia with market economy reforms (Russell, 2018).
[26] The American invasion of Iraq in 2003, the enlargement of NATO in 2004 and the United States' plans to build a missile shield in Poland in 2007.

Table 5.3: Case study: United States - Russia

		VAR model		Granger Causality Test
		coef.	**P-value**	
Militarized Interstate Dispute	lag1	0.2452	0.184	
	lag2	0.0105	0.959	
Log of Bilateral Trade	lag1	-0.5275	0.809	0.971
	lag2	-0.0130	0.995	
Intensity of Bilateral Trade	lag1	142.5984	0.769	0.848
	lag2	229.7517	0.610	
Log of Military Expenses	lag1	-1.8346	0.735	0.894
	lag2	2.2364	0.640	
Log of Military Personnel	lag1	-8.1900	0.260	0.248
	lag2	10.3745	0.095	
Log of Iron and Steel Production	lag1	0..5739	0.931	0.987
	lag2	0.8848	0.896	
Log of Primary Energy Consumption	lag1	1.9857	0.876	0.779
	lag2	-7.8742	0.522	
Log of Total Population	lag1	0.5879	0.964	0.893
	lag2	6.1601	0.688	
Log of Urban Population	lag1	-3.7104	0.490	0.761
	lag2	1.8898	0.775	
CINC	lag1	109.6675	0.217	0.338
	lag2	-134.5801	0.149	
Constant	-2.2535	0.986	**All:**	0.842
Observations:	49	**Log likelihood:**	1115.48	
R^2:	0.5435	**P > chi^2:**	0.0310	

5.2. Panel Data

5.2.1. Vector Autoregressive Model

The results of the pVAR model can be found in table 5.4. Only the conflict and trade equations are displayed. It can be seen that both models (L1 and L2) indicate that causality is running from trade to conflict, which answers the first hypothesis. A causality running from conflict to trade is found in the trade equation of the L1 model, the L2 model reports an insignificant result however. Note that the "Log of Distance" variable is added to the equations as an exogenous variable, which are not lagged in the pVAR model.

Table 5.4: Results panel data vector autoregressive model

Conflict equation	**pVAR model (L1)**		**Granger Causality (L1)**		**pVAR model (L2)**		**Granger Causality (L2)**
	coef.	**P-value**	**P-value**		**coef.**	**P-value**	**P-value**
MIDNumber2	0,3021	0,000		lag1	0,3676	0,000	
				lag2	0,1564	0,000	
LnRealBiTrade1	-0,0007	0,000	0,000	lag1	-0,0010	0,000	0,001
				lag2	-0,0001	0,560	
cinc_t	-0,3009	0,005	0,005	lag1	0,7618	0,095	0,023
				lag2	-0,9781	0,027	
lnGDP	-0,0611	0,000	0,000	lag1	0,0746	0,027	0,000
				lag2	-0,0309	0,120	
lnDistance	-0,3154	0.000			-0,5193	0,000	
All:			0,000				0,000
Trade equation							
MIDNumber2	10,5230	0,004	0,004	lag1	3,5711	0,183	0,128
				lag2	4,0358	0,077	
LnRealBiTrade1	0,5350	0,000		lag1	0,5700	0,000	
				lag2	0,1424	0,024	
cinc_t	-6,8877	0,538	0,538	lag1	-120,7259	0,247	0,004
				lag2	184,1302	0,077	
lnGDP	20,9764	0,000	0,000	lag1	18,5017	0,112	0,000
				lag2	21,3014	0,016	
lnDistance	85,2612	0.000			174,7677	0,000	
All:			0,000				0,000
Observations:	75.481				64.253		
Final GMM Criterion:	0,0117				0,0181		
MAIC:	579,98				342,05		

5.2.2. Conflict and Trade Regressions

The results of the probit model and OLS regression can be seen in table 5.5. The conflict regression with excluded gravity variables is displayed as "Conflict 1", this model is only used for answering the third hypothesis. "Conflict 2" will be used for further analysis. The

models indicate a significant negative effect of trade on conflict and a significant negative effect of conflict in trade, which answers the second hypothesis.

The marginal effect of trade is displayed in figure A.2. Note that the x-axis has a logarithmic scale, so the approximate linear relationship between the probability of conflict and the log of real bilateral trade reflects an exponential relationship between the probability of conflict and real bilateral trade in absolute terms. To demonstrate, it shows that the likelihood of war at zero bilateral trade is about 0.5%, this is what is to be expected since in about 99.5% of all observations no conflict is observed. Trade has to increase by about 45,000 real U.S. dollars, relative to the nominal case of no trade, to get this likelihood down to 0.4% ($\frac{1}{10}$ percentage point decrease; a relative decrease of 20%). In the mean, however, the likelihood of conflict is 0.357%, in order for this likelihood to go down to 0.353% ($\frac{1}{25}$ percentage point decrease; a relative decrease of 10%) trade has to increase by 115.5 billion real U.S. dollars on average (a 472.59% increase). For a relative decrease of 1% in the mean, real bilateral trade has to increase by 198 million real U.S. dollars (a 81.16% increase).

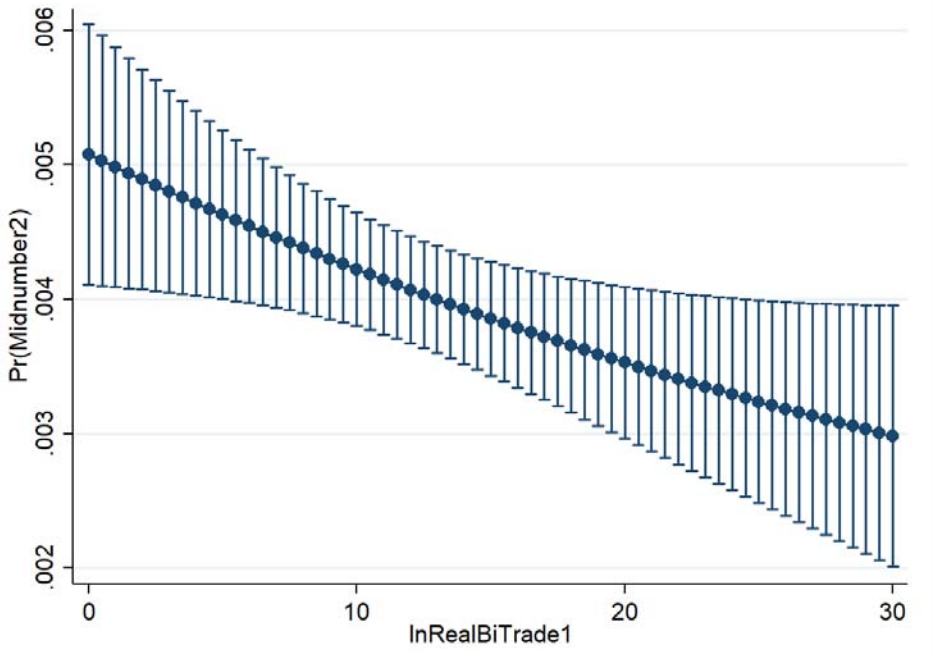

Figure 5.4: Predictive margins with 95% confidence Intervals

Looking at the results of "Conflict 2" in table 5.5, the intensity of bilateral trade has an insignificant coefficient. When it is not interacted with real bilateral trade it becomes significant however. This is an indication that the likelihood of a military dispute decreases when

real bilateral trade has a higher intensity, which answers the fifth hypothesis. Considering the gravity variables, GDP and distance have a significant effect on both trade and conflict[27] (as does contiguity). Furthermore, the effect of trade on conflict becomes very small and insignificant when the gravity variables are excluded from the model (see "Conflict 1"). Also note that the pseudo R^2 drops, as does the log likelihood, even though "Conflict 1" has more observations. These results are indicating that the gravity variables can indeed help predict the effect of real bilateral trade on the likelihood of conflict and also increase the reliability of the model as a whole. These results answer the third hypothesis.

Table 5.5: Results of the probit model on conflict and regression on real bilateral trade

		Conflict 1		Conflict 2		Trade	
Name	**Label**	**coef.**	**p-value**	**coef.**	**p-value**	**coef.**	**p-value**
Militarized Interstate Dispute	MIDNumber2					-1.9227	0.000
Log of Real Bilateral Trade	lnRealBiTrade1	-0.0005	0.883	-0.0104	0.004		
Intensity of Bilateral Trade	IOBT_NX	-8.7969	0.576	-16.7728	0.300		
Interaction Variable	residualTrade#IOBT_NX	0.0801	0.900	0.4326	0.515		
Contiguity	Direct_Contiguity						
	2	-0.4710	0.018	0.0488	0.808	4.8851	0.000
	3	-0.8176	0.054	-0.8779	0.041	2.0327	0.007
	4	-0.7276	0.000	-0.7261	0.000	-2.1149	0.000
	5	-1.1892	0.000	-1.0189	0.000	-2.2506	0.000
	6	-2.0252	0.000	-1.3895	0.000	-0.5757	0.000
Log of Military Expenses	lnmilex_t	0.1095	0.000	0.0910	0.001		
Log of Military Personnel	lnmilper_t	0.1990	0.000	0.1635	0.000		
Log of Iron and Steel Production	lnirst_t	-0.0150	0.130	-0.0275	0.015		
Log of Primary Energy Consumption	lnpec_t	-0.0595	0.021	-0.0649	0.018		
Log of Total Population	lntpop_t	-0.0124	0.767	0.0113	0.807		
Log of Urban population	lnupop_t	-0.0025	0.951	-0.0131	0.773		
CINC	cinc_t	2.3516	0.000	2.7457	0.000		
Defense Pact	defense	-0.2710	0.003	-0.4436	0.000	1.3410	0.000
Neutrality Pact	neutrality	0.2738	0.376	0.1748	0.579	2.5718	0.008
Non-aggression Pact	nonaggression	0.2031	0.010	0.1443	0.079	-2.9793	0.000
Entente statement	entente					2.6890	0.000
Log of Distance	lnDistance	omitted		-0.3889	0.000	-1.8837	0.000
Log of GDP	lnGDP	omitted		0.1389	0.005	2.4637	0.000
Common GATT/WTO Membership	trade_common	-0.0870	0.198	-0.0826	0.255	1.3769	0.000
One GATT/WTO Member	trade_one	0.1462	0.009	0.1748	0.003	0.6303	0.000
Religion	Religion_Overlay					0.3912	0.000
Common Official Language	col					-0.9413	0.000
Common Spoken Language	csl					6.9631	0.000
Common National Language	cnl					-4.0155	0.000
Constant	_cons	-2.8606	0.000	-1.4931	0.000	-8.2443	0.000
Log likelihood		-2,112.72		-1899.25	**Prob > F**	0.000	
Number of obs		125,029		112,080		108,755	
Pseudo R^2		0.3669		0.3930	**R^2**	0.4245	

Other coefficients of interest are the dummy variables common GATT/WTO membership and one GATT/WTO member, interestingly enough, in the conflict model, they have opposite signs. Indicating that when both states are a member of the WTO the likelihood

[27] The predictive margins of the gravity variables on conflict are depicted in appendix A.3.

of conflict decreases in comparison to no members, but when only one state is a member of the WTO the likelihood of conflict actually increases. The coefficient of common GATT/WTO membership is not significant though. So, even though evidence is found of the pacifying effect of trade in this analysis, this cannot be extended to a pacifying effect of simply being a WTO member. Trade_one does seem to indicate that non-WTO members are more likely to have a military conflict with WTO members than other non-WTO members. The forth hypothesis can be answered, it can be stated that no benefits of trade system membership are found, in the context of conflict prevention at least. Both dummies have significant positive coefficients in the trade regression, indicating that WTO members trade more with non-WTO members than non-WTO members do. Moreover, WTO members trade more among each other than non-WTO members do among each other. Given the pacifying effect of trade and the increased trade flows among WTO members, membership does influence the likelihood of conflict, but only through bilateral trade.

The variables of religion and language are not included in the conflict model because their addition would decrease the models adjusted R^2. Apparently these variables are not very important when you want to explain variance in the likelihood of conflict. Granted, these variables do contain a significant amount of missing values, which can also influence the adjusted R^2. The language and religion variables did have a significant result in the trade regression. So they do explain variance in bilateral trade levels. As is to be expected, since they are often applied as effective control variables in the gravity model (Melitz and Toubal, 2014).

As a final remark, none of the formal interstate alliance indicators have a significant effect on conflict with the exception of a defence pact, this is the only sort of pact that seems to be effective in preventing conflict. Peculiarly, their effect on real bilateral trade is ambiguous, whilst an entente statement, a defense pact and a neutrality pact seem to have a significant positive coefficient, a non-aggression pact has a significant negative coefficient. An explanation could be, and I am speculating here, that a non-aggression pact is generally less specified than a neutrality pact and is thus more often signed between hostile states rather than genuine allied states. This could be a reason for the negative coefficient, under the assumption that trade relations are actually worse between hostile states, that is.

6

Further Results

6.1. Case Studies

An overview of the diagnostics is provided in table 6.1. "Max rank cointegration" displays how many equations from the unrestricted VAR had cointegrated time series. "Stability" displays the highest modulus of the eigenvalue of all the parameters in the model. If at least one eigenvalue is greater than one, the stability condition is not satisfied. Note that the variables are all stationary, stability implies stationarity but stationarity does not imply stability. One value in the case study "the United States - China" does not satisfy the stability condition. "Residual autocorrelation" displays the p-values from the Lagrange Multiplier test for autocorrelation, it should be interpreted based on the amount of lags in the model (L2 for "the United States - China" and "the United States - Russia", and L1 for "the United States - Iran"). When $p > 0.05$ the null hypothesis of no autocorrelation cannot be rejected. In the case study "the United States - Russia" autocorrelation was found. "Normality" shows the Jarque–Bera statistic, if $p > 0.05$ the null hypothesis that the residuals are normally distributed cannot be rejected. Only the residuals in the "the United States - Russia" case study are not normally distributed.

Table 6.1: Diagnostics of the case studies

Dyad	Max Rank Cointegration	Stability	Residual Autocorrelation(L1)	Residual Autocorrelation(L2)	Normality
U.S.A. - Iran	collinearity	0.98711	0.99481	0.14004	0.19522
U.S.A. - China	collinearity	1.01325	0.01734	0.51009	0.05288
U.S.A. - Russia	6	0.94801	0.11040	0.00834	0.01633

Considering these diagnostics there are two studies which have BLUE coefficients and

that are "the United States - Iran" and "the United States - China". Although the magnitudes of the significant coefficients in these models are nonsensical. These case studies give no indication of a causality running from trade to conflict whatsoever. There can be many explanations for these results. Since only dyads with the United States are considered, maybe it is a trait of the United States specifically to go to war in disregard of there trade relations. Or maybe trade flows with these three countries were simply too small to deter the United States to go to war. Another explanation could be that trade did actually deter conflict, only that it was subordinate to other political considerations at the time. The point is, these results tell us basically nothing. Even if all the models had BLUE coefficients and would have indicated that there is a causal relationship between trade and conflict the external validity and sample size would be too small to extrapolate these results to a general case on the relationship between trade and conflict (which was never the goal of these case studies anyway).

What these results do show is that trade and war can be related in many different ways, this is also seen in the ordered probit models of the case studies displayed in appendix A.4. Even though no case study finds a significant coefficient of trade on conflict, it does show that the signs and magnitudes differ greatly between the studies. The correlation between trade and conflict is also given in appendix A.4 and it differs greatly from case to case as well. This is an indication that whatever the result of the panel-wide analysis may be, each case varies significantly from the next and the role of real bilateral trade may not be the same within each dyad. This seriously affects the policy implications of this research. When policy decisions are made, one should first examine the role of trade in each dyad and put a weight to its (possibly) pacifying effect.

6.2. Panel Data

6.2.1. Vector Autoregressive Model

The diagnostics of the pVAR model can be seen in table 6.2. As mentioned, only the stability condition is measured directly, normality, serial autocorrelation and heteroscedasticity are derived from a manual replication of the MID and trade equations in the pVAR matrix (see appendix A.2). Both models satisfy the stability condition. For both models and equa-

tions the residuals are not normally distributed according to the Jarque–Bera statistic, this is because the independent variable is a dummy (MIDNumber2) and 99,57% of the observations equal zero (which is not the case with the case studies). So the residual plots have a very slim peak near zero and a very small bump near one. This result was to be expected.

Autocorrelation of the residuals was only found in the L1 model of the conflict equation and on both models of the trade equation. In the residuals of both models and equations heteroscedasticity was observed. This result is also expected since we could only include a few variables in the pVAR model due to the size of the dataset and limited processing capabilities. It indicates that the pVAR model suffers from omitted variable bias.

Table 6.2: Diagnostics pVAR

	pVAR model (L1)	**pVAR model (L2)**
Stability	0,97380	0,97016
Residuals:		
Conflict Equation		
Normality	0,0000	0,0000
Serial Autocorrelation	0,0000	0,0544
heteroscedasticity	0,0000	0,0000
Trade Equation		
Normality	0,000	0,000
Serial Autocorrelation	0,000	0,000
heteroscedasticity	0,000	0,000

Even though the coefficients of both models are not BLUE. These results are still a decent indication of causality, given the restrictions metioned above. Both models indicate that trade Granger causes conflict at a significance level of 5%. With this result the first hypothesis can be answered, it can be stated that evidence for a unilateral causality running from trade to conflict was found.

6.2.2. Probit and Ordinary Least Squares Model

The DWH test indicates that real bilateral trade suffers from endogeinity (the p-value of the residuals was 0.000), this issue is not easily resolved because good instrumental variables are needed. Moreover, the models show that trade influences conflict but conflict also influences trade. This is an indication that the model suffers from simultaneity as well.

The diagnostic tests of the probit model can be seen in table 6.3. The linktest shows that the model is correctly specified since _hat is significant and _hatsq is not. Further-

more, the data seems to have a decent goodness-of-fit since the chi^2 is very significant. However, there does seem to be a lot of multicollinearity, this diagnostic stays within acceptable range (> 0.1) when the probit model contains less than ten variables or so, when more are added (in arbitrary order) multicollinearity is found. This result is to be expected considering some of the high correlations displayed in table 3.3. Multicollinearity makes it difficult to estimate the marginal effect of each individual variable but it does not bias the coefficients. No further action will be taken since variable selection is solely based on McFadden's adjusted R^2, as is mentioned section 4.2.

Table 6.3: Diagnostics probit model

	Linktest	**P > Chi^2**	**multicollinearity**
_hat	0.000	0.000	0.000
_hatsq	0.412		

7

Conclusion

7.1. Hypothesis One

1. There is an identifiable causality running from trade to conflict.

A unilateral causality was found running from trade to conflict, where trade Granger causes conflict (see table 5.4). Surprisingly, research on the causality running from conflict to trade was less conclusive. These results are puzzling on logical grounds. One would expect that if trade was to deter conflict, conflict was to deter trade as well. Even though the pVAR model satisfies the stability condition, diagnostic tests on the residuals have pointed out that the estimators are not BLUE (which is inherent to OLS regression on the kind of data that is used). This means that the reliability of the pVAR model is somewhat questionable.

7.2. Hypothesis Two

2. Real bilateral trade will reduce the likelihood of interstate conflict.

The probit model in table 5.5 finds a near-linear relationship between the likelihood of conflict and the log of real bilateral trade, which reflects an exponential relationship between the likelihood of conflict and real bilateral trade in absolute terms. In the mean, the marginal effect of an increase in bilateral trade volumes by 81.16%, is to decreases the likelihood of conflict by 1% on average. The overall variance in the likelihood of conflict is very low, it runs from a little over 0.5% to about 0.3%. So, note that the decrease in probability of conflict is relative to these figures.

The DWH test has demonstrated that the effect of trade on conflict did suffer from endogeinity. Moreover, the trade regression demonstrates that it also suffers from simultaneity. To solve these issues, future research could be focused on finding reliable and relevant instruments for bilateral trade. Another problem identified by the diagnostic tests is multicollinearity, it does not bias the coefficients but it does put into question the interpretability of the marginal effects in the model, since collinearity means that the estimators of the variables are highly interdependent. Results of regression analyses are commonly interpreted independently, keeping everything else constant. Under multicollinearity this interpretation is not very realistic, which could have serious consequences for the results as described above.

7.3. Hypothesis Three

3. The gravity variables significantly influence the effect of trade on conflict.

The two probit models, "Conflict 1" and "Conflict 2" in table 5.5, show that addition of the gravity variables greatly enhances the reliability of the model as a whole and the effect of trade on conflict in particular. The coefficient of real bilateral trade gains in magnitude and significance with their addition. Furthermore, the variables themselves have significant coefficients in both the conflict and trade regression, the likelihood of conflict reduces with distance and increases with GDP (the predictive margins are depicted in appendix A.3) as does the level of real bilateral trade.

7.4. Hypothesis Four

4. Members of the World Trade Organization are less likely to engage in conflict.

No evidence was found for the benefits of a WTO membership in the context of conflict prevention. The only evidence found is that the likelihood of conflict increases when one state in the dyad is a WTO member as opposed to no members in the dyad, which is basically the opposite of what the WTO states (World Trade Organization, 2019, p. 46). Indirect evidence of the pacific claim is found however. Since both dummies in the trade regression (see table 5.5) have a significant positive coefficient, whereby trade_common > trade_one.

This indicates that WTO members trade more in general. Given it is known that trade does have a pacifying effect by itself. It can be stated that trade system membership only influences the likelihood of conflict through the increased levels of bilateral trade. Increasing international trade would be more effective in preventing conflict than becoming a WTO member and maintaining present (bilateral) trade volumes.

7.5. Hypothesis Five

5. A higher intensity of bilateral trade will lower the probability of conflict.

The coefficient of the intensity of bilateral trade was not significant in the models displayed in table 5.5. But this was only the case when it is interacted with real bilateral trade. When it is added to the model by itself it keeps the negative sign and becomes significant. This regression is not displayed however, because the interaction variable increased the adjusted R^2 of the probit models. Moreover, it made the coefficient of real bilateral trade more significant and, in the end, that was the variable of interest. By itself, intensity of bilateral trade was significant, meaning that the likelihood of conflict between two states decreases when trade volumes within the dyad increases with respect to the total international trade volume of both states.

7.6. Research Question

Can international trade reduce interstate conflicts?

In this research, evidence of the pacifying effect of trade was found, hence it can be concluded that trade does reduce conflict. More specifically, for a 1% decrease in the probability of conflict real bilateral trade has to increase by 81.16% on average. This effect can be enhanced through a higher intensity of bilateral trade. There are some drawbacks to this result though. Diagnostic tests show that both the assumptions of the probit model and the pVAR are not completely met, meaning that the reliability of their results is questionable and it makes straightforward interpretation difficult.

The case studies have shown that the relationship between trade and war can differ greatly from one case to the next, this makes the policy implications of this research quite

indistinct. In general, trade reduces the likelihood of conflict. Absolute trade volumes have to increase by only a very small amount for a significant decrease in the probability of conflicts when initial trade flows are zero. When trade flows are initially high however, vast amounts of auxiliary trade volumes are needed in order to decrease the likelihood of conflict. Which is, of course, not always feasible in reality.

Relating back to the discussion between the realist and liberals mentioned in the introduction, this research supports the liberal argument, as does most empirical research. Sometimes conventional wisdom is coincidentally just the truth. The discussion is far from over however, the results of this research are nowhere near reliable enough to close the discussion indefinitely. Especially the endogeity of bilateral trade in the models is worrisome, further research should focus on finding good instruments to solve this issue.

If a human disagrees with you, let him live. In a hundred billion galaxies, you will not find another. - Carl Sagan, 1980

A

Appendix

A.1. Example Case Studies

```
% import data
import excel "...", sheet("...") firstrow
% set variables
replace GDP =. if GDP ==-9
generate Trade1 = Trade*1000000
generate lnTrade1 = ln(Trade1)
replace lnTrade1 =0 if lnTrade1 ==.
generate lnmilex_t = ln(milex_t)
generate lnmilper_t = ln(milper_t)
generate lnirst_t = ln(irst_t)
generate lnpec_t = ln(pec_t)
generate lntpop_t = ln(tpop_t)
generate lnupop_t = ln(upop_t)
generate lnGDP = ln(GDP)
% set time
tsset year
% plot time series to preliminary eyeball the relationship
line MIDNumber lnTrade1 IOBT_NX lnmilex_t lnmilper_t lnirst_t lnpec_t
    lntpop_t lnupop_t cinc_t lnGDP year, legend(size(medsmall))
% stationarity test
dfuller MIDNumber, lags(1)
dfuller lnTrade1, lags(1)
dfuller IOBT_NX, lags(1)
dfuller lnmilex_t, lags(1)
dfuller lnmilper_t, lags(1)
```

```
25 dfuller lnirst_t, lags(1)
26 dfuller lnpec_t, lags(1)
27 dfuller lntpop_t, lags(1)
28 dfuller lnupop_t, lags(1)
29 dfuller cinc_t, lags(1)
30 dfuller lnGDP, lags(1)
31 % all but lntpop_t are non-stationary
32 dfuller d.MIDNumber, lags(1)
33 dfuller d.lnTrade1, lags(1)
34 dfuller d.IOBT_NX, lags(1)
35 dfuller d.lnmilex_t, lags(1)
36 dfuller d.lnmilper_t, lags(1)
37 dfuller d.lnirst_t, lags(1)
38 dfuller d.lnpec_t, lags(1)
39 dfuller d.lntpop_t, lags(1)
40 dfuller d.lnupop_t, lags(1)
41 dfuller d.cinc_t, lags(1)
42 dfuller d.lnGDP, lags(1)
43 % stationary after first difference: MIDNumber lnTrade1 IOBT_NX
     lnmilex_t lnmilper_t lnirst_t  lnpec_t lnupop_t cinc_t lnGDP
44 % non-stationary after first difference: lntpop_t
45 % drop missing values lnGDP
46 % determine optimal lag length
47 varsoc MIDNumber lnTrade1 IOBT_NX lnmilex_t lnmilper_t lnirst_t
     lnpec_t lnupop_t cinc_t, maxlag(2)
48 % estimate the unrestricted var
49 var MIDNumber lnTrade1 IOBT_NX lnmilex_t lnmilper_t lnirst_t  lnpec_t
     lnupop_t cinc_t, lag(1/2) dfk
50 % granger causality test
51 vargranger
52 % test for stationarity of the variables
53 varstable, graph
54 % VAR satisfies stability condition, one variable lies just outside
     the unitcircle
55 % lagrange multiplier (LM) test for autocorrelation of the
     residuals
56 varlmar, mlag(2)
57 % there is no autocorrelation in the residuals at lagorder 2
58 % the Jarque Bera statistic is used to test for normality of the
```

```
    residuals
varnorm, jbera
% it shows that the residuals of the equation of MIDNumeber are
    normally distributed at 5% level
% Johansen test for cointergration
vecrank MIDNumber lnTrade1 IOBT_NX lnmilex_t lnmilper_t lnirst_t
    lnpec_t lnupop_t cinc_t, trend(constant)
% run VEC model
vec MIDNumber lnTrade1 IOBT_NX lnmilex_t lnmilper_t lnirst_t  lnpec_t
    lnupop_t cinc_t, trend(constant)
% correlation
corr lnTrade1 MIDNumber
% estimate ordered probit
oprobit MIDNumber c.lnTrade1##c.IOBT_NX c.lnmilex_t c.lnmilper_t c.
    lnirst_t c.lnpec_t c.lntpop_t c.lnupop_t cinc_t
```

A.2. Diagnostic Tests pVAR

```
% set time
xtset Dyadindex year
set matsize 6400
% test stationarity of individual variables
xtunitroot fisher MIDNumber2 if Dyadsizeyears > 10, pp lags(1)
xtunitroot fisher lnRealBiTrade1 if Dyadsizeyears > 10, pp lags(1) tr
xtunitroot fisher lnGDP if Dyadsizeyears > 10, pp lags(1) tr
xtunitroot fisher cinc_t if Dyadsizeyears > 10, pp lags(1)
xtunitroot fisher lnDistance if Dyadsizeyears > 10, pp lags(1)
% test on first difference
generate dMIDNumber = d.MIDNumber
generate dlnRealBiTrade = d.lnRealBiTrade
generate dlnGDP = d.lnGDP
generate dcinc_t = d.cinc_t
generate dlnDistance = d.lnDistance
xtunitroot fisher dMIDNumber if Dyadsizeyears > 10, pp lags(1)
xtunitroot fisher dlnRealBiTrade1 if Dyadsizeyears > 10, pp lags(1) tr
xtunitroot fisher dlnGDP if Dyadsizeyears > 10, pp lags(1) tr
xtunitroot fisher dcinc_t if Dyadsizeyears > 10, pp lags(1)
xtunitroot fisher dlnDistance if Dyadsizeyears > 10, pp lags(1)
% all are stationary after first differnce so we continue
```

```
% paneldata vector autoregressive model with one lag, assume that variables are not cointergrated
% (findit pvar)
pvar MIDNumber2 lnRealBiTrade1 cinc_t lnGDP if Dyadsizeyears > 10, instl(1/2) td exog(lnDistance)
% granger is implied because we use one lag, but for good measure:
pvargranger
% test for stability (implies stationarity)
pvarstable, graph
% (ssc instal jb)
by Dyadindex : gen lag1MIDNumber2 = MIDNumber2[_n-1]
by Dyadindex : gen lag1lnRealBiTrade1 = lnRealBiTrade1[_n-1]
by Dyadindex : gen lag1lnGDP = lnGDP[_n-1]
by Dyadindex : gen lag1cinc_t = cinc_t[_n-1]
% conflict equation
reg MIDNumber2 lag1MIDNumber2 lag1lnRealBiTrade1 lag1lnGDP lag1cinc_t lnDistance if Dyadsizeyears > 10
% test for hetroskelasticity of the residuals
estat ovtest
% test for normality of the residuals
predict resid1c, residuals
histogram resid1c, kdensity normal
jb resid1c
% test for serial autocorrelation of the resiudals
% (findit xtserial)
xtserial resid1c if Dyadsizeyears > 10
% trade equation
reg lnRealBiTrade1 lag1MIDNumber2 lag1lnRealBiTrade1 lag1lnGDP lag1cinc_t lag1lnDistance if Dyadsizeyears > 10
estat ovtest
predict resid1t, residuals
histogram resid1t, kdensity normal
jb resid1t
xtserial resid1t if Dyadsizeyears > 10
```

A.3. Predictive Margins Gravity Variables

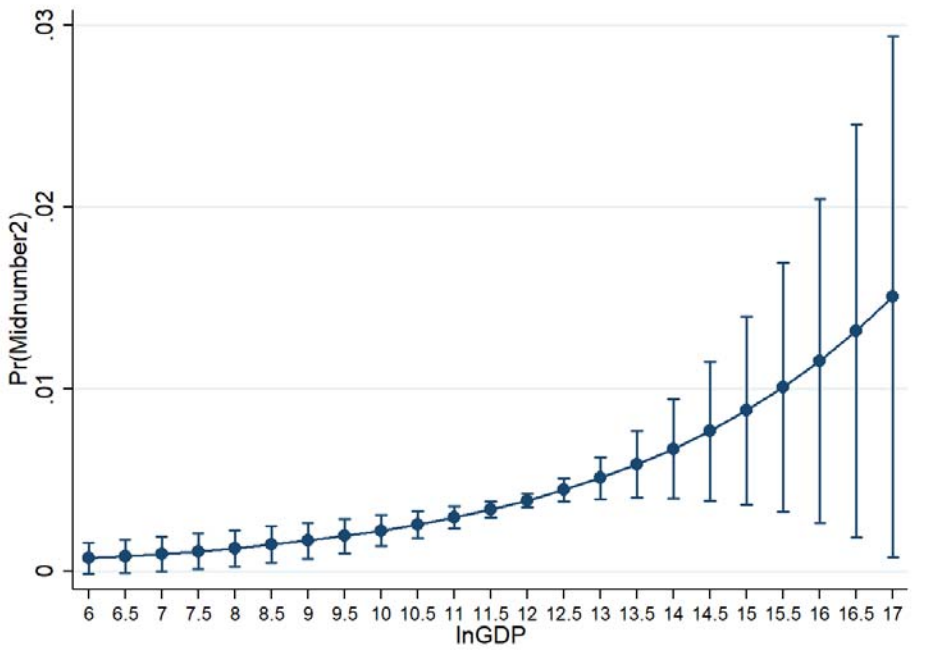

Figure A.1: Predictive margins lnGDP with 95% confidence Intervals

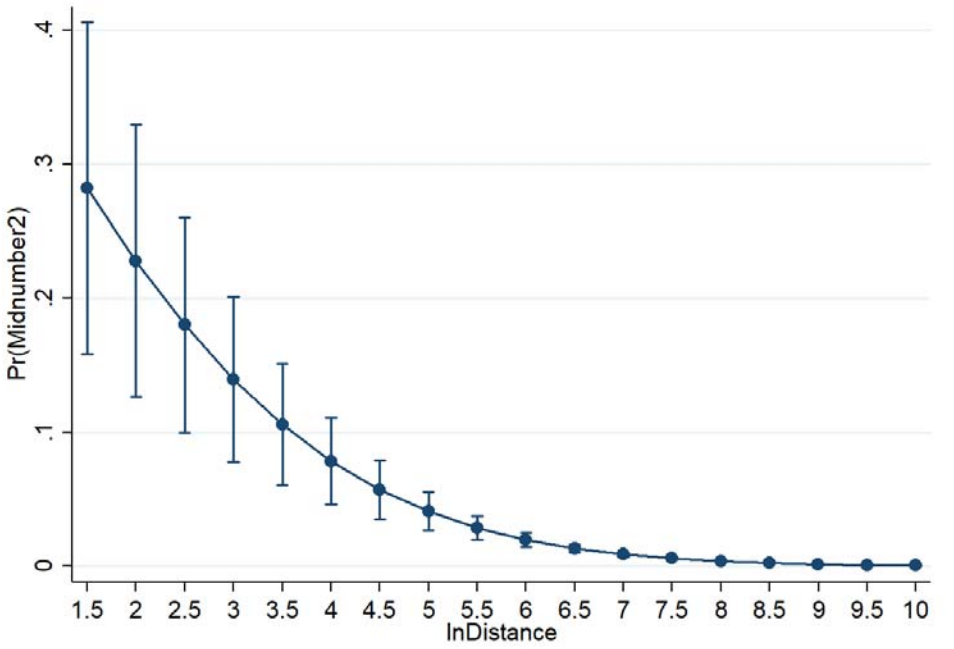

Figure A.2: Predictive margins lnDistance with 95% confidence Intervals

A.4. Ordered Probit Model Case Studies

Table A.1: Ordered probit model case studies

	U.S.A. - Iran		U.S.A. - China		U.S.A. - Russia	
Name	coef.	p-value	coef.	p-value	coef.	p-value
Log of Real Bilateral Trade	0.7254	0.170	-0.1158	0.150	-0.8759	0.505
Intensity of Bilateral Trade	-2423.7420	0.582	-1153.2120	0.131	524.2142	0.770
Interaction Variable	104.0666	0.63	30.4633	0.254	-9.0914	0.911
Log of Military Expenses	-3.0243	0.483	-4.1376	0.306	5.9435	0.044
Log of Military Personnel	7.9482	0.178	-11.8504	0.028	-3.2078	0.333
Log of Iron and Steel Production	-1.3636	0.775	-2.4192	0.573	6.5655	0.187
Log of Primary Energy Consumption	26.5767	0.311	-9.7611	0.218	-7.8406	0.271
Log of Total Population	-26.4762	0.498	73.8673	0.048	6.9312	0.574
Log of Urban population	8.6099	0.022	-1.3694	0.630	-11.6086	0.058
CINC	-261.1347	0.011	145.9333	0.036	-4.9059	0.914
Log likelihood	-22.2919		-23.3518		-36.6869	
Prob > chi^2	0.0000		0.0000		0.0004	
Number of obs	50		50		51	
Pseudo R^2	0.4909		0.5190		0.3032	
Corr. trade and conflict	0.2662		-0.6246		-0.5254	

Bibliography

Abrigo, M. R. M. and Love, I. (2016). Estimation of panel vector autoregression in stata. *The Stata Journal, 16*(3), 778–804.

Alvandi, R. (2014). *Nixon, Kissinger, and the Shah: The United States and Iran in the Cold War*. Oxford: Oxford University Press.

Anderton, C. H. and Carter, J. R. (2001). The impact of war on trade: An interrupted times-series study. *Journal of Peace Research, 38*(4), 445–457.

Barbieri, K. (1996). Economic interdependence: A path to peace or a source of interstate conflict? *Journal of Peace Research, 33*(1), 29–49.

Barbieri, k. and Keshk, O. M. G. (2011). Too many assumptions, not enough data. *Journal of Conflict Management and Peace Science, 28*(2), 168–172.

Barbieri, k. and Keshk, O. M. G. (2016). Correlates of War project trade data set codebook, version 4.0. http://www.correlatesofwar.org.

Barbieri, k., Keshk, O. M. G., and Pollins, B. (2009). Trading data: Evaluating our assumptions and coding rules. *Journal of Conflict Management and Peace Science, 26*(5), 471–491.

Barbieri, K. and Levy, J. S. (1999). Sleeping with the enemy: The impact of war on trade. *Journal of Peace Research, 36*(4), 463–479.

Bentham, J. and Bowring, J. (1843). *The Works of Jeremy Bentham*. London: Edinburgh, W. Tait.

Bera, A. K. and Jarque, C. M. (1987). A test for normality of observations and regression residuals. *International Statistical Review, 55*(2), 163–172.

Berbaum, M. L., Oneal, J. R., and Russett, B. (2003). Causes of peace: Democracy, interdependence, and international organizations, 1885–1992. *International Studies Quarterly*, *47*(1), 371–393.

Blainey, G. (1973). *The Causes of War*. London: Macmillan.

Blanchard, J. F. and Ripsman, N. M. (1994). Peace through economic interdependence? appeasement in 1936. *Paper presented at the annual meeting of the American Political Science Association, 1-4 September, New York*.

Blomberg, S. B. and Hess, G. D. (2006). How much does violence tax trade? *The Review of Economics and Statistics*, *88*(4), 599–612.

Boehmer, C., Gartzke, E., and Li, Q. (2001). Investing in the peace: Economic interdependence and international conflict. *International Organization*, *55*(2), 391–438.

Bremer, S., Singer, J. D., and Stuckey, J. (1972). Capability Distribution, Uncertainty, and Major Power War, 1820-1965. In B. Russett (Ed.), *Peace, War, and Numbers* (pp. 19–48). Beverly Hills: Sage.

Bright, J. and Cobden, R. (1868). *Speeches on Questions of Public Policy. Vol. 2 War, Peace, and Reform*. London: Macmillan.

Cao, X., Siverson, R. M., and Ward, M. D. (2007). Disputes, democracies, and dependencies: A reexamination of the kantian peace. *American Journal of Political Science, 51*(3), 583–601.

Chang, Y., Polachek, S. W., and Robst, J. (1999). Liberalism and interdependence: Extending the trade–conflict model. *Journal of Peace Research*, *36*(4), 405–422.

Chen, G. and Surumi, H. (2010). Probit and logit model selection. *Statistics - Theory and Methods*, *40*(1), 159–175.

CIA. (1998). The world factbook. http://www.cia.gov/cia/publications/factbook/index.html.

Clément, P. (1666). *Lettres, Instructions et Mémoires de Colbert*. Paris: Imprimerie Nationale.

Conant, C. A. (1898). The economic basis of “imperialism”. *The North American Review, 167*(502), 326–340.

Copeland, D. C. (1996). Economic interdependence and war: A theory of trade expectations. *International Security, 20*(4), 5–41.

Davis, D. R., Oneal, J. R., and Russett, B. (1998). The third leg of the kantian tripod for peace international organizations and militarized disputes, 1950– 85. *International Organization, 52*(3), 441–467.

Dickey, D. A. and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(1), 427–431.

Diehl, P. F., Gochman, C., Schafer, P., Stinnett, D. M., and Tir, J. (2016). The Correlates of War project direct contiguity data, version 3.2. *Conflict Management and Peace Science, 19*(2), 58–66.

Dorussen, H. and Ward, H. (2010). Trade networks and the kantian peace. *Journal of Peace Research, 47*(1), 29–42.

Durbin, J. (1954). Errors in variables. *Review of the International Statistical Institute, 22*(1), 23–32.

Fishman, J. A. (2010). *Handbook of Language and Ethnic Identity: Disciplinary and Regional Perspectives (Volume 1)*. Oxford: Oxford University Press.

Gartzke, E. (2007). The capitalist peace. *American Journal of Political Science, 51*(1), 166–191.

Gartzke, E. and Hewitt, J. J. (2010). International crises and the capitalist peace. *International Interactions, 36*(2), 115–145.

Gartzke, E. and Zhang, J. J. (2015). Trade and War. In L. L. Martin (Ed.), *The Oxford Handbook of the Political Economy of International Trade* (pp. 419–438). New York: Oxford University Press.

Gibler, D. M. (2009). *International Military Alliances, 1648-2008*. Washington, D. C.: Congressional Quarterly Press.

Gibler, D. M. and Sarkees, M. R. (2004). Measuring alliances: The Correlates of War formal interstate alliance dataset, 1816-2000. *Journal of Peace Research*, *41*(2), 211–222.

Gilber, D. M., Little, E. K., and Miller, S. V. (2016). An analysis of the militarized interstate dispute (mid) dataset, 1816–2001. *International Studies Quarterly*, *60*(4), 719–730.

Gleditsch, K. S. (2002). Expanded trade and GDP data. *Journal of Conflict Resolution*, *46*(5), 712–724.

Glick, R. and Taylor, A. M. (2010). Collateral damage: Trade disruption and the economic impact of war. *The Review of Economics and Statistics*, *92*(1), 102–127.

Hamilton, A. (1791). Report on Manufactures. In H. C. Syrett (Ed.), *The Papers of Alexander Hamilton* (pp. 230–340). New York: Columbia University Press.

Harlen, C. M. (1999). A reappraisal of classical economic nationalism and economic liberalism. *International Studies Quarterly*, *43*(4), 733–744.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica*, *46*(1), 1251–1271.

Hegre, H., Oneal, J., and Russett, B. (2010). Trade does promote peace: New simultaneous estimates of the reciprocal effects of trade and conflict. *Journal of Peace Research*, *47*(6), 763–774.

Henderson, E. A. and Maoz, Z. (2013). The world religion dataset, 1945-2010: Logic, estimates, and trends. *International Interactions*, *39*(1), 265–291.

Heston, A. and Summers, R. (1991). The penn world table (mark 5): An expanded set of international comparisons, 1950-1988. *Quarterly Journal of Economics*, *106*(1), 327–368.

Hobson, J. A. (1902). *Imperialism: A Study*. London: George Allen & Unwin LTD.

Hoff, P. D. and Ward, M. D. (2007). Persistent patterns of international commerce. *Journal of Peace Research*, *44*(2), 157–175.

Hughes, R. G. and Scott, L. (2015). *The Cuban Missile Crisis: A Critical Reappraisal*. London: Routledge.

Joas, H. and Knöbl, W. (2013). *War in Social Thought: Hobbes to the Present*. Princeton: Princeton University Press.

Johansen, S. (1995). *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford: Oxford University Press.

Johnson, P. L., Kaplan, J., Maoz, Z., Ogunkoya, F., and Shreve, A. (2019). The dyadic militarized interstate disputes (MID's) dataset version 3.1: Logic, characteristics, and comparisons to alternative datasets. *Journal of Conflict Resolution (forthcoming)*.

Kant, I. (1795). *Perpetual Peace: A Philosophical Sketch*. Konigsberg: F. Nicolovius.

Kent, J. and Young, J. W. (2003). *International Relations since 1945*. Oxford: Oxford University Press.

Keshk, O. M. G., Pollins, B. M., and Reuveny, R. (2004). Trade still follows the flag: The primacy of politics in a simultaneous model of interdependence and armed conflict. *The Journal of Politics*, *66*(4), 1155–1179.

Keshk, O. M. G., Pollins, B. M., and Reuveny, R. (2011). The perils of doctrine: A reply to Håvard Hegre, John R. Oneal & Bruce Russett: Trade does promote peace: New simultaneous estimates of the reciprocal effects of trade and conflict published. *Journal of Peace Research, Posted online*.

Leeds, B. A., Long, A. G., McLaughlin Mitchell, S., and Ritter, J. M. (2002). Alliance treaty obligations and pro- visions, 1815-1944. *International Interactions*, *28*(3), 237–260.

Lektzian, D. and Souva, M. (2009). A comparative theory test of democratic peace arguments, 1946–2000. *Journal of Peace Research*, *46*(1), 17–37.

Levy, J. (1989). The Causes of War: A Review of Theories and Evidence. In P. E. Tetlock, J. L. Husbands, R. Jervis, P. C. Stern, and C. Tilly (Eds.), *Behavior, Society, and Nuclear War* (pp. 209–313). New York: Oxford University Press.

Li, Q. and Reuveny, R. (2011). Does trade prevent or promote interstate conflict initiation? *Journal of Peace Research*, *48*(4), 437–453.

Lupu, J. and Traag, V. A. (2012). Trading communities, the networked structure of international relations, and the Kantian peace. *Journal of Conflict Resolution*, *48*(4), 437–453.

Lutkepohl, H. (2005). *New Introduction to Multiple Time Series Analysis*. New York: Springer.

Maoz, Z., Oneal, J. R., Oneal, F. H., and Russett, B. (1996). The liberal peace: Interdependence, democracy, and international conflict, 1950-85. *Journal of Peace Research*, *33*(1), 11–28.

Martin, P., Mayer, T., and Thoenig, M. (2008). Make trade not war? *The Review of Economic Studies*, *75*(3), 865–900.

Martin, P., Thierry, M., and Thoenig, M. (2007). Civil wars and international trade. *Journal of the European Economic Association*, *6*(2-3), 541–550.

Mastanduno, M. (1993). Do Relative Gains Matter? In D. Baldwin (Ed.), *Neorealism and Neoliberalism: The Contemporary Debate* (pp. 250–269). New York: Columbia University Press.

Melitz, J. and Toubal, F. (2014). Native language, spoken language, translation and trade. *Journal of International Economics*, *92*(2), 351–363.

Mill, J. S. (1848). *Principles of Political Economy*. London: John W. Parker.

Minderhout, H. (1665). *The battle of lowestoft*. Greenwich, London.

Montesquieu, C. (1750). *The Spirit of Laws*. Genève: Chez Barrillot & Fils.

Morrow, J. D. (1999). How could trade affect conflict? *Journal of Peace Research*, *36*(4), 481–489.

Newey, W. K. (1987). Efficient estimation of limited dependent variable models with endogenous explanaory variables. *Journal of Econometrics*, *36*(1), 231–250.

Nordstrom, T., Pevehouse, J. C., and Warnke, K. (2004). The cow-2 international organizations dataset version 2.0. *Conflict Management and Peace Science, 21*(1), 101–119.

Oneal, J. R. and Russett, B. (1997). The classical liberals were right: Democracy, interdependence, and conflict, 1950–1985. *International Studies Quarterly, 41*(2), 267–293.

Oneal, J. R. and Russett, B. (1999). Assessing the liberal peace with alternative specifications: Trade still reduces conflict. *Journal of Peace Research, 36*(4), 423–442.

Paganelli, M. P. and Schumacher, R. (2019). Do not take peace for granted: Adam Smith's warning on the relation between commerce and war. *Cambridge Journal of Economics, 43*(3), 785–797.

Paine, T. (1791). *The Rights of Man*. London: J. S. Jordan.

Polachek, S. W. and Seiglie, C. (2007). Trade, Peace and Democracy: An Analysis of Dyadic Dispute. In T. Sandler and K. Hartley (Eds.), *Handbook of Defense Economics, Vol. 2: Defense in a Globalized World* (pp. 1017–1073). Amsterdam: North Holland.

Pregibon, D. (1980). Goodness of link tests for generalized linear models. *Journal of the Royal Statistical Society. Series C (Applied Statistics), 29*(1), 15–23.

Rousseau, J. (1755). *A Lasting Peace and the State of War*. London: Constable and Company Limited.

Russell, M. (2018). U.S. - Russia relations: Reaching the point of no return? http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/628230/EPRS_BRI(2018)628230_EN.pdf.

Sagan, C. (1980). *Cosmos*. New York: Random House.

Saint-Pierre, C. C. (1713). *Project for Perpetual Peace in Europe*. Utrecht: Chez Antoine Schouten.

Singer, J. D. (1987). Reconstructing the Correlates of War dataset on material capabilities of states, 1816-1985. *International Interactions, 14*(1), 32–115.

Singer, J. D. and Small, M. (1966). Formal alliances, 1815-1939. *Journal of Peace Research*, *3*(1), 1–31.

Smith, A. (1776). *Wealth of Nations*. London: W. Strahan and T. Cadell.

Snidal, D. (1993). Relative Gains and the Pattern of International Cooperation. In D. Baldwin (Ed.), *Neorealism and Neoliberalism: The Contemporary Debate* (pp. 170–208). New York: Columbia University Press.

Torbat, A. E. (2005). Impacts of the U.S. trade and financial sanctions on Iran. *The World Economy*, *28*(3), 407–434.

Waltz, K. (1979). *Theory of International Politics*. New York: Random House.

Wolfe, M. (1966). French views on wealth and taxes from the middle ages to the old regime. *The Journal of Economic History*, *26*(4), 466–483.

WTO. (2019). 10 things the WTO can do. https://www.wto.org/english/res_e/publications_e/wtocan_e.pdf.

Wu, D. (1973). Alternative tests of independence between stochastic regressors and disturbances. *Econometrica*, *41*(1), 733–750.