Dividing the Watercourse:

the impact of power asymmetry and economic partnership on outcomes to transboundary water conflicts

by

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Abstract

This study assesses the impact of power asymmetry and economic partnerships on outcomes of transboundary water conflicts. Outcomes to transboundary water conflicts is taken to mean the formation of a treaty, the extent a treaty is equitable and reasonable, the respectability of a treaty, and the intensity of the conflict. Power asymmetry is captured by the difference in riparian states' capabilities and economic strength. Economic partnership is measured as the trade between the watercourse states as a fraction of their trade with the rest of the world. Other influencing factors – namely, water scarcity, diplomatic engagement, political tension, and regime similarities – are accounted for. The main results suggest that effects of power asymmetry and economic partnership play a role in certain aspects of the outcome of a transboundary water conflict, yet their effects can be influenced by other influencing factors. Neither power asymmetry nor economic partnership has an effect on the formation of a treaty or the extent the treaty is equitable and reasonable. Power asymmetry has a negative effect on the respectability of a treaty and a positive effect on the intensity of the transboundary water conflict. Economic partnership has a positive effect on the respectability of a treaty and a negative effect on the intensity of the conflict. However, its effect can be overridden by power asymmetry and other influencing factors.

To my father, who has given me the world,

To my mother, who has taught me to conquer it.

Preface

This was my first major research endeavor. At times, it wrote itself. Other times, it was an uphill battle. As with any undertaking, there are several people to thank that helped along the way. My first and foremost gratitude goes to Professor Dijkstra for her patience and guidance. Her feedback was always valuable. A word of thanks also goes to Professor Onderco for bettering my understanding of research. With creative analogies from *kroket-broodjes* to *wagyu steaks*, he explained me concepts in ways I could understand them.

When I was thirteen, I recall zipping on the Jhelum river on a speedboat, clenched onto my lifejacket, wondering how it was that two countries always at loggerheads, ever came to agree on the apportionment of the rivers of the Indus. Nine years later, I found myself asking a similar question, as I overlooked the beauty of the Danube on a summer day in Vienna, thinking to myself, how it was that ten European nations managed to amicably share that river. It was out of this undying curiosity that the topic of this research was born. Studying in a country - the Netherlands - that has mastered the art of water policy and management, it seemed the most obvious choice to have a research topic related to water.

Although this was a brief flirtation with research, I enjoyed it thoroughly. A humbling experience, it was the most fitting way to conclude my Master's studies at the Erasmus University of Rotterdam.

To anyone that has stumbled upon this research, I hope that you enjoy reading as much as I did writing.

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Chapter 1 – Introduction

It was a moment of political victory for the King of Lagash when he successfully deprived Umma, a neighboring region in the northwest of Babylonia, from its access to water. Having diverted water towards his own boundary canals, the King managed to escalate tensions between the two rival regions and Umma was left to deal with the disastrous consequences of not having any water supply. This conflict between the Mesopotamian city-states is one of the oldest recorded examples of a water conflict (Cooper, 1983).

Since then, the world has come to witness over two hundred recorded instances whereby water was the source of conflict between various regions (Pacific Institute, 2019). Instances usually arise when nations have to share an international watercourse. The Convention on the Law of the Non-Navigational Uses of International Watercourses (hereafter "UN Watercourse Convention") defines an international watercourse as a water body that has parts "…situated in different states." There are reportedly 286 water basins that cross international boundaries, accounting for nearly half of the earth's land area (Petersen-Perlman, Veilleux, & Wolf, 2017).

It has been argued that the sharing of waters is associated with conflict between nations (Toset, Gleditsch & Hegre, 2000). A considerable amount of international attention and academic literature has focused on the risk and danger of a transboundary water conflict. Pacific Institute defines transboundary water conflicts, particularly those in which water is used as a trigger or root cause for conflict, as a situation "where there is a dispute over the control of water or water systems, or where economic or physical access to water, or scarcity of water, triggers violence" (Pacific Institute, 2019).

Transboundary watercourses can be conflictual for two reasons. Firstly, watercourses are shared resources and can be beneficially exploited and depleted (Wouters, 2003). When a resource has shared ownership, every actor utilizes it in accordance with their self-interest, often at the expense of other actors. This, eventually, ruins the common resource (Hardin, 1968). Secondly, water is scarce. According to a Global Risks Report, water scarcity is one of the world's top ten gravest risks (World Economic Forum, 2019). This has the potential to impact the lives of nearly one billion people of the world by 2025 (IWMI, 1998). Pressures of the world today like climate change, urbanization, and population growth have placed additional strains on the global water supply. These strains increase water demand and in turn increase the likelihood of conflict, particularly in areas where watercourses are shared. To echo the words of caution by former UN Secretary-General, Ban Ki-Moon, at the Asia Pacific Water Summit, "water scarcity… [i]s a potent fuel for wars and conflict," (Moon, 2007).

However, just as watercourses have the potential of being a source of conflict, they also have the potential of being the means through which watercourse states cooperate. In fact, findings suggest that historically, nations have been more inclined towards cooperation over freshwater resources than towards conflict (Yoffe, Wolf, & Giordano, 2003). This is manifested in the formation of over 3,600 treaties between countries to share international waters (Wolf & Hamner, 2000). When a dispute arises, state practice has demonstrated that the preference is to build institutional capacity to resolve the conflict (Wouters, 2003). In the context of water resources, institutional capacity can be in the form of agreements and legally binding treaties (Priscoli & Wolf, 2009).

A successful resolution is the most favorable outcome to a transboundary water dispute because war is a costly alternative (Petersen-Perlman et al., 2017). Treaties help reduce conflict because they stabilize the relations of watercourse states by providing a degree of predictability (McCaffrey, 2003). The intensity of conflict also reduces with treaties, especially if they are mutually beneficial and respected.

However, a successful resolution is not always an easy task due to several hurdles.

Firstly, nations stay in disagreement with how to best apportion, utilize, and control shared watercourses (Salman, 2003). Studies, in review of existing treaties, reveal that most water agreements carry significant ambiguity. Water allocations are not clearly prescribed. It has been found that two-thirds of countless treaties fail to define specific allocations (Priscoli & Wolf, 2009). In the treaties that do specify quantities, they are agreed in fixed amounts which ignores the possibility of hydrologic variation (Priscoli & Wolf, 2009).

Secondly, states are not bound by any formalized and codified body of international water laws. As such, states rely on customary law (Wouters, 2000). A recognized principle of customary law is the rule pertaining to equitable and reasonable utilization. This principle, enshrined in the UN Watercourse Convention, governs states with respect to international watercourses (Wouters, 2000). It does not necessarily entitle each state to an equal portion of the uses and benefits of the watercourse. Instead, it requires states to incorporate certain elements into freshwater treaties that allow each riparian maximum benefit in using the watercourse (Caponera, 2003). The elements are identified in the UN Watercourse Convention.

Thirdly, even when agreements are concluded between watercourse states, disputes persist due to alleged breaches and violations over obligations and agreements (Wouters, 2003). In research carried out by Lautze & Giordano (2005), it was found that out of 153 water agreements identified in Africa, only 108 were considered substantive and many of them were never implemented in practice.

All in all, resolving transboundary water conflicts is complicated, largely because every solution must be tailor-fit for the region and the watercourse itself. It would be interesting to see if outcomes of transboundary water conflicts could be influenced not just by the characteristics of the watercourse but also the riparian states involved. This is an area of research that has been explored to some extent.

Some theories that have been proposed are that the level of power a nation yields in comparison to the other nation can affect outcomes of transboundary conflicts. One such theory, the hydro-hegemony framework, goes a step further to suggest that nations with relatively greater power exert their influence over weaker states to impede cooperation over the watercourse and enjoy more self-serving outcomes (Zeitoun & Warner, 2006). What has also been argued is that countries that are important trading partners are more likely to refrain from conflict, and by that logic, would be able to evolve more cooperative outcomes to transboundary water conflicts. The trade-conflict theoretical model dictates that states refrain from conflict in order to protect their trading relations.

Although such theories do have merit, they have been challenged with counter theories and have produced conflicting results when tested. Moreover, while power has been studied in transboundary water contexts, little research has attempted the same with economic partnership and trade. As such, the focus of this research is to continue the academic discussion and make modest attempts at unfolding what relationship exists between power asymmetry, economic partnerships, and outcomes to transboundary water conflicts.

1.1 Research Objective

The main objective of this research is to enrich academic discussion and insights on outcomes of transboundary water conflicts by assessing whether the degree of power asymmetry and economic partnership has an effect on outcomes to transboundary water conflicts. More specifically, the purpose is to analyze what riparian countries stand to gain or lose in the outcomes of conflicts over transboundary waters. When dividing the watercourse, how and why do states get however much they get?

1.2 Research Question

The research question is as follows:

What is the impact of power asymmetry and economic partnership on outcomes of conflicts over transboundary waters?

The following sub-questions assist in answering the central research question:

i. What theory and evidence currently exist on the relationship of power asymmetry and economic partnerships on outcomes of conflict?

ii. What is the effect of power asymmetry and economic partnerships on transboundary water conflicts?

1.3 Research Approach

In carrying out this research, a qualitative case study analysis is employed. As the objective of the research is to investigate whether different values of power asymmetry and economic partnership can produce different outcomes of the dependent variable, the research is X-centered. For that reason, co-variational analysis is the most appropriate form of analysis.

This research has two independent variables: power asymmetry and economic partnership. Power asymmetry is measured using the differences of riparian countries with respect to their economic power and state capabilities. Economic partnership is measured by the bilateral trade of two watercourse states as a fraction of their trade with the rest of the world. This reflects the relevance of their trade.

The dependent variable of this research is outcome of transboundary water conflicts. With regards to outcomes to transboundary water conflicts, the research looks at four aspects as indicators. First, it is to be determined whether varying degrees of power asymmetry and economic partnership influence whether a treaty is formed to appropriate the watercourse. Second, it is to be assessed whether the treaty, if concluded, is considered equitable and reasonable as per the UN Watercourse Convention. Third, it is to be investigated whether power asymmetry and economic partnership are contributing factors in whether a treaty is respected. Fourth, it is to be seen whether the degrees of power asymmetry and economic partnership affect the intensity of the transboundary water conflict. All of these aspects will be examined separately for a comprehensive assessment of the outcome of transboundary water conflicts.

Case selection is done by shortlisting a list of transboundary water conflict from a list of conflictive water events obtained from the International Water Events database. It focuses only on cases that involve only two watercourses countries and disputes related to the quantity of water. The final list of cases was chosen by selecting cases that reflect varying degrees of power asymmetry and varying degrees of economic partnership. Based on this criterion, 4 transboundary water disputes were chosen for this research, namely the Nestos River, the Helmand River, the Rio-Grande River, and the Indus River.

For this thesis, extensive desk research is carried out. The International Freshwater Treaties Database is used for access to treaties. It also consults any secondary sources that analyze the transboundary water dispute, such as academic articles, scholarly papers, books, and news articles. Of particular relevance is the work of experts belonging to think-tanks and water-based-entitites like Pacific Institute and International Water Management Institute. For the preliminary literature review, a search on Google Scholar and Erasmus Library EUR database was used with keywords (“transboundary water conflicts”, “power asymmetry”, “economic partnership”, and “outcomes of transboundary water disputes”.)

1.4 Academic Relevance

This research is closely related to the literature that explores power dynamics in transboundary water conflicts. Investigating the effect of power asymmetry in outcomes to transboundary water conflicts is not a new undertaking. However, what sets apart this research is that it ventures to study cases that have rarely been focused on in extant literature. Most studies have also primarily focused on the Nile, Jordan, Tigris-Euphrates, Amu Darya and Orange River (Zeitoun & Warner, 2006; Wegerich, 2008; Turton, 2005). This approach not only enlarges the scope in research but also considers unique differences in other transboundary water basins.

Furthermore, this research deviates from other previous academic works by expanding the dependent variable. Most research considered outcomes to transboundary water conflicts to mean treaty formation. This research broadens the dependent variable to also including other indicators, namely the extent the treaty is equitable and reasonable, respectability of the treaty, and intensity of the conflict.

While surely making subtle changes from previous research, it would a remiss not to mention that the primary purpose of the research is to build on the extant literature. A great deal of uncertainty still exists about the effect of power asymmetry and economic partnerships on transboundary waters. This is because there are theoretical argumentations that compete for influence in the realm of hydro-politics and little academic work has extended the trade-conflict model to hydro-contexts. This research, as such, attempts to find evidence that could potentially substantiate or reject claims of the role of power asymmetry and economic partnership in the outcomes of transboundary water conflicts.

1.5 Societal Relevance

The heart of this research is the problem of water scarcity. This is currently a relevant problem with pressures on the dwindling global freshwater supply. Pressures could, in turn, intensify competition over the scarce resource and trigger water feuds that could escalate into water wars. Although the only war over water was fought eons ago, several basins have been identified as ripe for conflict in the coming years (Yoffe, Wolf, & Giordano, 2003). Water disputes have the potential to spiral out of control if countries do not actively search for cooperative outcomes. Academic discourse should focus on understanding what factors impede or contribute to cooperative outcomes. Research like this is useful to a wide range of actors that have a stake in transboundary water security and policy, including national governments and private non-state actors that want to improve the overall governance and management of shared watercourses.

1.6 Thesis Outline

The remainder of this research is as follows. Chapter 2 presents an understanding of the theoretical framework and a review of the literature surrounding the concepts of power asymmetry and economic partnership. On the basis of the literature review, expected findings are drawn. Chapter 3 follows with a detailed description of the methodology, justifying why a case-study analysis is tailor-fit to answer research objectives. Empirical findings and a thorough analysis of results are presented in Chapter 4. The thesis is concluded in Chapter 5 with a reflection of research implications and limitations. It also discusses areas for future research.

Chapter 2 – Theoretical Background

2.1 Theoretical Framework

2.1.1 Power asymmetry and outcomes to transboundary water conflicts

A brief discussion of the literature on the relationship of power asymmetry and outcomes to conflicts in the water realm is relevant here.

Early discussions of power manifesting in transboundary waters was based on the argument that interactions between watercourse states are determined by the amount of military prowess, economic strength, and technological potential they have accumulated in order to exploit water resources (Zeitoun & Warner, 2006). Some even argued that the geographic configurations (i.e. whether states are upper riparians and control the waterworks) also mattered (Haftendorn, 2000). This approach measures power in terms of resources. The reasoning is that countries with more wealth can buy influence over other countries through aid, loans, and investments while countries with more assets can destroy enemies, attract allies, and extract concessions (Beckley, 2018). Having superior resources and capacities can determine the outcome over a shared water resource, particularly because relatively more powerful states can use force to gain access to the water resource yet at the same time defend their water resources against attack (Zeitoun & Warner, 2006). This is not to suggest that powerful states will only use coercion and brute force to achieve their objectives. Creating compliance through the use of soft power is also a tactic utilized by the relatively more powerful watercourse state (Hanasz, 2014). Eventually, the powerful state safeguards their own interests and elicits consent from co-riparians to play by its rules. Its superior power discourages any resistance against that self-serving behavior of the powerful state (Hanasz, 2014).

2.1.1.1 Hydro-hegemony framework

When focusing on the influence of power in water contexts, one theory that seems to dominate in literature is the hydro-hegemony framework, postulated by Zeitoun & Warner (2006). In this theoretical framework, it has been argued that relatively more powerful riparians use a series of tactics and mechanisms to achieve hegemony in the transboundary water basin. This ensures their control over the water resource. Zeitoun & Warner (2006) suggest that it is the more powerful actor that is able to obtain control over the water resource because it is able to use its power in a dominating manner. Some of the listed tactics include the (threats of) use of force and extensive exploitation of the resource with no regard to the consequences for the other watercourse state (Zeitoun & Warner, 2006). For example, building dams and creating water diversions impacts the water flow that the other state receives.

2.1.1.2 Hegemons and institutional capacity

There are also sets of arguments that claim watercourse states use power to secure more self-serving outcomes in transboundary water conflicts with the use of institutional capacity. In such arguments, power is measured in terms of outcomes, meaning that power is the ability of a state to win in a dispute, set agenda for negotiations, and influence the preferences of other states (Beckley, 2018). This would imply that more powerful riparians are able to exploit institutions in a number of ways. Treaties can be structured in a manner that they reflect power inequities (Petersen-Perlman, Veilleux & Wolf, 2017) and lead to inequitable allocation of resources (Zeitoun & Warner, 2006). They can also be structured so they are not easily enforceable (Zeitoun & Warner, 2006).

This has two implications. One, even in cases of power asymmetry, there is room for treaty cooperation. Two, power asymmetry increases inequalities, such that the treaty governing the watercourse would be more favorable for one riparian than it would be for the other. Asymmetry of power and its implications on treaties can even be seen rooted in history as many treaties date back to colonial era, in which colonial powers engineered and exploited resources (Perlman et al., 2017).

This school of thought is challenged with another perspective that claims powerful watercourses states do not necessarily use institutional capacity to exploit other watercourse states. Instead, they themselves share an interest in the formation of a treaty because achievable gains can result from treaty cooperation.

2.1.1.3 Counter-hydro hegemony Literature

The theories discussed above were very heavily tilted in favor of the more powerful state. It begs to reason that the famous adage '*might is right'* is apt in the context of transboundary water basins. However, not everyone shares this point of view.

There is a growing body of literature that emphasizes that powerful watercourse states can be challenged by relatively less powerful watercourse states. This research is collectively referred to as counter-hydro-hegemony literature. Hegemonic order, no matter how established it is, can be resisted through a variety of counter-hegemonic strategies. Relatively less powerful states possess capacities and tactics through which they can resist and counter the actions and wishes of hegemons in transboundary basins. Should they employ these strategies, they can contribute to a more equitable water-sharing regime. The bottom line is that relatively weaker watercourse states are not as powerless as they seem (Cascao, 2008).

Cascao (2008) identified that counter-hegemonic strategies are effective should they challenge the hegemonic status quo, contest hegemonic legitimacy, and create alternatives. Examples of counter-

hegemonic mechanisms include coercive mechanisms of resistance and forming strategic alliances to improve bargaining power. It can also be to undermine the legitimacy of the current order by questioning it and by utilizing international water law. Weaker powers can influence agendas, place moral obligations on stronger states and withhold agreements (Petersen-Perlman & Fischhendler, 2018). Weaker riparians that do not possess superior economic and political capacities can also appeal to external actors (Kehl, 2011). External help can come in the form of mediation or alliances. Zeitoun & Allan (2008) were even bold to propose that weaker riparians should diversify their economy such that do not remain dependent on their natural resource. This can help them adapt to situations where there is a risk against their natural resource.

Moreover, it has also been argued that powerful riparian nations have vulnerabilities and limitations, in spite of being the greater power. (Petersen-Perlman & Fischhendler, 2018) proposed three vulnerabilities of hegemonic watercourse states. Firstly, they have to concede on issues not directly related to the watercourse in order to achieve compliance and maintain control of the watercourse. Secondly, domestic politics and external agencies can greatly influence their behavior. Thirdly, watercourse states more likely to concede if their survival becomes threatened.

2.1.2 Economic partnership and outcomes of conflict

Extant literature exploring the relationship between economic partnership and international conflict is inspired mostly by the longstanding liberal perspective that trade alters states behavior, such that it reduces international conflict and facilitates peace (Nye, 1988). Trade, according to Buzan (1993), automatically creates "codes of conduct" which protects the states involved in trade. Advocates of deepening economic relations between states say that while trade promotes understanding and cooperation, it also reduces the likelihood of countries resorting to military violence and disputes (Gartzke, Li & Boehmer, 2001). Should conflicts of interests arise between states, the recognition that mutual benefits exist in the manifestation of their trading relations will deescalate tensions. It is acknowledged that the gains and costs of trade may not be the same for both states but regardless of that, trade still benefits them all (Oneal & Russett, 1997).

In contrast to the clear link established between expanded trade and peace within the liberal perspective, there are arguments put forward by realist thinking that claim economic partnerships and trade have costs that outweigh the benefits. It is argued that trading relations increase the likelihood of conflict because trade produces inequities, particularly when relations between states are asymmetrical (McMillan, 1997). It has also been argued that trade is used to instigate wars and has been often used as an instrument of coercion. States can threaten disruption in bilateral trade, impose trade sanctions or come into disagreement with one another over the negotiation of agreements and allegations of unfair trade (Stein, 2003).

In transboundary water contexts, trade can be used as a silent and effective tool for nations to secure water. It allows nations to become water secure by importing water-intensive commodities such as food (Allan & Mirumachi, 2013). Subsequently, states do not need to resort to extreme measures, such as filling reservoirs, pumping groundwater, constructing dams or going to war. This is particularly useful in circumstances of transboundary water disputes where riparians may quickly resort to armed conflict if their water supplies are threatened.

2.1.2.1 Trade-conflict model

One major theory that encapsulates the argument of bilateral trade mitigating the propensity of states to engage in conflict is the trade-conflict model. This model dictates that states restrain from initiating conflict against trading partners, out of the fear that they will lose welfare gains associated with trade (Chang, 2005). Even if conflict does not lead to a complete cessation of trade, it will lead to inferior terms of trade and welfare losses (Polachek, 1980). The vested interests of nations to preserve their strong economic ties is enough to prevent countries from adopting confrontationist policies (Papayoanou, 1996). In other words, if the conflict would likely disturb relationships with important trading partners, then countries prefer conflict be avoided (Polachek, Robst, & Chang, 1999).

2.1.3 Conclusion

To summarize, there is considerable literature discussing the relationship between power asymmetry and economic partnership with outcomes to transboundary water conflicts. Overall, theoretical concepts tend to disagree on the effect that power asymmetry has on transboundary watercourses. A dominant theoretical argumentation is the hydro-hegemony framework which argued that powerful riparians leverage their power for more self-serving outcomes in transboundary watercourses. However, this framework was challenged with an emerging body of literature that emphasized the capacities of the lesser powerful states in order to resist and counter-challenge the more powerful riparian. With regards to economic partnership, the dominant theoretical argument was that trade and economic partnership brings prosperity and reduces conflict. In this light, the trade-conflict model postulates that states refrain from initiating conflict with each other if they are trading partners.

2.2 Literature Review

It is now relevant to review the body of literature and existing evidence that tests the theoretical framework discussed in the sub-sections prior.

2.2.1 Power asymmetry and outcomes of transboundary water conflicts

Empirical studies that investigated the relationship between power asymmetry and outcomes of transboundary water conflicts have produced divergent results. As such, academic research is divided on what type of relationship exists between power asymmetries and outcomes of transboundary water conflicts.

On one hand, extensive research has revealed that power asymmetries impede cooperation.

One such study is the work of Lowi (1995a) who conducted a case-study analysis of the waters of the Jordan river. She argued that cooperation hinges on the powerful riparians with superior resources because they have little incentive to conclude technical arrangements. Dinar et. al, (2010) conducted a quantitative analysis and found similar results. In that study, treaty cooperation was taken to mean the likelihood of treaty formation and the number of treaties formed. Power differentials in international waters were represented by the differences in the riparians economic power and welfare power. The results revealed that power asymmetry in the basin is not conducive to treaty cooperation. The negative relation was significant in all regressions, including geography, meaning power asymmetries impede cooperation, regardless of the more powerful state sitting upstream or downstream. This negates a major viewpoint that claims the geographical position of a watercourse state influences outcomes of a transboundary conflict.

On the other hand, there is substantial literature that claims that power asymmetry facilitates cooperative outcomes.

In a quantitative study carried out by Zawahri & Mitchell (2011), it was hypothesized that power distribution increased treaty formation. The study relied on CINC data to capture distribution in power. In this study, a distinction between bilateral treaties and multilateral agreements was made. Findings revealed with less power asymmetry, the greater chance for a multilateral treaty. Findings also revealed that a hegemon within a multilateral river basin tended to contribute to bilateral treaties. This is also similar to the findings of Tir & Ackerman (2009) who, in a quantitative study, found evidence to confirm that power distribution between riparians is a key factor in the emergence of water quantity and quality treaties. Power distribution in this study was measured using CINC data.

Moreover, there is also a segment of academic works that found no significant positive causation between the two. Espey & Towfique (2004) find that power asymmetries are not significant for treaty formation. By

applying a logistic model, the study attempted to determine factors that influenced the formation of water treaties. It was found that power asymmetry acts as an obstacle to treaty formation in some cases whereas, in others, it assists treaty formation.

Besides studies that investigated the effect of power asymmetry on treaty cooperation, there were studies that have applied hegemonic stability theory on outcomes of transboundary conflicts. Wegerich (2008) carried out a case-study analysis of the Amu Darya Basin and claimed that different aspects of hydro-hegemony would not guarantee that the outcome of the transboundary water was shaped by the more powerful riparian. Zeitoun et al., (2016) examined transboundary water interaction with a particular focus on how states contest outcomes influenced by hegemonic designs. The role of power asymmetry in the study was interpreted through a list of intervention strategies that seek to influence or challenge arrangements. This analysis was applied in various river basins, including the Tigris, Mekong, Amu Darya, and the Nile. Turton (2005) studied in depth the case study of Orange River Basin and analyzed how the hydro-hegemon interacted with other riparian states in securing outcomes. Daoudy (2008) also carried out a case-study analysis of the Tigris and Euphrates rivers to demonstrate how riparians used forms of powers as a negotiating tactic in securing outcomes to transboundary water conflicts.

A summary of the abovementioned research is encapsulated in Table 1. For standardization, only research in which power asymmetry was linked to the likelihood of treaty formation is included in the table.

Authors	*Independent variable*	*Dependent variable*	*Result*
Dinar et al. (2010)	Power asymmetry	Treaty Formation	-
Espey & Towfique (2004)	Power asymmetry	Treaty Formation	Insignificant
Lowi (1995)	Relative power resources	Technical arrangements	-
Tir & Ackerman (2009)	Power asymmetry	Treaty Formation	+
Zawahri & Mitchell (2011)	Power asymmetry	Treaty formation	+/- (Depending on Treaty type)

Table 1. *Existing Evidence exploring Relationship between Power asymmetry and Outcomes of Transboundary Conflicts.*

2.2.2 Trade partnerships and outcomes of conflicts

There is mounting evidence that trade reduces international conflicts.

Oneal & Russett (1997), in a quantitative analysis, offered evidence that higher levels of economically important trade are associated with lower incidences of militarized interstate disputes and war. Economically important trade was measured as the trade-to GDP ratio between two dyads. Gartzke, Li, & Boehmer (2001) adopted most aspects of the research design represented by Oneal & Russett (1997) but expanded the definition of economic interdependence to also including monetary interdependence and capital investment. The findings substantiate that trade contributes to peace. Gasiorowski & Polachek (1982) examined US-Warsaw Pact as a case study. A strong, inverse relationship between trade and conflict was found, in which trade caused a greater reduction in Warsaw Pact conflict than in the US conflict. Conflict was measured in the analysis as any events that reflect a degree of hostility in actions between nations.

On the contrary, there have been empirical studies carried out by some scholars whose results reveal a positive association between trade relevance and conflict. Such findings suggest that trade partnerships increase international conflict.

One such study is carried out by Gasiorowski (1986) who examined the relationship between economic trade and international conflict. The study concluded that international interdependence, which was a measure of a relationship involving real or potential costs, leads to increased international conflict. However, the study also found evidence that trade produces a decline in conflict. It was argued that costly trade produces an increase in conflict but beneficial trade leads to a decline in conflict. Barbieri (1996) added to this debate with a study of dyadic relationships before World War II. The results of the study revealed that extensive economic linkages (measured by the size of the trading relationship and the equality of dependence between partners) between the states can increase the likelihood that states engage in militarized disputes. Interestingly enough, findings found no influence on the occurrence of wars. The difference lies in the intensity of the conflict, whereby war is considered to be the most intense form of a militarized dispute. Barbieri also suggested that while extensive economic interdependence increases the likelihood that dyads engage in militarized interstate disputes, low degrees of interdependence do not. They, in fact, reduce the likelihood of dyadic disputes.

There are not many studies that extended the debate of trade and conflict to the water domain. Of the limited research carried out, most have examined whether economic partnership increases transboundary water

cooperation. The precedent that research has followed is that cooperation over transboundary watercourses is captured by the likelihood of treaty formation.

Dinar et al. (2010), in their quantitative analysis, considered trade importance among many other variables to explain the emergence of treaty cooperation. Trade importance was measured as the ratio between trade and GDP between the watercourse states. The findings found an increase of 1% in trade importance led to an increase of 1 to 14 treaties. Another relevant quantitative analysis was conducted by Tir and Ackerman (2009), who measured the impact of many variables, including economic partnership, on the likelihood of river treaties. Economic partnership was measured by dividing the volume of trade between the two watercourses states by the sum of the sizes of their economies. Results confirmed economic partnership having a positive impact on the likelihood of river treaties. The quantitative analysis conducted by Espey & Towfique (2004) reported similar findings. It was revealed that the condition that states were trading partners increased the likelihood of water treaty being formed. Zawahri & Mitchell (2011), who also carried out quantitative analysis, attempted to extend the scope of research by making a unique distinction between bilateral treaties and multilateral tries. Results of the study revealed that basins with states more economically interdependent concluded more multilateral agreements.

An overview of the studies investigating the impact of economic trade on outcomes of transboundary waters is summarized in Table 2.

Authors	*Independent variable*	*Dependent variable*	*Result*
Tir & Ackerman, (2009)	Economic interdependence	Likelihood of River Treaty	+
Espey & Towfique (2004)	Whether dyads are trading partners	Likelihood of Water Treaty	+
Dinar et al. (2010)	Trade importance	Likelihood of treaty cooperation	+
Zawahri & Mitchell (2011)	Trade dependence	Likelihood of Multilateral Treaty	+

Table 2. *Existing Evidence exploring Relationship between Economic Partnership and Outcomes of Transboundary Water Conflicts.*

2.2.3 Conclusion

In conclusion, many basin-specific case studies, as well as quantitative analyses, has explored the impact of power asymmetry on outcomes to transboundary water conflicts. The findings, however, reveal divergent results. This suggests that the relationship remains unclear. With regards to economic partnership, limited empirical studies have attempted to undercover its effect on outcomes to transboundary water conflicts. Usually, the outcomes to transboundary water conflicts were taken to mean the likelihood of treaty formation. The results of these empirical findings offered clear evidence that a positive relationship existed between these two variables.

2.3 Conclusion of Theoretical Background

To summarize, literature disagrees as to what relationship exists between power asymmetry and economic partnership with outcomes to transboundary water conflicts. A dominant school of thought, spearheaded by the hydro-hegemony framework, is that powerful riparians use their power to secure more beneficial outcomes in transboundary water conflicts. Another dominant point of view is economic partnership impact outcomes to conflicts because nations restrain from conflict with their trading partners. These studies, when tested, produced divergent results. It is important to note that the outcomes of transboundary water conflicts, in a majority of these studies, was captured by the likelihood of treaty formation. A review of extant literature shows that scholars remain divided as to what effect power asymmetry has on transboundary water conflicts. With economic partnership, there appears to be a consensus that the variable impacts outcomes of transboundary water conflicts favorably.

2.3.1 Expected Findings

On the basis of this existing literature and evidence, four hypotheses are evolved.

H1: I expect a negative relationship between power asymmetry and treaty formation. In contrast, I expect a positive relationship between economic partnership and treaty formation.

H2: It is hypothesized that power asymmetry would have a negative relationship and economic partnership would have a positive relationship with the extent a treaty is equitable and reasonable. My expectations are that more difference in power between riparians will conclude less equitable and reasonable treaties whereas greater economic partnership between riparians will conclude more equitable and reasonable treaties.

H3: I expect that the more powerful states will be more inclined towards instigating conflict, and hence, higher levels of power asymmetry will reduce the respectability of a treaty. I expect the greater the economic partnership, the lesser amount of treaty violations.

H4: I expect power asymmetry to have a positive relationship with intensity of conflict. By contrast, I predict that the higher the economic partnership between riparians, the less intense the transboundary water conflict will be.

A conceptual model (Figure 1) has been constructed to illustrate the expected relationships between the two independent variables and the four aspects of the dependent variable.

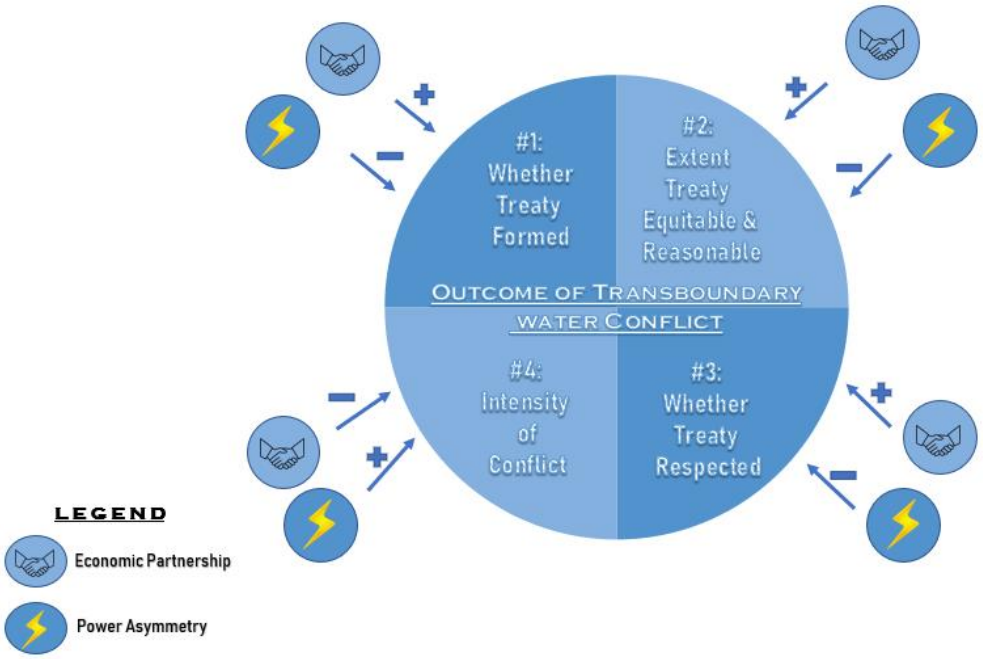

Figure 1. *Conceptual Model of Expected Findings.*

Chapter 3 – Methodology

This chapter discusses the research design in its entirety. Section 3.1 elaborates on the justification for choosing a case-study analysis as the method to undergo this research. Section 3.2 operationalizes the independent and dependent variables while Section 3.3 identifies other influencing factors. For this study, cases are selected such that they are variant in independent variables but similar with respect to other influencing factors. Thereby, familiarity with the independent variable as well as the other influencing factors is important. It is after this familiarity that section 3.4 follows with case selection. Section 3.5 concludes the chapter with a reflection on the validity and reliability of the chosen research design.

3.1 Research Design

Existing empirical research that investigated the relationship of power asymmetry and economic partnership with outcomes of transboundary water conflicts opted for different research designs. Some studies used quantitative statistical analyses while others pursued case-study analyses. Both forms of research designs have merits. For this research, a case study analysis has been selected.

Firstly, the case-study analysis will allow for context-specific indicators to be factored into account, which will, in turn, enhance internal validity (Blatter & Haverland, 2012). This is required because transboundary water conflicts are inherently different from one another, given that watercourses have different characteristics and riparian states that share transboundary watercourses also have different characteristics. As argued by Blatter & Haverland (2012), case studies allow for time and energy to be invested in order to reflect on the relationship of the variables. In-depth analysis will take into account the unique aspects of each transboundary watercourse and relationship of watercourse states.

Secondly, choosing case-study analysis will allow a chance of "knowing more about less" as opposed to "less about more" (Gerring, 2006, p. 49). The dependent variable, outcome to transboundary water, is a complex social phenomena and can be captured by a number of ways. As recommended by Yin (2018), a case-study approach is fit for research that aims to understand complex social phenomena. It is recommended when performing an extensive exploration of an area of research.

Thirdly, the measurement of the dependent variable involves four different aspects, including whether a treaty has been formed, the extent the treaty is equitable and reasonable, whether the treaty has been respected, and the intensity of the conflict. These aspects are not arbitrary categories. With four aspects, it is far too complicated for the research to be undertaken by quantitative analysis.

Choosing case-study analysis is not to suggest that the research cannot be carried out by quantitative analysis. Given that transboundary water conflicts are so great in number around the world, it is possible to employ a quantitative analysis, which is generally recommended for large amounts of data and sample size. However, as mentioned earlier, this research abandons the choice of using quantitative methods because it would not analyze in-depth the uniqueness and context of each transboundary water conflict. Understanding the specifics of each dispute and each riparian state involved is crucial to this research objective.

More specifically, this research requires a covariation approach (COV). COV investigates whether the independent variable makes a difference in the outcome variable (Blatter & Haverland, 2012). The option of performing congruence analysis was abandoned because the research is not comparing the explanatory relevance of competing theories (Blatter & Haverland, 2012). Instead, the research tests a preposition that the independent variable *x* has an effect on dependent variable *y*. Hence, it is *x*-centered research and COV is best suited for research that centers on the *x* variable (Blatter & Haverland, 2012).

What is important for co-variation analysis is the element of co-variance. In order to infer that the independent variables have an effect on the dependent variables, co-variance over time or space needs to be established between the variables (Blatter & Haverland, 2012). In other words, the approach will assess whether different values of X can produce different outcomes of Y. This is well suited for this research objective because the aim is to assess whether varying degrees of power asymmetry and economic partnership can influence outcomes to transboundary water conflicts.

It is noteworthy to add here that the research design centers on the cause and therefore follows an effects-of-causes perspective (EoC) as opposed to causes-of-effects (CoE) approach. The difference between these perspectives is that CoE centers on the outcome and discerns relevant causes while EoC centers on the cause and discerns whether it has an effect on the outcome (Rohlfing, 2012). In this research, the objective is to assess whether power asymmetry and economic partnership have explanatory power in the outcome of transboundary water conflicts, and thereby it pursues the EoC perspective for research.

3.2 Operationalization of Variables

The following section discusses the independent and dependent variables with a detailed account of how they are operationalized. The operationalization of these variables is relevant for two reasons. First, in order to establish covariance, cases in this research are selected that vary significantly with regard to the independent variables; therefore, it is important to first familiarize with how independent variables are computed. Second, the operationalization is a key step in order to investigate any relationship between the variables of interest and infer causality.

3.2.1 Independent Variables

Power asymmetry

Power asymmetry is one of the two explanatory variables for this research. Here, the conceptualization of power is in line with previous conceptions of power in transboundary waters. It assumes that the amount of resources a riparian possesses relative to the other riparian can determine whether it is more or less powerful. Therefore, power is measured in terms of resources, specifically the capabilities a state possesses and the economic power it holds. Power asymmetry would then be captured by the difference in the states' capabilities and economic power.

To capture state capabilities, the research relies on the National Materials Capabilities dataset compiled by the Correlates of War (COW) project. The dataset assigns a Composite Indicator of National Capabilities (CINC) score to each country, on the basis of its steel production, energy production, urban population, total population, military expenditures, and military personnel. Overall, this score reflects a country's capability demographically, industrially and militarily. Obtaining CINC score, the power asymmetry is calculated as the ratio of the CINC of the two riparian states. Using the National Material Capabilities dataset to calculate power asymmetries is an approach heavily used in prior studies.

To capture economic power, annual country-level Gross Domestic Product (GDP) and GDP per capita data are accessed. Data is obtained from the original Angus Maddison historical dataset. Maddison (1995), calculated real GDP and GDP per capita, based on purchasing power parities in constant 1990 USD. For each state, GDP and GDP per capita are computed and then multiplied to create an index. In this formula, GDP represents the size of a state's output and GDP per capita represents the state's economic and military efficiency. By dividing the value of the more economically powerful riparian by the value of the relatively less powerful riparian, I calculate a ratio between the values of the two riparians. This is the ratio for economic power. Calculating economic power in this manner which combines GDP with GDP per capita is an approach inspired by Beckley (2018), who suggested that GDP x GDP per capita is a better indicator of a state's power because it accounts for size and efficiency. According to Beckley (2018), accounting for population is important because population is a key determinant of a state's production, welfare and security costs.

Finally, one variable for power asymmetry is obtained by adding together the calculated ratio for state capabilities and the calculated ratio for economic power. This final ratio is the basis for power asymmetry in the basin. The higher the value, the greater the power asymmetry.

Economic partnership

Economic partnership is measured as the trade between countries A and B as a fraction of their trade with the rest of the world. In essence, this captures the relevance and importance of the trading relationship. This was inspired by the approach adopted by Dinar (2010).

The following equation is constructed:

$$ED_t{}^{AB} = \frac{(IMP_{ABt} + EXP_{ABt})}{(IMP_{Awt} + IMP_{Bwt} + EXP_{Awt} + EXP_{Bwt})}$$

where for any year *t*, the economic partnership of countries A and B is calculated by the sum of the volume of trade between A and B as a fraction of the sum of their total volume of trade with the rest of the world *w*. $IMP_{ABt} + EXP_{ABt}$ represents the total volume of trade between the riparian dyads. It is assumed that $IMP_{ABt} = EXP_{BAt}$, meaning the import of A from B is the same as the export of B to A. $IMP_{Awt} + EXP_{Awt}$ represents the total volume of trade of country A with the rest of the world *w* in given year *t*. Trade information from the IMF Direction of Trade Statistics (DOTS) is used. It contains data from 1950 to date.

3.2.2 Dependent variable

The dependent variable of this research is the outcome of transboundary water conflicts. This is captured by four aspects:

i. Whether a treaty has been formed;
ii. Extent treaty is equitable and reasonable;
iii. Whether treaty is respected;
iv. The intensity of the conflict.

The first aspect looks at whether the outcome of a transboundary water conflict has resulted in a treaty between riparian states. I recognize that the formulation of a water treaty is not the only thing reflective of a cooperative outcome to transboundary water disputes but for the purpose of this study, I focus primarily on treaties. I am following the precedent set by other studies (Espey & Towfique, 2004; Tir & Ackerman, 2009; Diner et. al, 2010). Treaties can be obtained from the International Freshwater Treaties Database, a searchable database with the full text of more than 600 freshwater-related international agreements from the years of 1820 to 2008. Each treaty is coded by basin, riparians involved, date signed, and treaty topic. Treaty category labels from the database are utilized to see whether a treaty was signed between riparian

states in a given year. The time period that I will see the effect of the independent variables on this particular aspect of outcome varies case basis. 5 years before the treaty was signed are observed, including the year of the treaty itself.

The second aspect investigates the extent to which the treaty is equitable and reasonable. Being equitable and reasonable means the treaty, in deciding appropriate water allocations, considers the equitable interests of all riparians involved. In order to assess this, this research uses the criterion established by the UN Watercourse Convention. Article 6 provides a list of key factors and circumstances that should be considered when determining what constitutes an equitable and reasonable use. They are as follows:

i. geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;

ii. the social and economic needs of the watercourse states concerned;

iii. the population dependent on the watercourse in each watercourse state;

iv. the effects of the use or uses of the watercourses in one watercourse state on other watercourse states;

v. existing and potential uses of the watercourse;

vi. conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;

vii. the availability of alternatives, of comparable value, to a particular planned or existing use.

To allow for easier comparisons between cases, a self-created score is attached to each case-study to indicate the extent it is considered equitable and reasonable. This is based on the number of factors out of the seven factors the treaty text contains. The score can take the values between 0 and 7 where 0 indicates "not at all equitable and reasonable" and 7 indicates "perfectly equitable and reasonable". A score of [1-2] means the treaty text is equitable and reasonable to "a small extent". A score of [3-4] means the treaty text is equitable and reasonable to "a moderate extent". A score of [5-6] means the treaty text is equitable and reasonable to "a great extent".

The third indicator assesses whether a treaty has been respected. In order to capture this, the research consults water-conflict related events listed in the International Water Events database. This database documents all historical international water relations from a time period of 1948 to 2008. This is supplemented by the use of newspaper articles as well as scholarly articles in order to find details about violations and breaches of agreements. Particular focus would be on provocative statements between relevant persons in the watercourse states. Even allegations that the treaty has been violated suffice for the

treaty to be considered as disrespected. For this indicator, the time frame looked at will be the years following the treaty up to 2008.

The fourth indicator assesses the intensity of the conflict. The study uses the Basin at Risk (BAR) scale. Each water event documented in the International Water Event database is accorded a score that indicates the degree of intensity of the event between the watercourse states. The scale has values from [-7 to 7], where anything below 0 indicates a greater degree of intensity and anything above 0 indicates no degree of intensity. This research considers a score of [-1 to -2] to indicate mild intensities as the events only involve an exchange of verbal hostilities. A score of [-3 to -5] would represent strong intensity as it involves hostile actions, whether diplomatic, economic, political or militarily. [-6 and-7] would be the gravest intensity because it is the outbreak of war. The full scale is provided in Appendix I. For this aspect, the entire duration of the conflict is observed, from the year of the first recorded conflictive event documented in the International Water Events database to the last.

A summary of the independent and dependent variables is presented in Table 3.

Variable	*Indicator*		*Source*
Power asymmetry	(i)	Gross Domestic Product	Angus Maddison dataset
	(ii)	State capabilities	National Material Capabilities dataset v5.0
Economic partnership		Relative Volume of trade	IMF Direction of Trade Statistics (DOTS)
Outcome of Transboundary Waters	(i)	Whether treaty formed	International Freshwater Treaty database
	(ii)	Extent treaty is equitable and reasonable	UN Watercourse Convention (art. 6)
	(iii)	Whether treaty respected	International Water Event database
	(iv)	Intensity of conflict	Basin at Risk Scale

Table 3: *Description and Measurement of Independent and Dependent Variables.*

3.3 Other Influencing Variables

This subsection identifies other influencing factors this research takes into account. There are several influencing variables but they all cannot be included. Hence, as suggested by Blatter & Haverland (2012), relevant ones are examined. Influencing variables will account for variation and context-specific differences

in the cases. These influencing factors will be relevant in the selection of cases as well as the analysis of the outcome in later sections.

Water scarcity

One influencing factor to consider is water scarcity. It is a fundamental principle of economics that competition arises from scarce resources. As the scarcity of water increases, conflict among users over the allocation of the water increases (Rijsberman, 2006). For that reason, this research takes into account the degree to which both watercourse states are water-stressed. One could expect that the outcome of transboundary water disputes would be more conflictive in nature if both watercourse states were water-stressed at high degrees. It would follow then that, if either one riparian was medium or low water-stressed, competition between the watercourse states would be lower and outcomes would be more cooperative. To measure water scarcity, this research looks at the country's baseline water stress, an indicator that is expressed as the "ratio of total annual water withdrawals to total available annual renewable supply" (Gassert, Reig, Luo & Maddocks, 2013, pp 3). The data of different country's baseline water stress can be obtained from the Aqueduct Water Risk Atlas Global Maps produced by the Water Resource Institute (WRI). A working paper written by Gassert et. al (2013) generates a global ranking of countries based on their Baseline Water Stress and categorizes them from extremely high stress to low stress. Values of the indicator for both countries are added together for a combined measure of water scarcity. The scale ranges from 0 to 10, in which [8-10] indicates countries are extremely high stress, [6-8] indicates high stress, [3-6] indicates medium-high stress, [2-4] indicates low-medium stress, and [0-2] indicates low stress.

Diplomatic engagement

Another variable that could have a cofounding impact on outcomes to transboundary water conflicts is diplomatic engagement. Dinar et. al (2010) found that diplomatic engagement has a positive effect on treaty cooperation. By contrast, rival states that do not diplomatically engage with one another, tend to overlook low-politics issues of concern such as water (Lowi, 1995a). Diplomatic engagement could have an impact on the outcome of transboundary water conflicts because diplomatic ties facilitate dialogue and communication. This, in turn, is useful for states to signal intentions, influence policies, and exercise influence over other states (Leiby & Butler, 2005). Data on diplomatic relations is collected from the Diplomatic Representation dataset compiled by the Diplometrics project at the Pardee Center for International Futures. The embassy dataset measures formal foreign diplomatic representation around the world, spanning from the years 1960 to 2015. A suggested categorization to measure diplomatic engagement takes the range of high, moderate, and low. High diplomatic engagement would be if the two countries enjoyed undisturbed diplomatic ties, with a strong presence of embassies, consulates, and

representatives in each country. Moderate diplomatic engagement would be if diplomatic ties were established and maintained diplomatic representation in each other's countries but in some years, had severed diplomatic ties. Low diplomatic engagement would be under the circumstance the countries have no diplomatic representation in each other countries and/or have not even recognized each other.

Political Tension

Similarly, the political tensions between the involved watercourse states are factored. To capture political tensions, the research assesses whether there is an ongoing militarized dispute between dyads or how many years have passed since their last dispute. Naturally, the longer time since the last militarized dispute between the watercourse states would indicate that there are less political tensions between them. By definition, militarized interstate disputes are "cases of conflict in which the threat, display or use of military force short of war…is explicitly directed towards…another state" (Jones, Bremer & Singer, 1996, pp 163). Disputes by that definition can be collected from the Militarized Interstate Dispute (MID) dataset compiled by the COW project. It displays conflicts in which states threaten, display, or use force against each other, from a time period of 1816 to 2010. For a more wholesome overview, this research also uses secondary data such as academic articles, newspaper journal articles, and research documents that describe the bilateral relations between the watercourse states.

Regime Type

Lastly, regime types of watercourse states should also be accounted for. More specifically, the research looks into the combination of the regimes and compares whether they are similar or dissimilar. Whether riparian states are constitutional democracies, monarchies, authoritarian or theocratic states could have an effect on the outcome of transboundary water conflicts. Oneal & Russett (1997) found that democratic states were less likely to be involved in disputes with other democracies but autocracies and democracies were more prone to conflict. On the basis of this literature, it is anticipated that similar regime types would reach a more cooperative outcome over transboundary waters and dissimilar regime types would reach a less cooperative outcome. This variable is assessed using Polity IV Project's political regime characteristics and Transitions, a dataset that plots regime trends for various countries from 1946 to 2013. The regime type of each country is assessed by the polity score that it is attached to. The score indicates the regime category the country belongs to and the values of the polity score range from -10 to 10. There is a three-part categorization of the scale, with [-10 to -6] indicating autocracies, [-5 to 5] indicating anocracies, and [6 to 10] indicating democracies.

The above-mentioned influencing variables are summarized in Table 4.

Control Variable	*Indicator*	*Source*	*Expected Effect on cooperative Outcome of Transboundary Water Conflict*
Level of water-scarcity in both watercourse states	Baseline water stress	Aqueduct Water Risk Atlas Global Maps	-
Degree of Political Tension between watercourse states	Time since last Militarized dispute	Militarized Interstate Dispute dataset	-
Degree of diplomatic engagement between watercourse states	Diplomatic representation during time-period of case	Diplomatic Representation dataset	+
Regime Type of each watercourse state	Extent of Similarity of Regime type between Riparians	Polity IV Regime Characteristics and Transitions dataset	+

Table 4: *Description of Control Variables.*

3.4 Case Selection

Within the COV approach, testing whether the independent variables have an effect on the dependent variable requires a careful case selection. Cases should be selected in such a manner that there is variance in the independent variable whilst other control variables remain stable (Blatter & Haverland, 2012). Following this logic, the discussion of selected transboundary water disputes is arranged according to two criteria: (1) cases in which there are variant degrees of power asymmetry; (2) cases in which there are variant degrees of economic partnership.

To select case studies, a list of all conflictive and cooperative events related to water is obtained and extracted from The International Water Events database. The database, when downloaded, contains 7,190 entries.

The list is first narrowed by filtering out the events that do not constitute disputes. This study is inspired by the definition of Petersen-Perlman et al., (2017) that characterizes transboundary water conflict as those in which "verbal, economic, or militarily hostile actions between stakeholders" are exhibited. To identify events that fit this definition, the BAR scale is used. The only events that are selected are

categorized with a ranking from -7 to -1 on the scale (-7 being "formal declaration of war", -1 being "mild verbal expressions displaying discord in interactions"). This significantly reduces the entries to 1,301 events. I recognize that I introduce potential selection bias by focusing only on the handful of watercourses with disputes, but for this purpose of this research paper, it seems appropriate to analyze only cases with transboundary water conflicts.

From this, the dataset is further narrowed by removing duplicate entries, so that the same dispute between riparians is not considered more than once. Next, the dataset is reduced to look at events that involve only two countries, because the objective is to focus on dyadic relations within transboundary water contexts. Here, it is important to add that the dataset may still contain entries where the dispute involves two states but the dispute is over a watercourse shared by other states also. Therefore, cross checking is required to ensure that the list is further filtered to exclude any conflict over a transboundary watercourse shared by more than two watercourse states. For example, the Tigris-Euphrates rivers and the Nile river are excluded.

The dataset is also filtered according to certain temporal and substantive bounds, a process recommended by Rohlfing (2012). With regards to substantive bounds, cases are selected which only concern disputes between watercourse states over the quantity of water. This is because the study is only concerned with water as a scarce or consumable resource. Due to a limitation in availability of data (as the International Water Events Database does not go beyond 2008), the cutoff time period is 2008. 1945 is noteworthy because it begins with the year when the United Nations Charter enshrined the principle of sovereignty and territorial integrity. In the years that followed after 1945, the world saw a rush of decolonization, globalization, and new member-states being admitted into the United Nations. Hence, it is fitting to look at disputes that emerged in violation of this principle during that time.

Finally, irrelevant data entries are manually removed from the dataset, such as entries that involve countries that are not sovereign states in the world today, for example, USSR and Yugoslavia. Entries that do not pertain to states are also removed. Examples include any events involving United Nations Organization, Arab League, and Organization of American States. After doing all of this, the dataset is reduced to 11 entries. A list of these 11 cases can be found in Appendix II.

It is from this list that 4 cases are to be selected, preferably two that involve riparian countries with variant degrees of power asymmetry and two that involve countries with variant degrees of economic partnership. While it would be interesting to analyze in-depth more than four cases, it must be recognized that there is a trade-off between breadth and depth. Practical and feasibility concerns also factor in the selection of cases. Given the time constraints for this research, the selection of cases is limited to four.

To choose cases, a median year between the chosen time period is selected. The chosen year is 1983. For the 1983 year, power asymmetry and economic partnership of 11 riparian dyads is calculated. Full calculations are available in Appendix III and IV. The cases, with respect to their power asymmetry and economic partnership, are displayed in Figure 2.

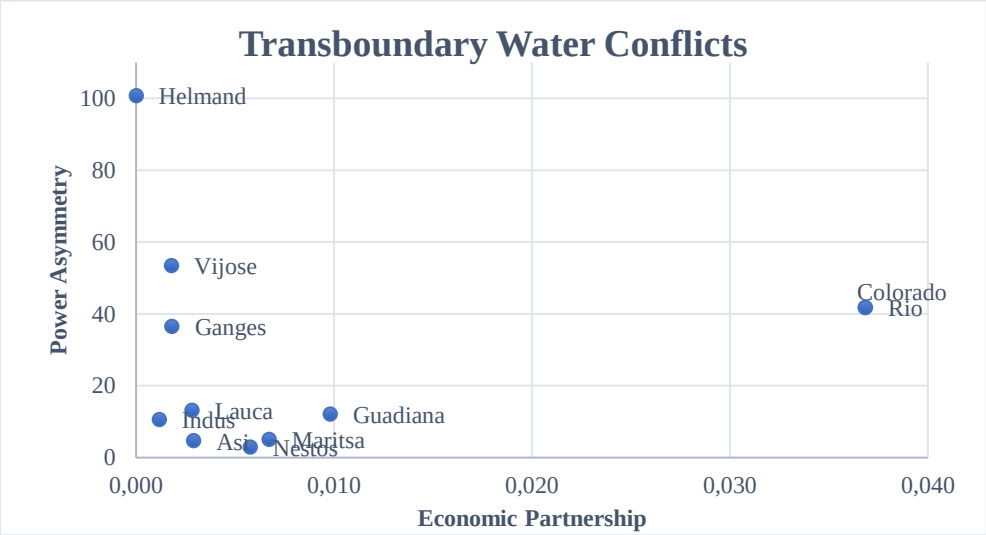

Figure 2*: Visualization of 11 Shortlisted Cases.*

On the basis of these values, cases are categorized as either low or high with respect to power asymmetry and economic partnership both. This is done by computing the median for each variable. The median value of power asymmetry is 13.13. Anything below this value is considered low power asymmetry and anything above this value is considered high power asymmetry. The median value for economic partnership is 0.0029. Anything below this value is a low economic partnership and anything above this value is a high economic partnership. There will be cases which have the median values for power asymmetry and economic partnership. In those cases, the research will consider the values as low.

In the selection of a case characterized by low power asymmetry and low economic partnership, there are three options: the Asi river, the Lauca river, and the Indus river. In the selection of a case characterized by low power asymmetry and high economic partnership, the choice of case is between the Maritsa river, the Nestos river and the Guardiana river. For a case that is high in power asymmetry but low in economic partnership, the choice is between the Helmand river, the Ganges river, and the Vijose river. To select a case characterized by high power asymmetry and high economic partnership, there are two options: the Colorado river and the Rio-Grande river.

In order to limit the options and select only one case per categorization, an attempt is made to select cases that are as similar as possible with respect to other influencing variables. For this, some preliminary research is carried out and a cross-comparison of the influencing variables is made across all short-listed cases. The cross-comparison is displayed in Appendix V.

On the basis of that approach, the Indus river is chosen as the case for low power asymmetry and low economic partnership. Asi river is eliminated because unlike other cases, it involves dyads that had no recorded militarized interstate dispute. The case of Lauca river is abandoned on the grounds that it involved countries that were relatively similar in regime types whereas other cases involved riparian countries mostly dissimilar in regime type. Furthermore, Lauca case involved a riparian which was low water-stressed. In contrast, other cases were selected that involved riparians with similar degrees of water scarcity, involving at least one riparian with high scarcity of water and preferably none with low water scarcity.

For the case of high power asymmetry and low economic partnership, the Helmand river is selected. The Ganges is abandoned because Bangladesh is low-stressed in water scarcity. The Helmand is more comparable to other cases because it involves riparians that are both extremely high-stressed in water scarcity. Vijose river is eliminated because unlike other cases, it does not involve dyads with any recorded militarized interstate dispute.

Choosing between Nestos and Maritsa for the case of low power asymmetry and high economic partnership is trickier. This is because both were similar with respect to other influencing variables. Both involved countries that had dissimilar regime trends, high diplomatic engagement, little political tension with only one reported militarized interstate dispute dating back to 1918, and in which one country was high-stressed in water scarcity. As such, the choice between Nestos and Maritsa is randomized; Nestos river is selected. The Guardiana case is eliminated because in contrast to other cases that are dissimilar in regime trends, it is quite similar. Furthermore, it has no recorded militarized interstate dispute and an attempt has been made to select cases that have at least one militarized interstate dispute.

For the selection of a case of high power asymmetry and high economic partnership, the choice is between three cases, two of which involve the same riparians – Mexico and the United States. As they are both similar with respect to influencing variables, the choice is randomized. Rio-Grande is selected.

Overall, an attempt is made to select cases that are very similar in the influencing variables, preferably those that involve countries that enjoy moderate to high diplomatic engagement, have dissimilar regimes, have at least one riparian that is highly stressed in scarcity and none that is low- stressed in scarcity.

Hence, four cases of transboundary water disputes are selected, specifically the Indus River, the Nestos River, the Helmand River, and the Rio-Grande River. See Figure 3.

		Economic partnership	
		Low	**High**
Power asymmetry	**Low**	**Indus**	**Nestos**
	High	**Helmand**	**Rio-Grande**

Figure 3: *Matrix of Selected Cases.*

For the four selected case studies, different timelines are drawn to analyze the different aspects of the outcome of transboundary water conflict. As per the criteria, timeframes depicted in Table 5 are sketched for each case.

Aspects of Dependent Variable	**Nestos/Mesta**	**Indus**	**Helmand**	**Rio**
Whether a treaty is formed	1990 to 1995	1955 to 1960	1968 to 1973	1939 to 1944
Whether treaty is equitable and reasonable	1990 to 1995	1955 to 1960	1968 to 1973	1939 to 1944
Extent to which treaty is respected	1995 to 2008	1960 to 2008	1973 to 2008	1944 to 2008
Intensity of conflict	1991 to 2008	1948 to 2008	1973 to 2008	1944 to 2008

Table 5*: Time frame for Dependent variable, per case basis.*

3.5 Validity and Reliability

To ensure good quality research, it is important that the research design appropriately accounts for validity and reliability.

The extent to which research is representative and can be generalized to a high number of cases is referred to as external validity (Yin, 2018). Findings arising from a case-study analysis are more difficult to generalize, given that they focus primarily on a select few cases. There is a tradeoff; the depth of case study analysis comes at the expense of the generalization of research findings. The findings of the 4 selected cases will likely not be applicable to all transboundary contexts, as every transboundary conflict is unique.

However, the internal validity has been accounted for by ensuring that the cases of this research were selected such that they are similar with respect to other influencing variables. Internal validity ensures that the conclusions drawn at the end of this research paper are credible, such that they are measuring what they are supposed to be measuring (Blatter & Haverland, 2012).

Furthermore, this study applies data triangulation, collecting evidence from multiple sources of evidence to form a comprehensive assessment of each case study. Using a variety of primary and secondary sources for desk research allows different insights and perspectives. This eliminates the risk of any misled bias and contributes positively to the validity of the research.

It is recognized that a limitation of case-study analysis is that there is less rigidity and so that comes at the expense of reliability. Reliability refers to the extent that research is repeatable and consistent (Kellstedt & Whitten, 2013). To counter the limitation, careful attention is made to the operationalization of all variables in this study. Each variable is defined according to a set of criteria and indicators. This ensures that should someone opt to repeat this research, they would easily be able to replicate the same steps.

Another limitation of case studies could be that findings may confirm predetermined predictions. In other words, it is easy to find what one is looking for. Having clear operationalization of variables and a careful selection of cases ensures that such self-serving bias is not introduced.

Chapter 4 – Results & Analysis

This chapter presents the results of the research. Each case is discussed separately. A profile of the transboundary watercourse begins each case-study in order to provide the necessary context. This is followed by an overview of all four aspects of the dependent variable. Then, data on power asymmetry and economic partnership is presented and analyzed for the riparians involved. Other influencing variables are also considered. The chapter is closed with a discussion of the findings, in which expectations are tested and analyzed.

4.1 The Nestos/Mesta

4.1.1 About the Transboundary River

Within the Eastern Balkans flows the Nestos/Mesta[1], a 234-kilometer-long river. Rising from the Rila mountains in southern Bulgaria, it then flows through the Thrace in Greece, and eventually empties in the Aegean Sea (UN ECE, 2007). 54% lies within Bulgaria and the remaining 46% belongs to Greece (Wolf, 2002b). The river basin is mountainous in nature upstream as it flows from a valley of granite in Bulgaria and the Rhodope mountain chain near the Greek-Bulgarian borders. In contrast, the river basin is lowland downstream as it flows towards the deltaic zone (Skoulikidis, Dimitriou, & Karaouzas 2018). The delta, situated in Greece, is of particular ecological importance because it cultivates the plains of Greece. Thrace, being one of the lesser developed areas in Greece, is dependent on the watercourse to secure its further development (Giannias, 2011). Besides irrigation purposes, the Nestos river is used by both watercourse states for domestic use, eco-tourism activities, and production of hydroelectricity (Eleftheriadou & Mylopoulos, 2008).

The allocation of the Nestos is a matter of concern for both watercourse states. Particularly in the late '50s, it was observed that Greece increasingly complained to Bulgaria of not getting sufficient shares of the river for her needs (Giannias, 2011). Several attempts were made to negotiate the allocation of the river, with the first round of meetings beginning in 1964 (Kampragou et al., 2007). The biggest complaint Greece had was that Bulgaria did not propose realistic schemes for water allocation (Giannias, 2011).

[1] To be noted is that the river is identified as Mesta in Bulgaria and Nestos in Greece but for the remainder of this paper, I continue to refer it as the Nestos.

4.1.2 Assessing the dependent variable

Aspect #1: Whether a treaty is formed

Greece and Bulgaria concluded a treaty in 1995. The treaty, titled as 'Agreement between the Government of the Hellenic Republic and the Government of the Republic of Bulgaria for the waters of the Nestos River' (hereby referred to as "1995 Treaty"), was the result of persistent negotiations. The 1995 Treaty allocates 29% of the total volume of the Nestos waters to Greece. It further establishes a cross-border commission in order to observe the implementation of the agreement.

Aspect #2: Extent treaty is equitable and reasonable

At points, the 1995 Treaty complies with the relevant factors required to be considered equitable and reasonable. The treaty text mentions the natural character of the watercourse. However, the specifics of how water flows should be measured and recorded are overlooked in the text. As a result of this, the 1995 Treaty has been criticized for being too general, which runs the risk of riparians interpreting it the way they see only (Mylopoulos et al., 2004). The treaty considers the social and economic needs of the watercourse states and also the effects of these uses. However, neither the conservation and protection of the watercourse nor the availability of alternatives are discussed. For example, the treaty does not consider arrangements in case of extreme weather conditions, like flooding and droughts. The population dependent on the watercourse is not mentioned in the text, causing some to argue that the agreement between Bulgaria and Greece was not reached with thorough research on the needs of the local populations (Eleftheriadou & Mylopoulos, 2008). Instead, it has been argued that the agreed water allocation was decided only through a procedure of bargaining (Eleftheriadou & Mylopoulos, 2008). Overall, a score of 4/7 is given to the Nestos case, indicating that the 1995 Treaty is equitable and reasonable to a moderate extent.

Factor	*Included in the treaty?*	
Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character	Yes	
The social and economic needs of the watercourse States concerned	Yes	
The population dependent on the watercourse in each watercourse State	No	
The effects of the use or uses of the watercourses in one watercourse State on other watercourse States	Yes	
Existing and potential uses of the watercourse	Yes	
Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect	No	
The availability of alternatives, of comparable value, to a particular planned or existing use.	No	
		Score: Moderate [4/7]

Table 6: *The Extent 1995 Treaty is Equitable and Reasonable.*

Aspect 3: Whether the treaty is respected

The International Water Events database does not contain any event after 1995 between Bulgaria and Greece that could indicate that the agreement was violated. The watercourse states were engaged in a mild disagreement in 1996 when Bulgaria complained the 1995 Treaty benefitted Greece more. This event would not be considered a breach of the treaty as only negative feelings were expressed.

The 1995 Treaty has consistently been criticized for not being fully implemented. The argument is that Greece and Bulgaria both have not taken steps to comply with the agreement and put it to action (Kallioras, Pliakas, & Diamantis, 2006). Plausible reasons could be limited availability of financial resources or the reluctance on part of the local authorities in charge of implementing (Mylopoulos et al., 2004). Some have pointed out that problems also are inherent in the treaty text, especially because measurements and frequencies are not specified. Subsequently, exchange of information has been slow. Greece is not informed on pollutants discharged in the river from Bulgaria and hence cannot react accordingly (Mylopoulos et al., 2004). Despite this, there have been no allegations that the treaty has been breached.

Aspect 4: Intensity of conflict

The most conflictive of the events recorded in the International Water Events database occurred in 1996 when Bulgaria verbally expressed concern that the 1995 Treaty favored Greece more. The Bulgarian Parliament had hoped that the maximum water entitlement of Greece would not go beyond 20% (Eleftheriadou & Mylopoulos, 2008). This event scored -1 on the BAR scale, and thereby, can be considered only mild in intensity. The other two events in the database scored 0 and 4 on the scale, indicating that they were not conflictive.

Summary of Outcome on the Nestos

Aspect of Dependent Variable	*Outcome of Nestos Transboundary Water Conflict*
#1: Treaty formed	Yes
#2: Treaty equitable and reasonable	Moderate [4/7]
#3: Treaty respected	Yes
#4: Intensity of Conflict	Mild

Table 7: *Outcome of Nestos Transboundary Water Conflict.*

4.1.3 Assessing the independent variables

The case of the Nestos transboundary water dispute was selected because Bulgaria and Greece, in comparison with other dyads, were characterized by relatively low power asymmetry and high economic partnership in 1983.

In order to assess whether the independent variables hold any explanatory power for the outcome of the water dispute, power asymmetry and economic partnership between Bulgaria and Greece are calculated for the time period of 1990 to 2008. These calculations are presented in Appendix VI and VII. The table in Appendix VI also indicates to the reader that in this case study, Greece appears to be the relatively more powerful riparian.

Figure 4 illustrates a visual representation of power asymmetry and economic partnership from 1990 to 2008. It is observable that power asymmetry between Bulgaria and Greece, initially very low, increased over the years. Although the values of power asymmetry increased, they remained below the median value of 13.13, indicating that power asymmetry remained low. Economic partnership, on the other hand, remained high during the time period; all computed values of economic partnership from 1990 to 2008 remained above the median value of 0.0029.

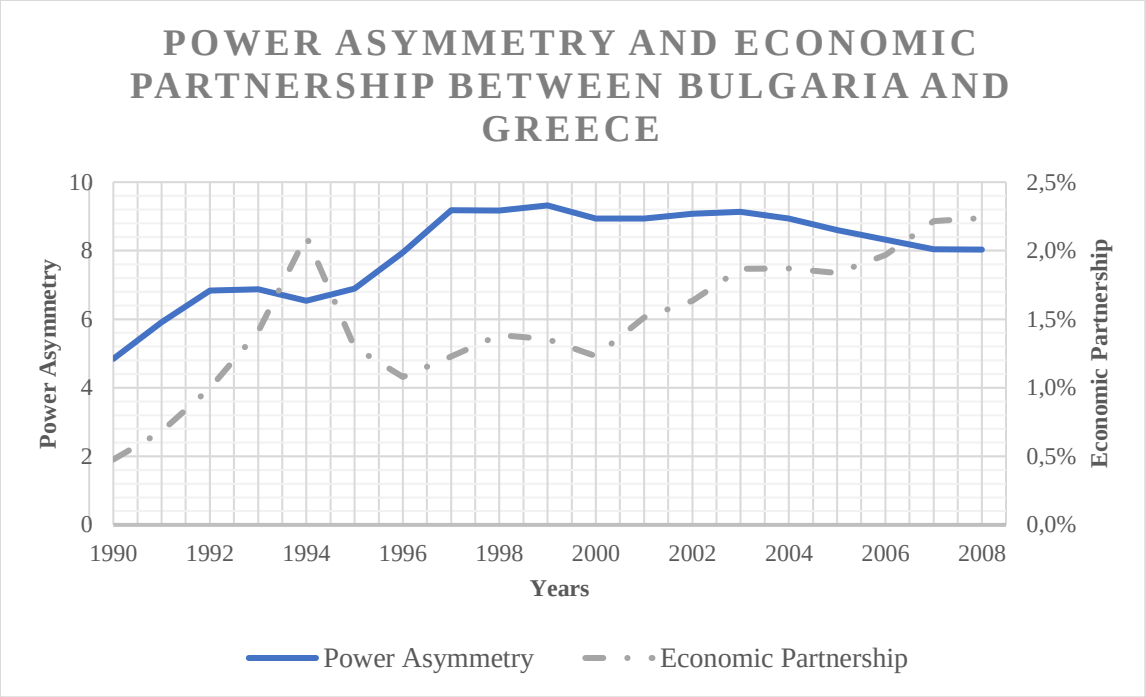

Figure 4: *Power Asymmetry and Economic partnership between Bulgaria and Greece*..

Attention should be diverted to power asymmetry and economic partnership from 1990 to 1995, the timeframe the research uses to analyze aspect 1 (i.e. whether a treaty has been formed) and aspect 2 (i.e. whether the treaty is equitable and reasonable) of the dependent variable. In the years leading up to the 1995 Treaty, the dyadic relationship between Bulgaria and Greece remained characterized by low power asymmetry and high economic partnership. It was expected that under such conditions, a treaty would be formed. Expectations were confirmed.

With regard to the extent the treaty is equitable and reasonable, results are not in line with expectations. It was predicted that low power asymmetry would contribute to a treaty that is equitable and reasonable to a great extent. Instead, it fell short and is equitable and reasonable to a moderate extent. Curiously, economic partnership, despite being high, was not enough to ensure the treaty would be equitable and reasonable to a greater extent. While it may not be to a great extent, it is still more equitable and reasonable than a small extent. This may be the subtle effect of economic partnership.

The time period after 1995 is evaluated to assess aspect 3 (i.e. the extent the treaty is respected). During that time, both power asymmetry and economic partnership increased. Power asymmetry remained low and economic partnership remained high. As such, results supported the expectations that low power asymmetry and high economic partnership would increase the respectability of the treaty.

Results also confirmed that low power asymmetry and high economic partnership went together with lower intensity of conflict.

The results are summarized in Table 8.

Dependent Variable	*Independent Variables*	*Expected Outcome of Transboundary Water Conflict*	*Actual Outcome of Transboundary Water Conflict*	*Expectation Supported?*
Aspect 1 (Whether Treaty Formed)	Low Power asymmetry	Treaty formed	Treaty formed	Yes
	High Economic partnership	Treaty formed	Treaty formed	Yes
Aspect 2 (Extent Treaty Equitable and Reasonable)	Low Power asymmetry	Greater extent	Moderate extent	No
	High Economic partnership	Greater extent	Moderate extent	No
Aspect 3 (Whether Treaty respected)	Low Power asymmetry	Treaty respected	Treaty respected	Yes
	High Economic partnership	Treaty respected	Treaty respected	Yes
Aspect 4 (Intensity of Conflict)	Low Power asymmetry	Lower intensity	Mild	Yes
	High Economic partnership	Lower intensity	Mild	Yes

Table 8: *Impact of Independent Variables on Outcome on the Nestos.*

4.1.4 Assessing other influencing variables

For more valid causal inferences, other factors are taken into account that may have a relationship with the outcome. One such factor to consider is the regime types of both watercourse states. Bulgaria began to practice a parliamentary democratic system of government after she adopted a new constitution with the collapse of the soviet bloc in 1989 (Curtis, 1993). Greece also entered into a democratic system of governance with the fall of dictatorship in 1974 and as a parliamentary republic, it held democratic elections in the time period of 1990 to 2008. This means that both watercourse states have similar regime types. It was expected that the similarity in regime types would lead to cooperative outcomes. That appears to be the case for the Nestos. This factor, however, does not explain why the treaty fell short of being equitable and reasonable to a great extent.

Another factor is the level of water scarcity of Bulgaria and Greece. Bulgaria is low-medium water stressed while Greece is high water-stressed. Altogether, their combined baseline water stress is 4.54, meaning they are only medium-high stressed. It was expected that the outcome would be more conflictive in nature if both watercourse states were significantly high water-stressed. As Bulgaria is less so, it may explain why the outcome of the Nestos is more cooperative in nature, such that a treaty was formed, treaty was respected,

and intensity was mild. Again, this factor does not explain why the treaty between Nestos is equitable and reasonable only to a moderate extent.

Political tensions between the two countries are also considered. It was expected that the less politically tense the watercourse states were, the less conflictive the outcome of the transboundary water dispute. This appears to hold true in the case of the Nestos. During the time period of 1990 to 2008, Bulgaria and Greece were characterized by friendly relations. Considerable time passed since their last conflict, which, according to the MID dataset, was in 1917. This is indicative of Bulgaria, not keeping any past hostility towards Greece (Michaletos, 2006). Moreover, a manifestation of their good relations is their diplomatic engagement and representation, with both countries enjoying diplomatic representation in each other's countries. Engagement is high, particularly because Bulgaria joined NATO in 2004 and European Union in 2007, both of which Greece supported and lobbied for ("Greece's Bilateral Relations with Bulgaria", n.d.). It was expected that diplomatic engagement would have a positive relationship with whether a treaty would be formed and whether treaty is respected. This appears to be the case in the Nestos case. It was also expected that diplomatic engagement would reduce the intensity of the conflict and given that the Nestos transboundary water conflict was of mild intensity, the expectation is confirmed.

4.1.5 Summary

To summarize, the case of the transboundary water conflict over the Nestos was selected because the dyadic relationship between Greece and Bulgaria was characterized by low power asymmetry and high economic partnership in 1983. From the period of 1990 to 2008, although both variables grew, power asymmetry remained low and economic partnership remained high. Under these conditions, it would appear a treaty to allocate the Nestos watercourse was formed. While this could surely be attributed to the effect of low power asymmetry and high economic partnership, it is also complemented by the effect of other influencing factors. This includes strong diplomatic engagement and little political tensions that Bulgaria and Greece shared. Perhaps these influencing factors also had a role to play in making the treaty equitable and reasonable to a moderate extent. It was expected that under the conditions, the treaty would be equitable and reasonable to a much greater level. Perhaps if economic partnership was as high in the years leading up to the treaty as it was in the years towards the end of the timeframe, the extent could surpass moderate level. Lower power asymmetry and high economic partnership, as expected, was associated with a treaty's respectability and a milder form of conflict. Other influencing factors, such as strong diplomatic relations, similar regime types, little political tensions, and the fact that one riparian was low water-stressed, also seemed to complement the effect of both variables. Altogether, power asymmetry and economic partnership both influenced the outcome of the Nestos, such that it was cooperative in nature. The effect of these variables was compounded by other influencing factors that also worked to the same effect.

4.2 The Helmand River

4.2.1 About the Transboundary River

The Helmand, a 1,300 km long river, is shared by watercourse states Afghanistan and Iran. Rising from the Hindu Kush mountain range in the Northwest of Afghanistan, the Helmand river flows towards the Iran-Afghan border (Hayat, 2017). At a bifurcation known as the Helmand Fork, the river divides into two major distributaries. One river forms the border between Iran and Afghanistan while the other river flows westward into Iran (Hearns, 2015). Eventually, the river ends at the Sistan delta in Iran (Hayat, 2017). The wetlands have been internationally recognized as an important ecological site under the Ramsar Convention (Thomas, Azizi, & Behzad, 2016).

Recognized as the longest river in Afghanistan, the Helmand flows mainly through Afghan territory. Although Afghanistan controls the river headwaters, it is in Iran that the river produces the more irrigable banks. This is because Iran benefits from being geographically positioned; she has lower, flatter parts where the waterflows naturally collect (Fisher, Fisher & Gershevitch, 1968). This is beneficial for irrigation in the region. As Sistan is one of the rare areas of Iran that is endowed with supplies of freshwater, the river has great importance for Iran (Fisher et al., 1968). The river is of great importance to Afghanistan also, particularly because Afghanistan is a landlocked country and virtually all of its major rivers, including the Helmand, drain into neighboring riparian states.

Tensions between the watercourse riparians have been persistent with regards to the appropriation and utilization of the Helmand river. Disputes over the water sharing date back to the nineteenth century (Hayat, 2017). Although Afghanistan has suffered enormously from decades of instability, she has tried to manage her water resources through national development plans to generate hydropower and expand agriculture (Hayat, 2017). Such development undertakings are a matter of concern for Iran, the downstream riparian, that would be impacted if Afghanistan limits the volume of water flow that she receives (Hayat, 2017). Hence, while Afghanistan is in dire need of development, she has to remain mindful of the water needs of her neighbor (Hearns, 2015). Exploitation of water resources of the Helmand River has been challenging for both nations (Hajihosseini et al., 2016). This is especially true when the river experiences dramatic declines in water flows due to declining precipitation (Panahi & Khosravi, 2005). The impact of extensive water withdrawal and consequential reduced flow availability to the Sistan delta could have disastrous consequences for the region (Thomas et al., 2016).

4.2.2 Assessing the dependent variable

Aspect #1: Whether treaty is formed

In 1973, Afghanistan and Iran concluded the 'Iranian-Afghan Helmand River Water Treaty' (hereby referred to as "1973 Treaty"). What made this agreement distinctive was that it was the first time the two countries specifically addressed water allocations (Hearns, 2015). Notably, the Helmand is the only river basin for which Afghanistan has a formal agreement with a neighbor in place (Hajihosseini et al., 2016).

In accordance with the agreement, Afghanistan is to deliver to Iran an average flow of $22m^3$ in a normal water year. An additional amount of 4 m^3 has also been granted by Afghanistan has an expression of goodwill. As per the 1973 Treaty, Afghanistan retains the rights to decide on the disposition of the water, granted that she is mindful of not disturbing the continued flow to the Helmand Delta, from which Iran benefits. This means that Afghanistan has complete liberty to undertake her water resource development projects, granted she ensures Iran is given its share of water as per the 1973 Treaty (Thomas et al., 2016). The Treaty also establishes a new Helmand Commission to administer the agreement.

Aspect #2: Extent Treaty is Equitable and Reasonable

The 1973 Treaty, for the most part, is drafted with considerable compliance to the factors proposed by the UN Watercourse Convention. It makes reference to geographic conditions of the transboundary river basin. The water allocation takes into account the distribution of average flow of water during various months of the year. The strength of the 1973 treaty is how specific it is; criteria for which Afghanistan is to deliver water flows to Iran are clearly marked. Another strength is its flexibility; in low flow years, provisions are made to reduce the flow allocated to Iran in proportion to measured deviation from a normal year.

Furthermore, the 1973 Treaty considers conservation of the river. For example, Afghanistan must ensure that water delivered to Iran is suitable for agriculture and is not polluted with industrial chemical effluent. The treaty considers the uses of the watercourse -- for both irrigation and domestic uses and the effects of the uses on both countries. Iran, however, has expressed disappointment that the water allocation is not sufficient enough for her needs and that it is not sufficient for the protection and preservation of the wetlands (Thomas et al., 2016). What the treaty lacks is reference to the population dependent on the watercourse and the availability of alternatives.

Overall, the 1973 Treaty fulfills 5 of the 7 conditions listed by the UN Watercourse Convention, indicating that it is equitable and reasonable to a great extent.

Factor	*Included in the treaty?*
Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character	Yes
The social and economic needs of the watercourse States concerned	Yes
The population dependent on the watercourse in each watercourse State	No
The effects of the use or uses of the watercourses in one watercourse State on other watercourse States	Yes
Existing and potential uses of the watercourse	Yes
Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect	Yes
The availability of alternatives, of comparable value, to a particular planned or existing use.	No
	Score: great [5/7]

Table 9*: The Extent 1973 Treaty is Equitable and Reasonable*.

Aspect #3: Whether Treaty is Respected

There are several events between Iran and Afghanistan documented in the International Water Events database that would be characterized as conflictive in nature. Overall, the 1973 treaty was not respected broadly for two reasons. Firstly, Afghanistan accused Iran of breaching the 1973 Treaty by inaccurately claiming more than her due share of the watercourse (Thomas et al., 2016). Iran has suggested that the 1973 Treaty be reviewed but with no sunset clause, it exists in perpetuity (Hearns, 2015). Secondly, Afghanistan blocked waterflow to Iran in 2001. Iran lodged a written protest with the UN Secretary General raising concerns that the blockage of the Helmand waters from the Kajaki dam was a violation of the treaty. Waters were blocked until 2002, which worsened conditions for the region that was already experiencing drought (Aman, 2016).

Aspect #4: Intensity of Conflict

The most intense conflict documented in the International Water Event database dates to 2001, when Iran accused Afghanistan of cutting the waterflow. This event scored a rank of -3 on the BAR scale, indicating strong intensity.

Summary of Outcome on the Helmand

Aspect of Dependent Variable	*Outcome of Helmand Transboundary Water Conflict*
#1: Treaty formed	Yes
#2: Treaty equitable and reasonable	Great extent – [5/7]
#3: Treaty respected	No
#4: Intensity of Conflict	Strong intensity

Table 10*: Outcome of the Helmand Transboundary Water Conflict*

4.2.3 Assessing the independent variables

The Helmand case was chosen because the dyadic relationship between Afghanistan and Iran was characterized by high power asymmetry and low economic partnership in 1983.

The values of power asymmetry and economic partnership between Afghanistan and Iran during the time period of 1968 to 2008 is displayed in Table 11. The full calculations are presented in Appendix VIII and IX. As the values would suggest in Appendix VIII, Afghanistan was the relatively less powerful riparian state in the time period.

Year	*Power asymmetry*	*Calculated Economic partnership*
1968	60.17	n/a
1969	73.38	n/a
1970	85.35	n/a
1971	116.82	n/a
1972	161.76	n/a
1973	153.89	n/a
1974	164.95	n/a
1975	162.77	n/a
1976	200.40	n/a
1977	223.04	n/a
1978	150.44	n/a
1979	125.51	n/a
1980	93.05	n/a
1981	76.13	0.0000086
1982	88.74	0.0000071
1983	100.73	0.0000048
1984	102.36	0.0000056
1985	105.71	0.0000015
1986	72.94	0.0000083
1987	98.06	n/a
1988	103.73	n/a
1989	110.24	n/a
1990	139.38	n/a
1991	162.92	n/a
1992	191.52	n/a
1993	236.83	n/a
1994	283.79	n/a
1995	202.44	n/a
1996	205.59	n/a
1997	206.28	n/a
1998	195.14	n/a
1999	178.15	n/a
2000	197.11	n/a
2001	267.61	n/a
2002	186.15	n/a
2003	92.23	n/a
2004	170.51	n/a
2005	148.27	n/a
2006	147.41	n/a
2007	138.01	n/a
2008	138.16	n/a

Table 11: *Power Asymmetry and Economic partnership between Afghanistan and Iran.*

A visual representation of power asymmetry can be seen in Figure 5. Power asymmetry was volatile during the time period. It peaked in 1994 after which it took a dip. It then reached the highest it ever was in 2001. Overall, despite the fluctuations in power asymmetry, it remained very high.

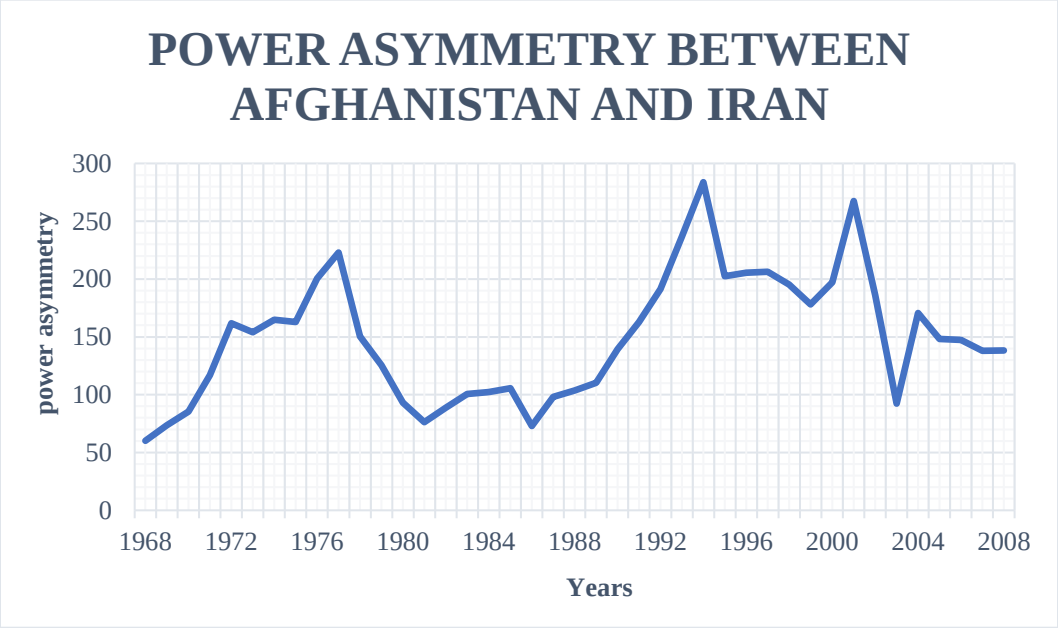

Figure 5: *Power Asymmetry between Afghanistan and Iran*.

Unlike the values for power asymmetry, there are less calculated values for economic partnership. Only economic partnership between 1981 to 1986 are calculated. This is because there is limited trade data between the riparians available in the IMF DOTS database, probably owing to the fact that Afghanistan witnessed decades of political instability and upheaval. However, this does not pose much of a problem for the purpose of this research. It can be assumed that the economic partnership reflected from 1981 to 1986 would more or less remain the same for the remainder of the years. The severely low values indicate Afghanistan and Iran did not have significant trade relations and so, it is a relation characterized by low economic partnership. It is true that today, Iran has emerged as Afghanistan's biggest trading partner, particularly now as Iran looks to assist in rebuilding and stabilizing Afghanistan (Worden, 2018). However, this reality does not reflect the economic relationship of the time period between 1968 to 2008 because political turbulence was too great for any economic relationship to fully materialize.

In order to assess aspect 1 (i.e. treaty formation) and aspect 2 (i.e. extent treaty is equitable and reasonable), the years leading up to the 1973 Treaty are observed. During that time, there was a gradual increase in power asymmetry between Afghanistan and Iran. Under these conditions, the outcome was cooperative. It was not expected that with high power asymmetry, a treaty would be formed or that treaty would be

equitable and reasonable to a great extent. A plausible explanation could be that economic partnership was too low to counter the effect of power asymmetry.

To assess aspect 3 (i.e. the extent treaty is respected) of the dependent variable, the years after the 1973 Treaty was signed are observed. Findings lend support to my expectations that high power asymmetry and low economic partnership are associated with the lack of respectability of a treaty. Findings also support expectations with regards to aspect 4 (i.e. intensity of conflict). Results reveal that high power asymmetry and low economic partnership went together with stronger intensity of conflict.

The summary of the results is presented in Table 12.

Dependent Variable	*Independent Variables*	*Expected Outcome of Transboundary Water Conflict*	*Actual Outcome of Transboundary Water Conflict*	*Expectation Supported?*
Aspect 1 (Whether Treaty Formed)	High Power asymmetry	No treaty	Treaty formed	No
	Low Economic partnership	No treaty	Treaty formed	No
Aspect 2 (Extent Treaty Equitable and Reasonable)	High Power asymmetry	Lesser extent	Great extent	No
	Low Economic partnership	Lesser extent	Great extent	No
Aspect 3 (Whether Treaty Respected)	High Power asymmetry	Treaty not respected	Treaty not respected	Yes
	Low Economic partnership	Treaty not respected	Treaty not respected	Yes
Aspect 4 (Intensity of Conflict)	High Power asymmetry	Greater intensity	Strong	Yes
	Low Economic partnership	Greater intensity	Strong	Yes

Table 12*: Impact of Independent Variables on the Helmand.*

4.2.4 Assessing other influencing variables

It is important to take into account other influencing variables.

Firstly, diplomatic engagement is considered. Afghanistan and Iran enjoyed a moderate degree of diplomatic engagement. There were disturbances to their level of engagement, like when the Taliban murdered eight diplomats at the Iranian consulate in 1998 (Koepke, 2013). Expectations were that only high diplomatic engagement, in which the two countries enjoyed undisturbed diplomatic ties, would lead

to cooperative outcomes of transboundary water disputes. Hence, it could be that Afghanistan and Iran's disturbed diplomatic engagement complemented the effect of high power asymmetry and low economic partnership on the outcome of aspects 3 and 4. Notable to mention here is that in the years leading up to the 1973 Treaty, Afghanistan and Iran had strong diplomatic linkages. This would mean high power asymmetry and low economic partnership probably did not have consequences for aspects 1 and 2 because it was countered by the strong diplomatic ties.

Secondly, the level of water scarcity of both watercourse states is considered. As per the baseline water stress indicator, both Afghanistan and Iran are extremely high water-stressed, with a combined score of 8.79. It was predicted that water scarcity would impact the outcome of transboundary water conflicts, such that it would be more conflictive in nature. Hence, it is likely that the level of high water scarcity contributed to the fact that the treaty was not respected and that the conflict was strong in intensity.

Thirdly, the regime types of the watercourse states are considered. Both Afghanistan and Iran underwent tumultuous political and regime changes. Neither of the watercourse states had significant Western-style democratic procedures or institutions in place. Both practiced a mix of anocracy and autocracy. At the start of the time period, Afghanistan was set up as a constitutional monarchy but this monarchy saw an abrupt end in the early '70s with a military coup. In the late '70s, Afghanistan witnessed Soviet occupation and witnessed Taliban seize power in 1996. It was in 2001 that Afghanistan directly elected her first president. Iran too, during this time period, underwent political turbulence. Before the Iranian Revolution, she was ruled as an autocracy. The revolution in 1979 overthrew the absolute monarchy and Iran became an Islamic Republic. It was a decade later that Iran amended the constitution to include democratic and theocratic elements (Curtis, 2008). These political developments illustrate that the regime types were somewhat similar. It was expected that the similarity in regime trends would allow more cooperative outcomes to transboundary conflicts. However, results do not confirm this; Afghanistan and Iran had a conflict of strong intensity, suggesting that high power asymmetry and low economic partnership had a stronger relationship to the outcome of the transboundary conflict. Notably, in some aspects – 1 and 2 – cooperative outcomes were reached, such that a treaty was formed and it was equitable and reasonable to a great extent. This possibly has to do more with the diplomatic engagement Afghanistan and Iran shared in the years leading up to the treaty than this variable.

Lastly, the political tensions between the two watercourse states are considered. Up until 1979, Iran's relations with Afghanistan were friendly (Milani, 2006). Perhaps this is why there is no militarized dispute documented between the two nations under the Militarized Interstate Dispute dataset. Even after 1979, when the Soviet Union occupied Afghanistan, Iran urged for withdrawal and aided in the Afghan jihad. However, when Afghanistan came under the rule of the Taliban, Iran retracted her support and became one

of the many nations of the world to not recognize the Taliban government. After the fall of the Taliban, Iran tried to engage once again with friendly relations. Taken altogether, political developments as described present a rocky relationship, one that has seen periods of high and low. The 1973 Treaty was conceived in the years that Iran and Afghanistan shared a friendlier relationship than other years in their political history. This suggests that the relative lack of political tension contributed to aspects 1 and 2. With closer analysis, it is noted that the treaty was mainly violated in the years whereby Iran and Afghanistan had more tensions. Hence, this variable has consequences for aspects 3 and 4 and works in the same direction as high power asymmetric conditions, low economic partnership, and high water scarcity.

4.2.5 Summary

To conclude, the case of the transboundary water conflict over the Helmand was selected because Afghanistan and Iran experienced high power asymmetry and low economic partnership in 1983. During 1968 to 2008, power asymmetry remained high and economic partnership remained low. It was expected that high power asymmetry would impede the formation of the treaty and would hinder the extent to which the treaty is equitable and reasonable. This did not appear to be the case, probably owing to the role of other influencing factors such as strong diplomatic engagement and low political tension in the years leading up to the treaty. These influencing factors may have contributed to a great extent that the treaty was equitable and reasonable. While power asymmetry did not hinder the formation of treaty or the extent to which the treaty is reasonable and equitable, results did reveal that power asymmetry had consequences for aspects 3 and 4. This was probably complemented with the impact of other influencing factors that give way to more conflictive outcomes, such as high political tensions and the high level of water scarcity in both riparians. It was predicted that low economic partnership would not impact the outcome of the transboundary water conflicts. Results seemed to confirm this – especially as the treaty was not respected and the conflict was of strong intensity. Economic partnership could not be a strong predictor of the formation of treaty or the extent to which it was equitable and reasonable, probably because its effect was mitigated by the role of other influencing factors.

4.3 The Rio-Grande

4.3.1 About the Transboundary River

The United States and Mexico share the Rio-Grande river. 3,030 kilometers in length, the river runs along the border between Texas and Mexico, starting at the twin cities of El Paso and Juarez and ending with the twin cities of Laredo and Nuevo Laredo (Lopez, 1996). The land surrounding the river is divided into the Upper basin -- which is fed by tributaries in the United States, and the Lower Basin -- which is fed by tributaries mostly from Mexico. With an arid to semi-arid climate, the entire region is one of the driest in North America (Lopez, 1996). This impacts the needs of the watercourse states, both of whom depend on the water supply. Water is used primarily for domestic consumption and irrigation. Mexico, in particular, relies heavily on agriculture as its primary economic base.

When the United States and Mexico formally established a geographic border in 1848, they did not discuss natural resource allocation. With the settlement of the local population at the border, the demands for water also increasingly grew. The United States initially considered herself entitled to use all the water on her land without any regard that little amount was left for Mexico to use (Lopez, 1996). Mexico contested that United States is not entitled to utilize the waterflows of the Rio-Grande at the expense of Mexico's needs. This led to clashes between the local populations on both sides of the border. Those on the US side, composed mostly of farmers from Texas' multi-million-dollar agricultural business, were of the view that Mexico needs to better manage the water supply that she received than ask for more. Eventually, the 1906 Rio-Grande Treaty was concluded in order to iron out differences of the riparians regarding water allocation, in which only the upper Rio-Grande was discussed. The agreement did not include allocation provisions for the lower Rio-Grande in the southeastern portion of the basin (Lopez, 1996). This left each watercourse state to continue utilizing waterflows of the Rio-Grande without any regard to the fact that these were shared waters.

4.3.2 Assessing the dependent variable

Aspect #1: Whether Treaty is Formed

The United States and Mexico settled their differences in 1944 whereby they signed the Treaty Between the United States of America and Mexico Respecting the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio-Grande (hereby referred to as "1944 Treaty"). The agreement does not exclusively discuss the Rio-Grande but also waters of Tijuana and Colorado which the two watercourse states share. The treaty was enforced in 1945. The purpose of the agreement, as alluded on in its preamble, is to "obtain

the most complete and satisfactory utilization…". It mandates a percentage of the water that flows through the river to be stored in two internationally controlled reservoirs located along the river, from which Mexico and United States can draw their allotted measurements. The United States is entitled to all of the water flowing from each of the sources within the United States, such as the Pecos & Devils, Goodenough Spring, and Pinto Creeks. Mexico is entitled to all of the water from the San Juan and Alamo Rivers.

Aspect #2: Extent Treaty is Equitable and Reasonable

Upon close reading of the 1944 Treaty, it appears the treaty text does not factor all the required factors required for it to be considered equitable and reasonable to a great extent.

Firstly, the geography, hydrology, and climate of the region, is not mentioned in the 1944 Treaty. The basin is subject to recurring droughts, which as Lopez (1996) pointed out, should be considered in the 1944 Treaty as both riparians ought to share the costs related to drought.

Secondly, the needs of the local population living in the areas surrounding the river are not considered. It is worth mentioning however that the Rio-Grande basin was the site of dramatic population growth and thereby, the 1944 Treaty should be adjusted to reflect the changing needs and requirements of the new demographics (Schiff, 2003).

Thirdly, the 1944 Treaty text does not explicitly mention the effects that the use of the Rio-Grande by one riparian could have on the other riparian. In fact, the 1944 Treaty makes no provision for any form of compensation in case one of the parties is harmed. Fourthly, the conservation and protection of the Rio-Grande have not been considered. Although there are articles that discuss the development of the Rio-Grande, there is no clause that discusses environmental protection.

While the effects of the uses have not been elaborated on, the uses of the watercourse, both existing and potential, have been discussed. Essentially, both Mexico and the United States use the watercourse for the same purposes and this is reflected in the 1944 Treaty. The treaty text establishes a hierarchy of uses for the water, in which domestic and municipal uses, agriculture and stock-raising use, electric power and industrial uses are prioritized. The treaty also discusses the variability of the watercourses' needs in article IX and the availability of alternatives in which the 1944 Treaty describes situations in which different development or alternative modes of actions can occur.

All in all, the 1944 Treaty is equitable and reasonable to a moderate extent, with a score of 3/7. It is noteworthy to add here that the 1944 Treaty was drafted at a time long before the UN Watercourse was drafted and therefore, it should come as no surprise that the 1944 Treaty does not qualify as equitable and

reasonable to a great extent. However, it raises questions as to whether the 1944 Treaty should be amended in conformance with the principles proposed by the UN Watercourse Convention.

Factor	*Included in the treaty?*	
Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character	No	
The social and economic needs of the watercourse States concerned	Yes	
The population dependent on the watercourse in each watercourse State	No	
The effects of the use or uses of the watercourses in one watercourse State on other watercourse States	No	
Existing and potential uses of the watercourse	Yes	
Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect	No	
The availability of alternatives, of comparable value, to a particular planned or existing use.	Yes	
		Score: moderate [3/7]

Table 13: *Extent 1944 Treaty is equitable and reasonable*.

Aspect #3: Whether Treaty is Respected

The International Water Event database documented 21 events related to the transboundary conflict over the Rio-Grande. It is noteworthy to mention that the International Border and Water Commission (IBWC) was tasked to enforce the 1944 Treaty and settle disputes.

Tensions between the two watercourse nations began to simmer when Mexico experienced an extreme drought in 1992 (Neir & Campana, 2007). To deal with the water crisis, Mexico began depleting vast amounts of her yearly water allotment from the reservoirs. Mexico claimed that the drought conditions made it difficult for her to make her annual treaty payments of at least 350,000 acre-feet of water (Vina, 2005). It was after this that Mexico requested the United States to increase her water allotment from the international reservoirs. After initially denying the request as per IBWC's recommendation, the United States granted Mexico's request, particularly when the situation in Mexico worsened. Between 1995 to

1997, Mexico was allowed to divert up to 81,000 acre-feet of water to meet its domestic and municipal needs, on the grounds that she does this only in critical situations (Vina, 2005). Mexico was required to return the borrowed water within eighteen months because essentially, this was a loan (Carter, Stern & Mulligan, 2018). However, Mexico's water debt continued to rise and consequently, tensions between the watercourse states also escalated (Vina, 2005). By the end of 2002, the IBWC required Mexico to make an immediate transfer of water worth 90,000 acre-feet from the international reservoirs to the United States. Mexico was unable to do so (Carter el al., 2018). By that time, Mexico's water debt had grown another 477,828 acre-feet (Vina, 2005). Mexico's inability to repay her water debt outraged the United States, in particular the farmers on the Texan border, who alleged the 1944 treaty was violated. There were calls for the United States to impose economic sanctions against Mexico. Eventually, through presidential intervention and negotiation of new minutes under the 1944 Water Treaty, a solution was reached to eliminate Mexico's water debt in 2005. Hurricane-induced wet conditions helped in clearing the remaining water debt (Carter et al., 2018). For the time period of 1992 to 2002, the 1944 Treaty was violated.

Aspect #4: Intensity of conflict

The most conflictive events recorded in the International Water Events pertain to the prolonged drought of 1992 to 2002 that brought Mexico and the United States at odds against each other. Officials of the United alleged that with satellite imaging, it was clear to see that Mexico had more water than she claimed. Mexico, in turn, complained that she was being spied on (Jordan & Duggan, 2002). When Mexico declared that she would not be able to pay her water debt and alleged that the pressures from the United States were unfounded, the event scored -3 on the BAR scale, indicating that the conflict was of strong intensity.

Summary of the Outcome on the Rio

Aspect of Dependent Variable	*Outcome of Rio-Grande Transboundary Water Conflict*
#1: Treaty formed	Yes
#2: Treaty equitable and reasonable	Moderate – 3/7
#3: Treaty respected	No
#4: Intensity of Conflict	Strong

Table 14: *Outcome of the Rio-Grande Transboundary Water conflict.*

4.3.3 Assessing the Independent variables

The case of the Rio-Grande was selected because the dyadic relationship between Mexico and the United States was characterized by high power asymmetry and high economic partnership in 1983. It is curious to

note that power asymmetry diminished over the years between 1939 to 2008. Economic partnership, in contrast, increased. It peaked in 2000. This is observable in the graphical representation of the variables (Figure 6). Although power asymmetry diminished, it never became too small for the dyadic relationship to be qualified as low. The full calculations of power asymmetry and economic partnership can be seen in Appendix V and VI.

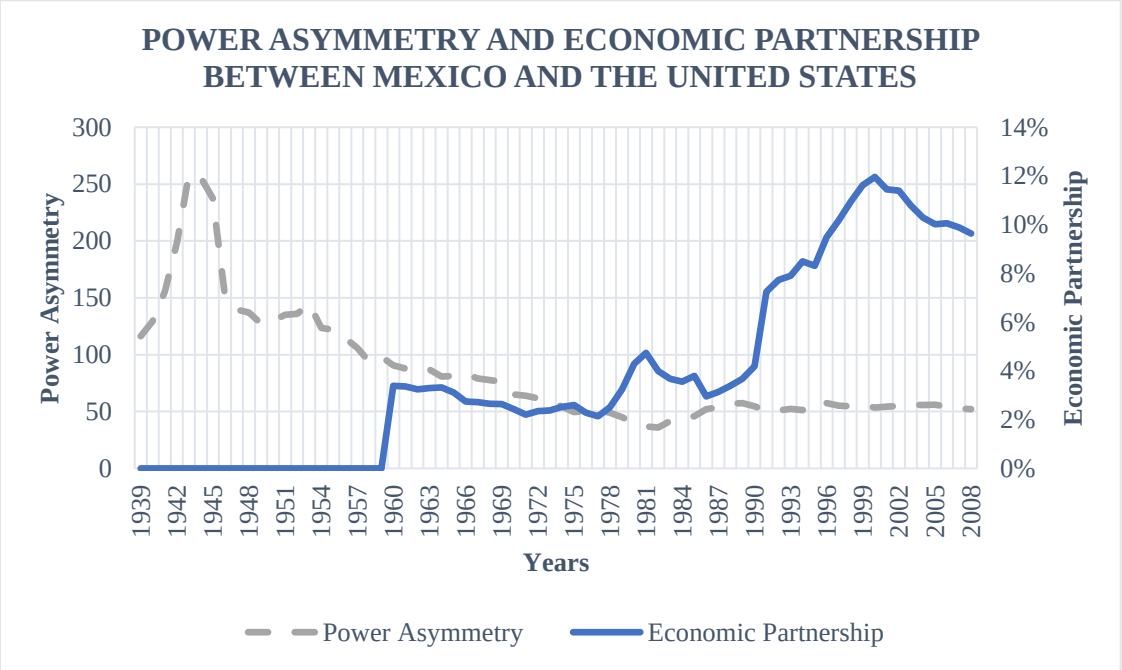

Figure 6: *Power Asymmetry and Economic partnership between Mexico and The United States.*

The years of 1939 to 1944 are relevant to analyze aspect 1 (i.e. whether treaty is formed) and aspect 2 (i.e. the extent the treaty is equitable and reasonable). Power asymmetry was at its peak in 1943, only to gradually lessen in the year after. This is interesting because 1944 was the year that Mexico and the United States concluded the allocation of the Rio-Grande watercourse. Despite high power asymmetry, a treaty was formed. The treaty, however, is equitable and reasonable to a moderate extent. This is as per expectations.

The analysis of the impact of economic partnership is trickier. Due to limited available data, economic partnership was not calculated in the years leading up to the treaty. However, seeing the general trend of economic partnership, it can be inferred that economic partnership remained high during those years. In that case, results suggest a positive relationship between economic partnership and treaty formation. This is as per expected findings. It was also expected that high economic partnership would increase the extent that a treaty is equitable and reasonable to greater levels but instead, the treaty remained moderately equitable and reasonable.

With respect to aspect 3 (i.e. whether the treaty is respected), the years after 1944 are observed. In these years, power asymmetry and economic partnership remained high. It was expected that high power asymmetry would decrease the likelihood the treaty was respected. Results confirm these expectations. In this case, high power asymmetry goes together with the lack of respect for a treaty. It was expected, however, that high economic partnership would diffuse tensions between riparians and help restrict them from initiating conflict. This did not appear to be the case. Special attention should be given to the years between 1992 and 2002 when Mexico experienced the drought. Figure 6 illustrated that power asymmetry remained steady whereas economic partnership gradually increased. High economic partnership was not enough to counter the effect of high power asymmetry.

With regards to aspect 4 (i.e. intensity of conflict), it was found that the conflict over the Rio-Grande waters was of strong intensity. Although it was expected that results would suggest a positive relationship between power asymmetry and intensity of conflict, it was not expected that results would paint a negative relation between economic partnership and intensity of conflict.

The summary of the results and whether they support expectations is presented in Table 15.

Dependent Variable	*Independent Variables*	*Expected Outcome of Transboundary Water Conflict*	*Actual Outcome of Transboundary Water Conflict*	*Expectation Supported?*
Aspect 1 (Whether Treaty Formed)	High Power asymmetry	No treaty	Treaty formed	No
	High Economic partnership	Treaty formed	Treaty formed	Yes
Aspect 2 (Extent Treaty Equitable and Reasonable)	High Power asymmetry	Lesser extent	Moderate extent	Yes
	High Economic partnership	Greater extent	Moderate extent	No
Aspect 3 (Whether Treaty respected)	High Power asymmetry	Treaty not respected	Treaty not respected	Yes
	High Economic partnership	Treaty respected	Treaty not respected	No
Aspect 4 (Intensity of Conflict)	High Power asymmetry	Greater intensity	Strong	Yes
	High Economic partnership	Lesser intensity	Strong	No

Table 15: *Results of the Impact of Independent Variables on Outcome on the Rio-Grande*

4.3.4 Assessing other influencing factors

It is important to examine whether other influencing factors have a relationship with the outcome.

One factor to take into account is the political tensions between the two countries. According to the MID dataset, United States and Mexico clashed in 1847. Hence, almost a whole century passed since their last

conflict. Between 1939 to 2008, main areas of friction between the two nations included counter-narcotics operation and undocumented immigration. It was the signing of the North American Free Trade Agreement in 1994 that enhanced their economic ties and started a new chapter in their bilateral history ("Timeline: U.S.-Mexico Relations", n.d.). Overall, Mexico and the United States have had less troubled political tensions. It was expected that this would lead to more cooperative outcomes. This may be the case for aspect 1 but it may not be the case for aspects 2, 3 and 4 because the treaty was not equitable and reasonable to a great extent, the treaty was not respected, and the conflict was of strong intensity.

Similarly, diplomatic engagement is considered. Mexico and the United States shared a high degree of diplomatic engagement because it was uninterrupted and they maintained embassies and representation in each other's countries throughout the 1939 to 2008 period. It was expected that in the case of high diplomatic engagement, the outcome would be more cooperative. Hence, it could be that high power asymmetry did not have any consequences for aspect 1 because it was countered by other factors such as high economic partnership, low political tension, and high diplomatic engagement.

Another factor to consider is the extent of similarity of regime types. The United States was founded on the ideals of democracy. Mexico, on the other hand, had a more troubled political history before she migrated towards democratic reforms. Up until the late 20th century, she was effectively a one-party state under the rule of powerful political party, Institutional Revolutionary Party (PRI). 71 years of continuous rule by the PRI came to an end in 2000 after President Zedillo instituted electoral reforms and held a primary election to choose a candidate instead of nominating the successor (Merrill, 1997). The election was considered to be the fairest and most democratic in Mexico's history. So even though eventually, the regime types became similar, they were not always the case for most of the period of 1939 to 2008. It was expected that similarity in regime trends would give way to more cooperative outcomes. As the United States and Mexico had more dissimilar regime trends, this variable has consequences to aspects 2, 3 and 4. It does not have consequences for aspect 1, perhaps outweighed by the fact that Mexico and the United States shared less politically tense relations.

Lastly, the level that riparian states are water-scarce is considered. Mexico and the United States have a combined score of 6.41 as per their baseline indicators, meaning the countries are high water-stressed. It was expected under these circumstances, the outcome would be more conflictive in nature. Thereby, it could be that high economic partnership did not have consequences for aspects 3 and 4, because it was countered by influencing factors such as the relatively high level of water scarcity.

4.3.5 Summary

To summarize, the case of the transboundary water conflict over the Rio-Grande was selected because it was a case of high power asymmetry and high economic partnership in 1983. From 1939 to 2008, the degree of power asymmetry and economic partnership remained high.

Results revealed that despite high power asymmetry, a treaty was formed. High economic partnership probably countered the effect of high power asymmetry. It could also be because other influencing factors like the strong diplomatic engagement and the low political tensions between Mexico and the United States had a role to play. Results also suggested that high power asymmetry may have inhibited the treaty from being equitable and reasonable to a greater extent. At the same time, high economic partnership ensured it was more equitable and reasonable than a small extent.

Expectations were confirmed that high power asymmetry would inhibit the treaty from being respected and would increase the intensity of conflict. High power asymmetry may have been compounded by the effect of relatively high scarcity of water and dissimilarity in regime types. Economic partnership did not seem to have consequences for aspects 3 and 4, probably countered by other factors such as high-power asymmetry, the dissimilarity in regime types, and the relatively high level of water scarcity of watercourse states. What was most surprising was that high economic partnership did not prevent the conflict from being one of strong intensity.

4.4 The Indus

4.4.1 About the Transboundary River

The Indus is a mighty river, one whose annual runoff and drainage is considered to be among the largest of the world (Mountjoy, 2005). The melting snow from the Himalayan mountains as well as seasonal monsoon runoffs feeds into the waters of the river. The climate over the river basin varies from alpine to temperate, subtropical, sub-humid and sometimes semiarid (Frenken, 2012). With a total length of 2,897 kilometers, the river ultimately flows into the Arabian Sea (Mountjoy, 2005). Along the way, it branches off into many tributaries, namely the Sutlej, Beas, Ravi, Chenab, and Jhelum (Gilmartin, 2015).

Covering 65% of Pakistan's territory, the river flows through Kashmir, the plains of Punjab and Sindh, and ends in a large delta southeast of Pakistan's port-city, Karachi (Frenken, 2012). Relying on the river and its tributaries for irrigation and hydroelectric generation, the Pakistani people consider the mighty Indus the country's lifeblood (Mountjoy, 2005). For India, it is equally important. The headwaters of the basin lie in India (Sarfaraz, 2013). What makes the Indus special is its testament to the many civilizations, religions, and cultures that that influenced the region throughout history.

India and Pakistan have fought over the use of the Indus and its tributaries since they gained their independence from Great Britain in 1947 (Mountjoy, 2005). In many ways, the dispute over the Indus is considered to be a legacy of the partitioning of the massive irrigation system that was developed during the colonial era (Haines, 2018). The division was the doing of Sir Radcliffe and his Boundary Commission, without considering the irrigated boundaries. Radcliffe reportedly suggested to the leaders of the Congress and the Muslim League that they should agree in advance to run the irrigation system jointly after partition – an idea that both sides were hostile to (Gilmartin, 2015). With the partition of British-India, the Indus basin was sliced in two, with 47% of the basin's total land area going to Pakistan and 39% to India (Gilmartin, 2015). Ultimately, the division led to an international water dispute in 1948.

On the 1st of April, 1948, when the standstill agreement between the two nations expired, India, without any warning, stopped the flow of the main canals crossing the partition line (Gilmartin, 2015). India's actions on April 1 reflected her claim of proprietary rights and absolute sovereignty over any natural resource within her borders. By virtue of her upstream position, India consistently asserts that she is entitled to absolute sovereignty over the waters, such that she owns the water that flows within the borders and can do with it whatever she pleases. Pakistan, the downstream riparian, has challenged this assertion on the claims that she has the right to continue receiving water to which she is accustomed –for years, the Indus was the source of irrigation, hydropower, industry, and human consumption (Haines, 2018).

4.4.2 Assessing the dependent variable

Aspect #1: Whether a treaty has been signed

India and Pakistan, under the aegis of the World Bank, concluded the Indus Water Treaty in 1960. Hailed as one of the greatest success stories of international water disputes, the treaty modeled itself on the World Bank's proposed 1954 plan (Gilmartin, 2015). In accordance to the treaty, Pakistan is given unrestricted use of the three Western rivers of Indus, Jhelum, and Chenab whereas India is given full right of the three eastern rivers of Ravi, Sutlej and Beas. India is allowed however some run-of-the-river use of water in the three western rivers, meaning for non-consumptive, domestic and limited agricultural use as well as hydropower generation. This Treaty also established the Permanent Indus Commission.

Aspect #2: Whether treaty is equitable and reasonable

The 1960 Treaty facilitates most of the seven relevant factors required to be considered equitable and reasonable. It particularly acknowledges the domestic, human and industrial needs for water of both watercourse states. The main shortcoming, however, is that environmental impact, preservation, and management is not factored into the treaty text. The only mention the treaty makes of the environment is a provision that riparians have to declare the intention of preventing undue pollution. The problem is that the allocations do not account for the fluctuations in precipitation and runoff. This means that environmental flow requirements are not factored into the allocation of the Indus (Sarfraz, 2013).

Factor	*Included in the treaty?*
Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character	No
The social and economic needs of the watercourse States concerned	Yes
The population dependent on the watercourse in each watercourse State	Yes
The effects of the use or uses of the watercourses in one watercourse State on other watercourse States	Yes
Existing and potential uses of the watercourse	Yes
Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect	No
The availability of alternatives, of comparable value, to a particular planned or existing use.	Yes
	Score: Great [5/7]

Table 16: *The Extent 1960 Treaty is equitable and reasonable.*

Aspect #3: The extent to which treaty is respected

Part of the reason that the 1960 Treaty is hailed such a success is because it has survived even when the watercourse states went to war. Although the treaty has survived, it has not been respected. There have been allegations that the treaty has been violated.

The International Water Events database documents over fifty events between India and Pakistan over the Indus after the signing of the treaty. A general trend is observed in most of them – the treaty is tested during the construction of hydropower projects. Pakistan contests that because the 1960 Treaty has given non-consumptive uses of the three western rivers to India, Pakistan has to, in turn, guard the watercourse from Indian exploitation (Wirsing & Jasparro, 2006). It is thereby that Pakistan protests when India constructs dams on the western rivers, particularly if she has concerns that the pondage area is not consistent with the treaty and concerns that India is building storage capacity more than the run-of-the- river use allowed in the treaty. India claims that her projects are intended to build capacity for water storage and not to inflict harm on Pakistan. Pakistan worries that India would use the storage capacity to stop water from flowing to Pakistan during sowing seasons, thereby strangulate or economically squeeze Pakistan altogether (Wirsing & Jasparro, 2006). As such, the construction of the Baglihar dam was a source of tension between the riparians, particularly when both sides argued on whether the design of the dam was in compliance with the treaty (Wirsing & Jasparro, 2006). Another example of a project that Pakistan took serious note of is the Wullar barrage on the Jhelum river. Pakistan protested that the barrage that India planned to construct in 1986 was meant for irrigation purposes and therefore violates the 1960 treaty because the rights of the Jhelum river belong to Pakistan. India insists that the project is allowed by the treaty because it will only regulate outflow in a way that will not affect the inflow of water of Pakistan (Bhutta, 2011).

Aspect #4: Intensity of conflict

It comes as no surprise that most events documented in the database are linked to the issue of the Baglihar dam project and the Wullar barrage, most of which rank -2 on the BAR scale. The most conflictive of these ranks -3 on the BAR scale, in which India announced in a meeting of the Indus Commission that it would refuse to stop the construction of the Baglihar dam on the Chenab river. India contended that her design of the dam is in full compliance with the treaty (Wirsing & Jasparro, 2006). Altogether, a score of -3 indicates that the conflict is of strong intensity.

Summary of Outcome

Aspect of Dependent Variable	*Outcome of Nestos Transboundary Water Conflict*
#1: Treaty formed	Yes
#2: Treaty equitable and reasonable	Great [5/7]
#3: Treaty respected	No
#4: Intensity of Conflict	Strong

Table 17*: Outcome of Indus Transboundary Water Conflict.*

4.4.3 Assessing the independent variables

The case of the Indus transboundary water dispute was selected because Pakistan and India had low power asymmetry and low economic partnership in 1983.

Between 1955 and 2008, the levels of power asymmetry and economic partnership varied. The calculations of both variables are displayed in tables are found in Appendix XII and XIII. Notably, due to data unavailability in trade data, some values for economic partnership are not calculated, particularly in the years of 1955 – 1959, 1968-1969, and 1974.

A graphical representation tracing the trend of both variables is presented in Figure 7. Power asymmetry became high with occasional years where it was low. Economic partnership was volatile and seesawed between low and high.

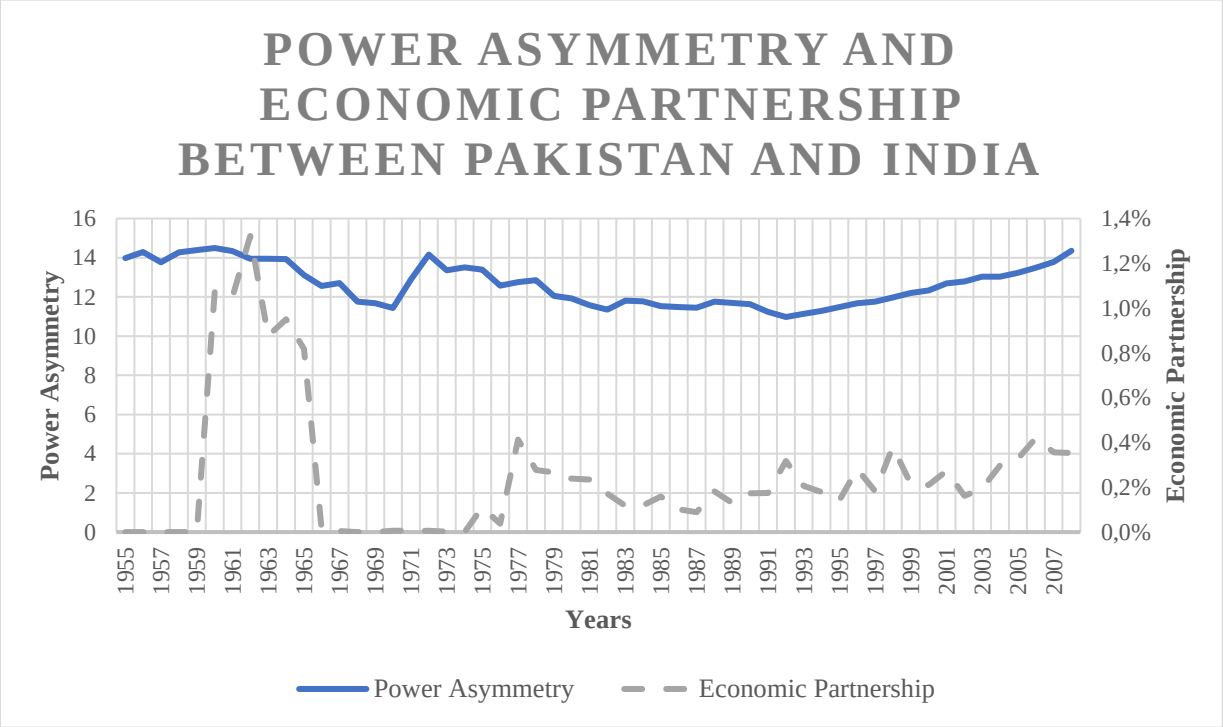

Figure 7*: Power Asymmetry and Economic partnership between Pakistan and India.*

To assess aspect 1 (i.e. whether a treaty has been formed) and aspect 2 (i.e. whether the treaty is equitable and reasonable), the years leading up to the treaty are observed. From 1955 to 1960, power asymmetry was high, with a score higher than the median value. Economic partnership values are not computed in the years leading up to the treaty but in the years after the signing of the treaty (1960-1965), economic partnership was high. Therefore, it can be inferred that economic partnership was high also in the years prior to the signing of the treaty. Contrary to what was expected, results suggest that high power asymmetry may be associated with treaty formation, possibly because high economic partnership countered the effect of high power asymmetry. The same holds true for the extent to which a treaty is respected. High power asymmetry did not inhibit the treaty from being equitable and reasonable to a great extent probably because high levels of economic partnership ensured that it was.

To assess aspect 3 (i.e. the extent the treaty is respected) of the dependent variable, the time period from 1960 to 2008 is evaluated. During that time, power asymmetry varied. There were more years with low power asymmetry between Pakistan and India than there were years of high power asymmetry. Economic partnership, a variable that also varied considerably. Peaking from 1963 to 1965, it dropped to drastically low levels in the years that followed. From 1977 to 1981, it was again high but became low between 1982 and 1991. From 1992 to 2008, economic partnership remained high, with some occasional years when it was low. Overall, there were more years of high economic partnership than of low economic partnership. Of particular interest is the time period between 1999 and 2007, which is when Pakistan alleged that India's construction of the Baglihar dam disrespected the 1960 Treaty. During these years, power asymmetry and economic partnership were both mostly high This would suggest that high power asymmetry goes together with the lack of respectability of the treaty. The effect of high economic partnership is mitigated by the effect of high power asymmetry.

The focus to analyze aspect 4 turns to 2003, the date in which the most conflictive event between Pakistan and India was recorded in the International Water Events database. In this year, Pakistan and India had high power asymmetry and high economic partnership. This would suggest that high power asymmetry has consequences for the intensity of the conflict and can even counter the effects of high economic partnership. These results are summarized in Table 18.

Dependent Variable	*Independent Variables*	*Expected Outcome of Transboundary Water Conflict*	*Actual Outcome of Transboundary Water Conflict*	*Expectation Supported?*
Aspect 1 (Whether Treaty Formed)	High Power asymmetry	No treaty	Treaty formed	No
	High Economic partnership	Treaty formed	Treaty formed	Yes
Aspect 2 (Extent Treaty Equitable and Reasonable)	High Power asymmetry	Lesser extent	Great extent	No
	High Economic partnership	Greater extent	Great extent	Yes
Aspect 3 (Whether Treaty Respected)	High Power asymmetry	Treaty not respected	Treaty not respected	Yes
	High Economic partnership	Treaty respected	Treaty not respected	No
Aspect 4 (Intensity of Conflict)	High Power asymmetry	Greater intensity	Strong	Yes
	High Economic partnership	Lesser intensity	Mild	No

Table 18: *Impact of Independent Variables on Outcome on the Indus.*

4.4.4 Assessing other influencing variables

Other influencing variables and their relationship with the outcome need to be examined.

The regime types of both watercourse states are considered. Pakistan and India had dissimilar regime trends from 1955 to 2008. Pakistan's democratic process could not take roots, in part because it wasn't until 1956 that a constitution was prepared but also because political instability made it opportune for the military to intervene and assume a leading role. On the other hand, India stitched a democratic constitution early on after her inception, because of which democratic elections are held every five years (Heitzman, 1996). It was expected that if watercourse states had dissimilar regimes, it would contribute to more conflictive outcomes. This means this variable could have complemented high power asymmetry with respect to aspect 3 and 4.

Another factor to consider is the level of water scarcity of Pakistan and India. According to the baseline water stress indicator, Pakistan has a combined score of 7.89. As both watercourses are high water-stressed, it was expected that the outcome would be conflictive in nature. Just like dissimilarity in regime types, this variable could complement the effect of high power asymmetry and counter the effect of high economic partnership on 3 and 4.

The political tensions between Pakistan and India are accounted for. Since their independence, Pakistan and India have had a troubled relationship, marked by mutual distrust and animosity. There are four militarized interstate disputes documented between Pakistan and India, with the last one in 1999. It was expected that the more politically tense the watercourse states were, the less cooperative the outcome of the

transboundary water dispute. The political tensions between Pakistan and India mainly hinge on several factors such as unsettled territorial issues, political incompatibility, and positions on national identity. As such, it has been regarded by scholars as an enduring and persistent rivalry, such that hostile interactions and conflicting positions are sustained (Paul, 2006).

As a result of these political tensions, Pakistan and India do not have very strong diplomatic engagement and this should also be considered in analysis. It has consequences for aspects 3 and 4 as per expectations but does not have consequences for aspect 1 and 2.

Altogether, other influencing variables cannot explain why a treaty was formed and why that treaty is equitable and reasonable to a great extent. Those aspects, instead, may be better explained by the interplay of high economic partnership and power asymmetry.

4.4.5 Summary

To conclude, the case of the transboundary water conflict over the Indus was selected because in 1983 economic partnership and power asymmetry were both low. Between 1955 and 2008, power asymmetry and economic partnership varied considerably. In the years prior to the signing of the treaty, power asymmetry and economic partnership were both high. High power asymmetry did not seem to have consequences for formation of treaty nor the extent to which the degree of equitable and reasonable, probably because it was countered by the effect of high economic partnership. In the years after the signing of the treaty, power asymmetry and economic partnership seesawed between high and low. High economic partnership did not have consequences for the respectability of the treaty, probably because it was countered by high power asymmetry, especially during the years of the dispute concerning Baglihar dam. High power asymmetry had consequences for the intensity of the conflict and its effect was also amplified by the fact that both Pakistan and India were highly water-stressed, dissimilar in regime types, had significant political tensions and poor diplomatic engagement.

4.4 Discussion of Results

This research looked at conflicts over four different transboundary waters. The cases that were selected that involved dyadic relationships with variant degrees of power asymmetry and economic partnership. Curiously, some cases switched from one quadrant to another over time.

The results produced some interesting insights into the outcomes of transboundary water conflicts.

A treaty was formed in three cases that power asymmetry was high. However, a treaty was also formed in the one case that power asymmetry was low, probably because other influencing factors such as high diplomatic engagement, reduced political tension, at least one riparian being lower water-stressed, and similarity in regime types had a role to play. This would suggest that a treaty can be formed, regardless if power asymmetry is high or low and particularly if other influencing factors contribute to cooperative outcomes.

Power asymmetry did not have a role to play in the extent to which a treaty was equitable and reasonable. In two cases, the treaty was equitable and reasonable to a moderate extent whereas in the other two cases, it was equitable and reasonable to a great extent. There was no correlation with whether the power asymmetry was high or low. However, in two cases when economic partnership was high, it can be seen that the effect of economic partnership countered the effect of high power asymmetry and ensured that the treaty was not just equitable and reasonable to a small extent.

In support of my expectations, results reveal a negative relationship between power asymmetry and whether a treaty is respected. In three cases of high power asymmetry, the treaty was not respected. This effect was compounded when the level of water scarcity in both watercourse states was high and the political tensions were also high. It did not appear that economic partnership, when high, could override the effect of high power asymmetry on the treaty's respectability. In the one case that power asymmetry was low, the treaty was respected. In that particular case, strong diplomatic engagement and little political tensions had a role to play.

Also in support of my expectations, results suggest power asymmetry is positively related to intensity of conflict. In three cases of high power asymmetry, the conflict was of strong intensity. In one case where power asymmetry was low, the intensity of the conflict was mild and high economic partnership could not counter the effect of power asymmetry.

Results illustrate a mixed story about the impact of economic partnership on the outcomes to transboundary waters.

It appears that economic partnership has no role to play in the formation of a treaty. In three cases when economic partnership was high, a treaty was formed. It even countered the effect of high power asymmetry in two of these cases. However, in the one case that economic partnership was low, a treaty was still formed. This testifies that even in the most intense transboundary water disputes, even when there is no economic partnership, there is hope for treaty cooperation. Economic partnership also did not play a leading role in the extent to which a treaty was equitable and reasonable. There was one case in which the treaty was equitable and reasonable to a great extent, despite low economic partnership. It could be that in that case, high diplomatic engagement and similarity of regimes may have influenced the outcome more. It is also observable that in the other cases, higher economic partnership mitigated the effect of high power asymmetry and ensured that the treaty was at least equitable and reasonable to moderate extent.

Results would reveal a positive effect of economic partnership on the respectability of a treaty. In one case where there was low economic partnership, the treaty was not respected and in another case where there was high economic partnership, the treaty was respected. In the other two cases where treaty was not respected, the effect of high power asymmetry probably mitigated the effect of high economic partnership. It was also probably countered by the role of other influencing factors like dissimilarity in regime trends and relatively high level of water scarcity.

Results may paint that economic partnership has a negative effect on the intensity of conflict. This is supported by the case in which high economic partnership was a predictor of a conflict of mild intensity and the case in which low economic partnership was a predictor of a conflict of strong intensity. Noteworthy is that in the case where conflict was of mild intensity, the effect of high economic partnership was complemented by the effect of low power asymmetry, low political tensions, and low levels of water scarcity. There were two other cases in which, despite high economic partnership, the conflict was of strong intensity. In these cases, the effect of economic partnership was probably mitigated by power asymmetry. This would suggest that power asymmetry has a larger role than economic partnership to play in aspect 4.

In summary, this research would not suggest any relationship between power asymmetry and economic partnership with treaty formation or the extent the treaty is equitable and reasonable. Other influencing factors, like high diplomatic engagement and little political tension, may have greater roles to play in these aspects. However, results did support the expectation that there is a negative relationship between power asymmetry and whether treaty is respected as well as a positive relationship between power asymmetry and intensity of conflict. These relationships were consolidated by similar effects that high-water scarcity in watercourses and dissimilarity in regime types had. The outcome in these aspects may also be influenced by the role of economic partnership, such that economic partnership has a positive effect on the

respectability of a treaty and a negative effect on the intensity of a conflict. However, it may be that power asymmetry can oftentimes override the effect of power asymmetry.

The results of the cases are summarized in Table 19.

Dependent Variable	Independent Variables	Expected Impact on Outcomes to Transboundary Water Conflict	Number of Cases Expectation Confirmed	Number of Cases Expectation Not Confirmed
Aspect 1	Power asymmetry	Negative relationship	1	3
	Economic partnership	Positive relationship	3	1
Aspect 2	Power asymmetry	Negative relationship	1	3
	Economic partnership	Positive Relationship	1	3
Aspect 3	Power asymmetry	Negative relationship	4	0
	Economic partnership	Positive relationship	2	2
Aspect 4	Power asymmetry	Positive relationship	4	0
	Economic partnership	Negative relationship	2	2

Table 19*: Results in Comparison to Expected Findings*.

Chapter 5 - Concluding Remarks

5.1 Discussion

One of the sub-questions of this research was to explore the existing theory and evidence on this relationship of power asymmetry and economic partnership with outcomes to transboundary water conflicts. One of the main theoretical frameworks applied is the trade-conflict model, where it has been suggested that countries that trade with one another, are more inclined to reducing conflict because they have more stakes in the bilateral relationship. This research found that the impact of high economic partnership may be mitigated by other influencing factors, especially if political tensions are high or water-scarcity is high in both watercourse nations. It may also be overridden by high power asymmetry. One could argue that Mexico and the United States were able to work out their differences through negotiation and presidential intervention; perhaps, this is indicative of high degrees of economic partnership playing a role in not escalating the crisis that occurred in 1992 to 2002 any further. There is merit in this argument because soon after, Mexico and the United States were engaged in heavy economic ties. It is also illustrative of the role that other influencing factors like diplomatic engagement have to play in influencing outcomes.

Another theoretical framework relevant to this research is the hydro-hegemony framework. This theory dictated that more powerful riparians can impede cooperative outcomes to transboundary water disputes. Curiously, the results of this research reject the argument that powerful riparians would impede cooperative outcomes by yielding their power and dominating the transboundary watercourse. In a way, the findings of this research are more in line with the counter-hydro-hegemony literature that challenges the notion that only powerful states have more influence on the outcomes of transboundary water disputes. The findings of this research confirm the arguments of Petersen-Perlman et al., (2018) that weaker powers are able to influence agendas and can even withhold agreements. In the analysis of the case studies, it can be seen that less powerful nations were able to resist more dominant powers and undermined the legitimacy of the current order. In the case of the Helmand river, Afghanistan blocked the waters to Iran. In the case of the Rio-Grande, Mexico refused to meet its water debt. In the case of the Indus, Pakistan lodged protests against India's dam projects.

The second sub-question dealt with the empirical findings of our results. It appeared to be that power asymmetry and economic partnership had small roles to play in the formation of a treaty and the extent the treaty is equitable and reasonable. Results displayed that in all cases, treaties were formed. Such findings confirm what was found by Espey & Towfique (2004) that power asymmetries are insignificant for treaty formation. It could be that the effect of power asymmetry and economic partnership is smaller because

their effect is mitigated by other factors. Diplomatic engagement, for example, was decisive in influencing treaty formation and political tension was decisive in influencing whether a treaty is respected.

The results also suggest that power asymmetry plays a greater role in the respectability of a treaty and the intensity of the conflict. The relationship is especially strong if other influencing factors like the level of scarcity and similarity or dissimilarity in regime types also work in the same direction. Although economic partnership may have an effect on these aspects also, in some cases it was seen that economic partnership's effect was overridden by power asymmetry itself.

5.2 Policy Implications

A takeaway of this research is that watercourses need to actively engage and negotiate with one another to find cooperative outcomes to transboundary water conflicts. It is assuring that the negative effects of high power asymmetry can be overridden and the negative effects of low economic partnership can also be overridden by other influencing factors. Strong diplomatic engagement, for example, can lead to some cooperative outcomes in the conflict, particularly when there is high power asymmetry (like in the case of the Indus) or when there is low economic partnership (like in the case of the Helmand). In both these cases, treaties were equitable and reasonable to a great extent. Negotiating can also work in favor of the less powerful state. Contrary to theoretical arguments that more powerful riparian acts only to secure self-serving outcomes, more powerful countries do not necessarily take the role of a bully in transboundary water conflicts. Matters can be resolved (like in the case of the Rio-Grande).

A promising takeaway of this research is that treaties can be formed. However, it takes a great deal of work to ensure that treaties are respected. If riparians do not actively engage to reduce their political tension, the effect of power asymmetries can be harmful to the outcome of the conflict, particularly if riparians are both water-scarce.

The case-study analysis allowed us to see that most transboundary waters were appropriated by treaties that were becoming outdated in the changing times. As Lopez (1996) has suggested, treaties need to be revised to reflect the changing demographics and hydraulics surrounding the transboundary watercourse. Given the increasing pressures on global water supply, there is a need for treaties to be re-examined, especially in light of the principles of equitable and reasonable utilization. After careful introspection of all the treaties in the case studies, it was found that treaty text still lacked some core elements that could make the treaty more equitable and reasonable. In the case of Indus, the treaty could be built upon to include provisions for climate change and environmental impact and damage, for example. More detailed analysis of how treaties can be improved is required.

On the whole, this research highlights the uniqueness of each basin. Each transboundary water conflict requires an agreement that is tailored to the transboundary watercourse and the needs and requirements of the riparian states. As Espey & Towfique (2004) pointed out, economics, politics, and culture all play a role in the resolution of water disputes. Watercourse states need to have a thorough understanding of the needs of the other riparian in order to reach more meaningful outcomes.

5.3 Limitations and Areas for Future Research

Sincere efforts were made to ensure that this study had as few shortcomings as possible. However, it has to be acknowledged that the explanatory power of this research was limited by several factors. This, of course, creates some room for improvement.

Firstly, there are some obvious shortcomings, such as the unavailability of data. Full calculations, particularly involving trade data, could not be performed. The unavailability of data poses limitations to the analysis of the dyadic relationships. Interstate trade data seems to be more readily available of developed states, leading to an inherent bias by not allowing full analysis on developing countries.

Furthermore, the measurement of explanatory variables is somewhat limited. For example, this research only considered hard forms of power. A nation's power is not only measured in the size of its military or economic strength. Future research could assess the impact of power asymmetry with consideration of different forms of power. It could, for example, consider soft power, bargaining power, or silent forms of power.

Moreover, due to time constraints, the study only focused on transboundary water conflicts related to water quantities. Transboundary water conflicts can be related to a host of other issues, like the quality of water and the management of the shared watercourse. Future research could encompass other issue areas of transboundary water conflicts.

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Appendices

I. Basin at Risk Scale

-7	Formal Declaration of War
-6	Extensive War Acts causing deaths, dislocation or high strategic cost
-5	Small scale military acts
-4	Political-military hostile actions
-3	Diplomatic-economic hostile actions
-2	strong verbal expressions displaying hostility in interaction
-1	mild verbal expressions displaying discord in interaction
0	Neutral or non-significant acts for the inter-nation situation
1	Minor official exchanges, talks or policy expressions-mild verbal support
2	Official verbal support of goals, values, or regime
3	Cultural or scientific agreement or support (non-strategic)
4	Non-military economic, technological or industrial agreement
5	Military economic or strategic support
6	International Freshwater Treaty; Major strategic alliance (regional or international)
7	Voluntary unification into one nation

"Product of the Transboundary Freshwater Dispute Database, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University. Additional information about the TFDD can be found at: http://transboundarywaters.science.oregonstate.edu."

II. List of 11 shortlisted cases

Transboundary Water Dispute	*Country A*	*Country B*
Colorado River	Mexico	United States
Lauca River	Bolivia	Chile
Ganges River	Bangladesh	India
Guadiana River	Portugal	Spain
Helmand River	Afghanistan	Iran
Indus River	Pakistan	India
Maritsa River	Bulgaria	Turkey
Nestos River	Bulgaria	Greece
Asi River	Syria	Turkey
Rio-Grande	Mexico	United States
Vijose	Albania	Greece

III. Calculations for Case selection (Power Asymmetry)

Transboundary Water Dispute	*Country A*	*Country B*	*CINC A*	*CINC B*	*CINC Ratio*	*GDP A*	*GDP per capita A*	*GDP B*	*GDP per capita B*	*GDP x GDP per capita Index A*	*GDP x GDP per capita index B*	*Economic Ratio*	*Calculated Power Asymmetry*
Nestos	Bulgaria	Greece	0.00	0.00	1.38	55,574	6,237	87,244	8,866	346,619,806	773,486,655	2.23	2.96
Maritsa	Bulgaria	Turkey	0.00	0.01	2.56	55,574	6,237	205,811	4,230	346,619,806	870,481,446	2.51	5.07
Asi	Turkey	Syria	0.01	0.00	2.66	205,811	4,230	64,766	6,638	870,481,446	429,891,914	2.02	4.69
Lauca	Bolivia	Chile	0.00	0.00	3.82	12,905	2,249	56,216	4,810	29,026,743	270,413,750	9.32	13.13
Vijose	Albania	Greece	0.00	0.00	5.54	6,771	2,387	87,244	8,866	16,159,613	773,486,655	47.87	53.40
Indus	Pakistan	India	0.01	0.05	5.66	122,649	1,303	753,942	1,043	159,766,571	786,208,215	4.92	10.58
Guadiana	Portugal	Spain	0.00	0.01	7.04	81,492	8,255	361,902	9,478	672,688,675	3,430,035,832	5.10	12.14
Helmand	Afghanistan	Iran	0.00	0.01	8.51	11,157	863	199,031	4,459	9,623,445	887,558,504	92.23	100.73
Ganges	Bangladesh	India	0.01	0.05	9.94	52,961	559	753,942	1,043	29,590,925	786,208,215	26.57	36.51
Colorado	Mexico	United States	0.01	0.13	10.90	446,602	6,088	4,433,129	18,920	2,718,722,925	83,875,493,982	30.85	41.75
Rio-Grande	Mexico	United States	0.01	0.13	10.90	446,602	6,088	4,433,129	18,920	2,718,722,925	83,875,493,982	30.85	41.75

Notes: The CINC values represent the capabilities a state possesses. Source of the data is National Materials Capabilities dataset by the COW project. The 5th column from the left 'CINC Ratio' has been calculated as the ratio of the CINC of country A and country B. To represent economic strength of a state, GDP and GDP per capita data is obtained from the Angus Maddison historical dataset. GDP is multiplied with GDP per capita to obtain GDP x GDP per capita index for both countries A and B, an approach suggested by Beckley (2018). Economic Ratio, the 2nd column from the right, is calculated by dividing the GDP x GDP per capita index of the powerful riparian by the GDP x GDP per capita index of the relatively less powerful riparian. Power asymmetry, the last column, is calculated as the sum of the CINC ratio and Economic Ratio. 13.13 corresponds to the median value. Anything below represents lower power asymmetry, anything above represents higher power asymmetry.

IV. Calculations for Case selection (Economic partnership)

Transboundary Water Dispute	*Country A*	*Country B*	*Imports to A from B*	*Exports from A to B*	*Sum of A Imports Exports*	*A Imports from World*	*B Imports from World*	*A Exports to World*	*B Exports to World*	*Sum of A and B world trade*	*Calculated Economic partnership*
Helmand	Afghanistan	Iran	0.03	0.15	0.18	372.56	18103.00	195.41	19184.99	37855.95	0.0000
Indus	Pakistan	India	7.02	28.50	35.52	5326.06	13892.73	3074.84	7857.42	30151.05	0.0012
Vijose	Albania	Greece	8.92	16.76	25.68	241.58	9501.03	217.50	4413.03	14373.14	0.0018
Ganges	Bangladesh	India	37.89	6.92	44.81	2291.08	13892.73	724.46	7857.42	24765.69	0.0018
Lauca	Bolivia	Chile	16.22	6.84	23.05	530.74	2977.60	786.72	3846.56	8141.62	0.0028
Asi	Turkey	Syria	3.33	58.90	62.23	9187.24	4542.39	5732.09	1936.24	21397.96	0.0029
Nestos	Bulgaria	Greece	47.87	59.85	107.72	3082.81	9501.03	1701.42	4413.03	18698.29	0.0058
Maritsa	Bulgaria	Turkey	22.29	110.10	132.39	3082.81	9187.24	1701.42	5732.09	19703.56	0.0067
Guadiana	Portugal	Spain	417.77	186.64	604.41	8110.39	29194.29	4570.31	19726.50	61601.49	0.0098
Colorado	Mexico	United States	5454.00	13033.50	18487.50	9020.00	269918.50	22312.70	200592.60	501843.80	0.0368
Rio-Grande	Mexico	United States	5454.00	13033.50	18487.50	9020.00	269918.50	22312.70	200592.60	501843.80	0.0368

Notes: Economic partnership represents trade relevance between countries A and B. It is calculated by dividing values of the "Sum of A and B world trade" column by values from the "Sum of A Imports and Exports" column. 0.0029 corresponds to the median value. Values below 0.0029 indicate low economic partnership and values above indicate high economic partnership. Sources of data include IMF DOTS database.

V. Cross-comparison of Control Variables

Control Variable	*Case of Transboundary Water Conflict*										
	Indus	*Asi*	*Vijose*	*Lauca*	*Maritsa*	*Nestos*	*Ganges*	*Helmand*	*Guardiana*	*Colorado*	*Rio-Grande*
Level of water-scarcity of riparians	Pakistan: Extremely High Stress India: High Stress	Syria: High Stress Turkey: High Stress	Albania: Low-medium stress Greece: High Stress	Bolivia: low stress, Chile: high stress	Bulgaria: Low-medium Stress Turkey: High stress	Bulgaria: Low-medium stress Greece: High stress	India: High Stress, Bangladesh: Low stress	Afghanistan: Extremely High Iran: Extremely High	Spain: High Stress Portugal: High Stress	USA: Medium-High, Mexico: High Stress	USA: Medium-High, Mexico: High Stress
Political tension between riparians	Tense with 4 MIDs (last one 1999).	Tense with no MID.	Friendly with no MID.	Tense with MID (last one 1800s).	Friendly with MID (last one 1918).	Friendly with MID (last one 1918).	Friendly with no MID.	Tense with no MID.	Friendly with no MID.	Friendly with MID (last one 1847)	Friendly with MID (last one 1847)
Similarity or Dissimilarity in Regime type of riparians in 1983	Dissimilar	Dissimilar	Dissimilar	Similar	Dissimilar	Dissimilar	Dissimilar	Dissimilar	Similar	Dissimilar	Dissimilar
Diplomatic engagement between riparians	Moderate	Moderate	Moderate	Moderate	High	High	High	Moderate	High	High	High

VI. Calculations for power asymmetry between Bulgaria and Greece

Year	*CINC Bulgaria*	*CINC Greece*	*CINC ratio*	*GDP Bulgaria*	*Gdp per capita Bulgaria*	*GDP Greece*	*Gdp per capita Greece*	*Gdp x GDP per capita index Bulgaria*	*GDP x GDP per capita index Greece*	*Economic ratio*	*Calculated Power asymmetry*
1990	0.0028	0.0034	1.20	49779.00	5,597	101452.00	10,015	278,608,167	1,016,082,102	3.65	4.84
1991	0.0025	0.0035	1.41	45597.56	5,198	104597.05	10,204	237,009,875	1,067,278,437	4.50	5.91
1992	0.0023	0.0038	1.63	42268.94	4,882	105329.23	10,201	206,347,774	1,074,458,590	5.21	6.84
1993	0.0020	0.0037	1.83	41634.91	4,932	103643.90	9,982	205,341,367	1,034,581,844	5.04	6.87
1994	0.0023	0.0035	1.55	42384.34	5,074	105716.85	10,136	215,055,656	1,071,547,431	4.98	6.53
1995	0.0019	0.0039	2.06	43613.48	5,283	107936.60	10,321	230,399,629	1,114,056,846	4.84	6.89
1996	0.0022	0.0041	1.86	39513.81	4,842	110482.19	10,543	191,316,819	1,164,789,086	6.09	7.95
1997	0.0021	0.0041	1.94	37301.04	4,624	114501.06	10,902	172,496,630	1,248,336,316	7.24	9.18
1998	0.0020	0.0042	2.12	38793.08	4,866	118329.00	11,248	188,778,966	1,330,956,439	7.05	9.17
1999	0.0018	0.0040	2.19	39685.32	5,028	122405.00	11,617	199,528,646	1,421,974,086	7.13	9.32
2000	0.0019	0.0037	2.02	41828.33	5,350	127880.00	12,111	223,778,267	1,548,737,952	6.92	8.94
2001	0.0019	0.0038	2.06	43543.29	5,627	133600.00	12,626	245,013,749	1,686,805,717	6.88	8.94
2002	0.0017	0.0041	2.40	45676.91	5,962	138834.00	13,093	272,309,474	1,817,722,424	6.68	9.08
2003	0.0016	0.0039	2.45	47641.02	6,278	145837.00	13,725	299,096,936	2,001,556,621	6.69	9.14
2004	0.0015	0.0039	2.57	50785.00	6,755	152462.00	14,319	343,060,054	2,183,103,840	6.36	8.93
2005	0.0015	0.0040	2.69	53934.00	7,239	156883.00	14,705	390,434,912	2,307,035,902	5.91	8.60
2006	0.0015	0.0040	2.67	57331.00	7,763	163943.00	15,339	445,048,101	2,514,704,472	5.65	8.32
2007	0.0015	0.0039	2.68	60886.00	8,315	170501.00	15,925	506,237,455	2,715,281,484	5.36	8.04
2008	0.0013	0.0040	3.03	64539.00	8,886	175445.00	16,362	573,519,058	2,870,603,023	5.01	8.03

Notes: The CINC values represent the capabilities a state possesses. Source of the data is National Materials Capabilities dataset by the COW project. The 5th column from the left 'CINC Ratio' has been calculated as the ratio of the CINC of Bulgaria and Greece. To represent economic strength of a state, GDP and GDP per capita data is obtained from the Maddison dataset. GDP is multiplied with GDP per capita to obtain GDP x GDP per capita index for both countries A and B, an approach suggested by Beckley (2018). Economic Ratio, the 2nd column from the right, is calculated by dividing the GDP x GDP per capita index of the powerful riparian by the GDP x GDP per capita index of the relatively less powerful riparian. Power asymmetry, the last column, is calculated as the sum of the CINC ratio and Economic Ratio. 13.13 corresponds to the median value. Anything below represents lower power asymmetry, anything above represents higher power asymmetry.

VII. Calculations for economic partnership between Bulgaria and Greece

Years	*Trade volume between A and B*			*Trade of A and B with rest of World*					*Calculated Economic partnership*
	(1) Imports to A from B	*(2) Exports from A to B*	*(3) Sum of A Imports Exports*	*(1) As Imports from World*	*(2) B Imports from World*	*(3) A Exports to World*	*(4) B Exports to World*	*(5) Sum of A and Bs world trade*	
1990	58.37	100.47	158.84	3,461.70	19,763.87	2,031.61	8,062.67	33,319.86	0.004767127
1991	95.95	142.94	238.89	2,715.05	21,564.03	2,051.43	8,667.99	34,998.51	0.006825720
1992	245.13	144.44	389.567	4,348.33	22,818.02	2,443.74	9,437.40	39,047.48	0.009976751
1993	330.74	178.52	509.26	4,484.83	20,200.35	2,319.33	9,092.69	36,097.20	0.014108021
1994	496.93	294.43	791.36	4,724.05	20,639.99	3,399.71	8,808.13	37,571.88	0.021062561
1995	248.70	367.70	616.4	5,469.27	25,948.80	5,220.42	10,961.09	47,599.58	0.012949693
1996	196.05	347.64	543.692	4,891.37	28,744.80	4,780.67	11,949.00	50,365.84	0.010794856
1997	191.35	378.31	569.659	3,879.56	27,046.35	4,313.59	11,129.82	46,369.33	0.012285255
1998	296.88	376.61	673.483	5,044.32	28,742.91	4,150.00	10,737.34	48,674.57	0.013836444
1999	305.36	337.84	643.199	5,220.00	28,016.82	3,755.12	10,481.31	47,473.25	0.013548662
2000	318.06	376.63	694.692158	6,507.21	33,397.26	4,823.63	11,694.12	56,422.22	0.012312386
2001	411.45	447.60	859.045465	7,261.52	32,971.13	5,114.11	11,416.01	56,762.77	0.015133961
2002	481.12	525.71	1006.829348	7,989.88	36,447.20	5,750.70	11,446.81	61,634.59	0.016335461
2003	724.95	782.79	1507.734972	10,902.62	48,096.27	7,541.20	14,158.41	80,698.50	0.018683557
2004	830.65	985.59	1816.247294	14,471.89	56,125.54	9,934.00	16,642.98	97,174.41	0.018690592
2005	912.34	981.33	1893.670673	15,488.26	57,728.83	11,440.19	18,436.33	103,093.61	0.018368459
2006	1,218.69	1,204.00	2422.684355	19,443.19	67,296.60	14,774.52	21,533.03	123,047.35	0.019689042
2007	1,858.99	1,688.40	3547.3884	30,087.08	84,852.64	18,575.37	26,557.42	160,072.51	0.022161134
2008	1,959.00	2,234.92	4193.919856	37,032.67	96,616.85	22,494.08	31,280.76	187,424.36	0.022376599

Notes: Economic partnership represents trade relevance between countries A and B. It is calculated by dividing values of the "Sum of A and B world trade" column by values from the "Sum of A Imports and Exports" column. Values below 0.0029 indicate low economic partnership and values above indicate high economic partnership. Sources of data include IMF DOTS database.

VIII. Calculations for power asymmetry between Afghanistan and Iran

Year	*CINC Afghanistan*	*CINC Iran*	*CINC ratio*	*GDP Afghanistan*	*GDP per capita Afghanistan*	*GDP Iran*	*GDP per capita Iran*	*GDP x GDP per capita Index Afghanistan*	*GDP x GDP per capita index Iran*	*Economic Ratio*	*Calculated Power asymmetry*
1968	0.00	0.01	4.06	8508.00	719	96759.00	3,550	6,121,277	343,520,254	56.12	60.17
1969	0.00	0.01	4.28	8645.00	713	109304.00	3,897	6,164,945	425,988,310	69.10	73.38
1970	0.00	0.01	4.43	8819.00	709	120865.00	4,189	6,256,707	506,281,800	80.92	85.35
1971	0.00	0.01	4.44	8398.00	659	135829.00	4,577	5,531,749	621,658,971	112.38	116.82
1972	0.00	0.01	4.38	8240.00	630	157909.00	5,174	5,191,162	816,952,532	157.37	161.76
1973	0.00	0.01	4.77	9181.00	684	171466.00	5,462	6,280,372	936,552,131	149.12	153.89
1974	0.00	0.01	6.45	9680.00	703	186655.00	5,778	6,803,796	1,078,437,627	158.51	164.95
1975	0.00	0.01	5.92	10184.00	721	195684.00	5,883	7,338,927	1,151,113,496	156.85	162.77
1976	0.00	0.01	5.89	10694.00	737	229241.00	6,691	7,886,265	1,533,932,165	194.51	200.40
1977	0.00	0.01	5.66	9959.00	669	226315.00	6,402	6,665,269	1,448,885,503	217.38	223.04
1978	0.00	0.01	6.48	10752.00	704	199481.00	5,464	7,571,116	1,089,907,543	143.96	150.44
1979	0.00	0.01	6.56	10715.00	689	182267.00	4,817	7,380,695	877,973,946	118.96	125.51
1980	0.00	0.01	6.53	10427.00	690	156643.00	3,974	7,194,366	622,423,427	86.52	93.05
1981	0.00	0.01	6.47	10547.00	764	151918.00	3,693	8,053,242	560,970,816	69.66	76.13
1982	0.00	0.01	8.03	10726.00	833	175826.00	4,100	8,930,967	720,873,493	80.72	88.74
1983	0.00	0.01	8.51	11157.00	863	199031.00	4,459	9,623,445	887,558,504	92.23	100.73
1984	0.00	0.01	10.42	11336.00	847	202379.00	4,361	9,598,702	882,528,001	91.94	102.36
1985	0.00	0.01	9.43	11299.00	819	207245.00	4,299	9,253,321	890,917,716	96.28	105.71
1986	0.00	0.01	6.91	12161.00	878	187780.00	3,754	10,673,272	704,845,472	66.04	72.94
1987	0.00	0.01	7.32	10064.00	726	184939.00	3,584	7,303,462	662,746,427	90.74	98.06
1988	0.00	0.01	8.72	9228.00	656	174532.00	3,293	6,049,523	574,773,069	95.01	103.73
1989	0.00	0.01	8.74	9284.00	640	181227.00	3,327	5,939,460	602,856,634	101.50	110.24
1990	0.00	0.01	7.75	8861.00	604	199819.00	3,526	5,352,478	704,579,679	131.64	139.38
1991	0.00	0.01	8.04	8932.00	601	220999.00	3,759	5,364,499	830,810,801	154.87	162.92
1992	0.00	0.01	7.78	9021.00	553	234472.00	3,908	4,987,059	916,296,217	183.73	191.52
1993	0.00	0.01	7.73	8741.00	476	239395.00	3,980	4,158,873	952,769,425	229.09	236.83

1994	0.00	0.01	7.92	8479.00	426	244901.00	4,069	3,612,614	996,603,322	275.87	283.79
1995	0.00	0.01	10.39	10700.00	512	252983.00	4,162	5,482,849	1,052,967,407	192.05	202.44
1996	0.00	0.01	10.23	11342.00	526	267403.00	4,359	5,966,671	1,165,647,932	195.36	205.59
1997	0.00	0.01	10.48	12023.00	541	280773.00	4,535	6,503,344	1,273,369,882	195.80	206.28
1998	0.00	0.01	10.47	12744.00	556	285827.00	4,580	7,088,153	1,308,972,152	184.67	195.14
1999	0.00	0.01	3.19	13508.00	571	291258.00	4,635	7,716,530	1,350,079,509	174.96	178.15
2000	0.00	0.01	3.14	13508.00	565	306112.00	4,838	7,635,139	1,480,950,467	193.97	197.11
2001	0.00	0.01	10.95	12157.00	507	317438.00	4,979	6,158,691	1,580,648,199	256.65	267.61
2002	0.00	0.01	8.24	15634.00	619	331723.00	5,188	9,673,027	1,720,939,453	177.91	186.15
2003	0.00	0.01	7.78	18088.00	668	255607.00	3,995	12,090,591	1,021,043,924	84.45	92.23
2004	0.00	0.01	8.26	19535.00	685	373743.00	5,810	13,383,620	2,171,492,426	162.25	170.51
2005	0.00	0.01	10.65	22680.00	758	391309.00	6,045	17,186,763	2,365,296,491	137.62	148.27
2006	0.00	0.01	11.47	24540.00	790	414005.00	6,367	19,390,529	2,635,896,299	135.94	147.41
2007	0.00	0.01	9.67	27509.00	863	446297.00	6,824	23,729,912	3,045,696,674	128.35	138.01
2008	0.00	0.01	9.62	28445.00	869	457455.00	6,944	24,714,666	3,176,688,708	128.53	138.16

Notes: The CINC values represent the capabilities a state possesses. Source of the data is National Materials Capabilities dataset by the COW project. The 5th column from the left 'CINC Ratio' has been calculated as the ratio of the CINC of Iran and Afghanistan. To represent economic strength of a state, GDP and GDP per capita data is obtained from the Angus Maddison historical dataset. GDP is multiplied with GDP per capita to obtain GDP x GDP per capita index for both countries A and B, an approach suggested by Beckley (2018). Economic Ratio, the 2nd column from the right, is calculated by dividing the GDP x GDP per capita index of the powerful riparian by the GDP x GDP per capita index of the relatively less powerful riparian. Power asymmetry, the last column, is calculated as the sum of the CINC ratio and Economic Ratio. 13.13 corresponds to the median value. Anything below represents lower power asymmetry, anything above represents higher power asymmetry.

IX. Calculations for economic partnership between Afghanistan and Iran

Years	Trade volume between A and B			Trade of A and B with rest of World					Calculated Economic partnership
	(1) Imports to A from B	(2) Exports from A to B	(3) Sum of A Imports Exports	(1) A Imports from World	(2) B Imports from World	(3) A Exports to World	(4) B Exports to World	(5) Sum of A and Bs world trade	
1968	n/a	n/a	n/a	124.43	1,393.00	71.82	1,869.60	3458.85	n/a
1969	3.57	1	4.57	123.52	1,384.40	81.88	n/a	n/a	n/a
1970	2.79	0.58	3.37	109.53	n/a	84.59	n/a	n/a	n/a
1971	5.27	0.33	5.6	145.39	n/a	99.9	n/a	n/a	n/a
1972	4.75	0.78	5.53	129.79	n/a	124.42	n/a	n/a	n/a
1973	13.13	2.11	15.24	242.53	3,379.00	159.02	n/a	n/a	n/a
1974	14.26	5.22	19.48	338.4	5,425.80	230.55	n/a	n/a	n/a
1975	19.09	5.07	24.16	314.12	10,345.90	224.86	n/a	n/a	n/a
1976	66.8	5.21	72.01	458.65	12,886.70	297.15	n/a	n/a	n/a
1977	n/a	2.49	n/a	450.52	14,641.60	313.14	n/a	n/a	n/a
1978	n/a	n/a	n/a	551.22	10,372.00	269.16	n/a	n/a	n/a
1979	0.48	n/a	n/a	494.75	9,695.00	435.02	n/a	n/a	n/a
1980	0.05	0.43	0.48	541.52	10,849.00	670.47	n/a	n/a	n/a
1981	0.04	0.17	0.21	321.96	13,515.00	638.12	9,936.78	24,411.86	0.0000086
1982	0.03	0.17	0.2	372.56	11,845.00	200.9	15,686.55	28,105.01	0.0000071
1983	0.03	0.15	0.18	392.9	18,103.00	195.41	19,184.99	37,876.30	0.0000048
1984	0.03	0.14	0.17	596.98	14,494.00	175.98	15,182.20	30,449.16	0.0000056
1985	0.02	0.02	0.04	681.23	11,408.00	203.07	13,725.08	26,017.38	0.0000015
1986	0.02	0.13	0.15	524.5	9,355.00	166.31	8,043.97	18,089.78	0.0000083
1987	n/a	0.17	n/a	425.81	9,369.00	336.18	11,040.03	21,171.02	n/a
1988	0.02	n/a	n/a	479.28	8,171.00	175.08	10,709.00	19,534.36	n/a
1989	n/a	n/a	n/a	443.11	12,807.00	174.74	13,081.00	26,505.85	n/a
1990	n/a	n/a	n/a	398.24	18,721.60	131.09	19,305.00	38,555.93	n/a
1991	n/a	n/a	n/a	464.76	29,677.50	189.03	18,661.00	48,992.29	n/a
1992	n/a	n/a	n/a	390.84	29,870.00	181.32	19,868.00	50,310.16	n/a

1993	n/a	n/a	n/a	387.41	20,037.00	688.11	18,080.00	39,192.52	n/a
1994	n/a	n/a	n/a	660.8	11,795.00	104.6	19,434.00	31,994.40	n/a
1995	n/a	n/a	n/a	604.31	12,313.00	165.99	18,360.00	31,443.30	n/a
1996	n/a	n/a	n/a	462.49	15,117.00	128.05	22,391.00	38,098.54	n/a
1997	n/a	n/a	n/a	490.31	15,907.80	144.65	18,380.80	34,923.56	n/a
1998	n/a	n/a	n/a	520.59	14,323.00	151.18	13,118.00	28,112.77	n/a
1999	n/a	n/a	n/a	517.69	12,683.00	122.75	21,030.00	34,353.44	n/a
2000	n/a	n/a	n/a	709.44	14,373.70	148.6	24,816.06	40,047.80	n/a
2001	n/a	n/a	n/a	976.41	16,618.81	100.56	21,499.73	39,195.50	n/a
2002	n/a	n/a	n/a	1147.43	20,599.93	98.49	19,311.60	41,157.45	n/a
2003	n/a	n/a	n/a	1725.76	26,199.30	149.08	28,469.44	56,543.58	n/a
2004	n/a	n/a	n/a	2051.08	33,154.79	145.75	36,732.81	72,084.43	n/a
2005	n/a	n/a	n/a	2176.36	39,144.31	183.59	47,971.42	89,475.68	n/a
2006	n/a	n/a	n/a	3050.19	40,957.88	142.33	67,320.15	111,470.55	n/a
2007	n/a	n/a	n/a	n/a	45,456.38	204.82	78,171.34	n/a	n/a
2008	175.29	18.2	193.49	n/a	58,722.48	556.32	105,206.45	164485.2544	n/a

Notes: Economic partnership represents trade relevance between country A and B. It is calculated by dividing values of the “Sum of A and B world trade” column by values from the “Sum of A Imports and Exports” column. Values below 0.0029 indicate low economic partnership and values above indicate high economic partnership. Sources of data include IMF DOTS database.

X. Calculations for power asymmetry between Mexico and United States

Year	*CINC Mexico*	*CINC USA*	*CINC ratio*	*GDP Mexico*	*GDP per capita Mexico*	*GDP USA*	*GDP per capita USA*	*GDP x GDP per capita index Mexico*	*GDP x GDP per capita index USA*	*Economic Ratio*	*Power asymmetry*
1939	0.01	0.18	34.46	37,248	1,858	862,995	6,561	69,208,036	5,661,895,717	81.81	116.27
1940	0.01	0.20	36.27	37,767	1,852	929,737	7,010	69,942,936	6,517,120,833	93.18	129.45
1941	0.01	0.24	42.07	40,851	1,949	1,098,921	8,206	79,637,519	9,017,401,514	113.23	155.30
1942	0.01	0.29	53.99	43,754	2,032	1,318,809	9,741	88,910,111	12,846,659,793	144.49	198.48
1943	0.01	0.35	62.42	45,387	2,051	1,581,122	11,518	93,106,430	18,211,639,632	195.60	258.02
1944	0.01	0.35	56.25	49,094	2,159	1,713,572	12,333	106,018,335	21,134,260,125	199.35	255.59
1945	0.01	0.38	59.18	50,623	2,134	1,644,761	11,709	108,020,913	19,257,921,678	178.28	237.46
1946	0.01	0.36	51.12	53,967	2,211	1,305,357	9,197	119,298,615	12,004,774,582	100.63	151.75
1947	0.01	0.31	47.50	55,807	2,221	1,285,697	8,886	123,971,867	11,424,694,141	92.16	139.66
1948	0.01	0.29	44.58	58,114	2,248	1,334,331	9,065	130,637,359	12,095,124,210	92.59	137.16
1949	0.01	0.27	42.28	61,303	2,304	1,339,505	8,944	141,264,437	11,980,186,543	84.81	127.09
1950	0.01	0.28	42.47	67,368	2,365	1,455,916	9,561	159,326,619	13,920,519,331	87.37	129.84
1951	0.01	0.32	47.00	72,578	2,477	1,566,784	10,116	179,803,517	15,849,972,899	88.15	135.15
1952	0.01	0.31	47.34	75,481	2,504	1,625,245	10,316	189,003,498	16,765,287,300	88.70	136.05
1953	0.01	0.31	47.55	75,688	2,439	1,699,970	10,613	184,609,643	18,041,115,223	97.73	145.28
1954	0.01	0.28	42.91	83,258	2,605	1,688,804	10,359	216,898,841	17,494,503,640	80.66	123.57
1955	0.01	0.27	42.45	90,307	2,742	1,808,126	10,897	247,657,927	19,702,886,332	79.56	122.00
1956	0.01	0.26	41.22	96,502	2,843	1,843,455	10,914	274,337,692	20,119,988,023	73.34	114.56
1957	0.01	0.26	39.09	103,812	2,965	1,878,063	10,920	307,775,601	20,508,423,062	66.63	105.73
1958	0.01	0.23	33.85	109,333	3,025	1,859,088	10,631	330,743,173	19,763,087,063	59.75	93.60
1959	0.01	0.23	32.13	112,599	3,016	1,997,061	11,230	339,647,892	22,427,333,058	66.03	98.16
1960	0.01	0.22	30.20	121,723	3,155	2,046,727	11,328	384,060,728	23,186,296,708	60.37	90.58
1961	0.01	0.21	28.12	126,365	3,172	2,094,396	11,402	400,843,986	23,879,746,993	59.57	87.70
1962	0.01	0.21	27.53	132,039	3,211	2,220,732	11,905	423,970,523	26,437,780,055	62.36	89.89
1963	0.01	0.21	27.12	141,839	3,343	2,316,765	12,242	474,105,122	28,362,625,977	59.82	86.94
1964	0.01	0.20	25.47	157,312	3,594	2,450,915	12,773	565,329,654	31,304,474,656	55.37	80.85
1965	0.01	0.20	24.74	167,116	3,702	2,607,294	13,419	618,659,134	34,986,500,478	56.55	81.29

1966	0.01	0.21	24.91	177,427	3,813	2,778,086	14,134	676,446,215	39,264,152,541	58.04	82.95
1967	0.01	0.21	23.95	188,258	3,922	2,847,549	14,330	738,424,040	40,805,463,723	55.26	79.21
1968	0.01	0.20	23.65	201,669	4,073	2,983,081	14,863	821,311,968	44,337,350,416	53.98	77.63
1969	0.01	0.20	24.02	213,924	4,185	3,076,517	15,179	895,375,599	46,699,708,656	52.16	76.17
1970	0.01	0.18	18.09	227,970	4,320	3,081,900	15,030	984,749,698	46,320,482,658	47.04	65.13
1971	0.01	0.17	17.08	237,480	4,365	3,178,106	15,304	1,036,573,474	48,638,683,948	46.92	64.00
1972	0.01	0.16	16.53	257,636	4,602	3,346,554	15,944	1,185,623,748	53,357,013,354	45.00	61.53
1973	0.01	0.16	16.04	279,302	4,853	3,536,622	16,689	1,355,338,126	59,023,897,857	43.55	59.59
1974	0.01	0.15	15.26	296,370	5,013	3,526,724	16,491	1,485,638,687	58,160,156,799	39.15	54.41
1975	0.01	0.14	14.13	312,998	5,158	3,516,825	16,284	1,614,550,172	57,266,686,487	35.47	49.60
1976	0.01	0.14	13.67	326,267	5,244	3,701,163	16,975	1,710,868,159	62,827,562,330	36.72	50.40
1977	0.01	0.14	13.13	337,499	5,293	3,868,829	17,567	1,786,474,559	67,961,795,283	38.04	51.17
1978	0.01	0.14	12.15	365,340	5,595	4,089,548	18,373	2,044,127,298	75,137,151,400	36.76	48.91
1979	0.01	0.14	11.61	398,788	5,968	4,228,647	18,789	2,379,794,680	79,453,713,317	33.39	45.00
1980	0.01	0.13	10.89	431,983	6,320	4,230,558	18,577	2,730,302,785	78,592,627,118	28.79	39.67
1981	0.01	0.14	11.06	469,972	6,717	4,336,141	18,856	3,156,724,415	81,760,344,550	25.90	36.96
1982	0.01	0.13	10.27	466,649	6,514	4,254,870	18,325	3,039,622,297	77,971,004,454	25.65	35.92
1983	0.01	0.13	10.90	446,602	6,088	4,433,129	18,920	2,718,722,925	83,875,493,982	30.85	41.75
1984	0.01	0.14	11.20	462,678	6,162	4,755,958	20,123	2,851,232,528	95,702,559,584	33.57	44.77
1985	0.01	0.14	11.23	475,505	6,194	4,940,383	20,717	2,945,332,530	102,351,510,157	34.75	45.98
1986	0.01	0.14	11.30	457,655	5,834	5,110,480	21,236	2,670,086,827	108,526,590,039	40.65	51.95
1987	0.01	0.13	11.19	466,148	5,818	5,290,129	21,788	2,712,021,961	115,259,710,149	42.50	53.69
1988	0.01	0.13	11.35	471,953	5,771	5,512,845	22,499	2,723,583,861	124,035,934,239	45.54	56.89
1989	0.01	0.15	12.09	491,767	5,899	5,703,521	23,059	2,900,851,152	131,519,077,422	45.34	57.43
1990	0.01	0.14	11.73	516,692	6,085	5,803,200	23,201	3,144,024,742	134,637,489,452	42.82	54.56
1991	0.01	0.14	11.07	538,508	6,226	5,791,931	22,849	3,352,959,471	132,337,101,082	39.47	50.54
1992	0.01	0.15	11.60	558,049	6,333	5,985,152	23,298	3,534,389,354	139,442,774,592	39.45	51.05
1993	0.01	0.15	12.08	568,934	6,339	6,146,210	23,616	3,606,562,612	145,149,350,705	40.25	52.33
1994	0.01	0.15	11.01	594,054	6,504	6,395,858	24,279	3,863,677,295	155,282,711,992	40.19	51.20
1995	0.01	0.14	10.52	557,419	6,001	6,558,151	24,603	3,345,335,494	161,351,326,343	48.23	58.75
1996	0.01	0.14	10.14	586,144	6,209	6,803,769	25,230	3,639,512,293	171,660,610,996	47.17	57.31
1997	0.01	0.14	9.87	625,759	6,525	7,109,775	26,052	4,083,359,194	185,220,652,114	45.36	55.23

1998	0.01	0.14	9.83	657,263	6,753	7,413,357	26,849	4,438,678,361	199,039,547,602	44.84	54.67
1999	0.01	0.14	9.78	681,982	6,915	7,746,169	27,735	4,716,224,346	214,838,059,525	45.55	55.33
2000	0.01	0.14	10.26	726,934	7,275	8,032,209	28,467	5,288,210,893	228,653,383,635	43.24	53.49
2001	0.01	0.14	10.33	726,676	7,177	8,093,143	28,405	5,215,544,287	229,889,488,509	44.08	54.41
2002	0.02	0.15	9.81	732,256	7,145	8,223,657	28,604	5,232,232,938	235,228,866,869	44.96	54.77
2003	0.02	0.15	9.81	742,508	7,159	8,431,121	29,074	5,315,546,005	245,128,390,049	46.12	55.92
2004	0.02	0.15	9.87	772,208	7,357	8,738,865	29,845	5,681,283,364	260,813,513,003	45.91	55.78
2005	0.02	0.16	10.32	797,691	7,511	9,009,770	30,481	5,991,464,579	274,629,987,019	45.84	56.16
2006	0.01	0.15	10.33	837,576	7,795	9,253,034	31,004	6,528,959,116	286,885,351,945	43.94	54.28
2007	0.02	0.15	9.80	866,576	7,972	9,447,347	31,357	6,908,443,499	296,243,910,443	42.88	52.68
2008	0.02	0.15	9.72	877,312	7,979	9,485,136	31,178	6,999,895,825	295,724,933,072	42.25	51.96

Notes: The CINC values represent the capabilities a state possesses. Source of the data is National Materials Capabilities dataset by the COW project. The 5th column from the left 'CINC Ratio' has been calculated as the ratio of the CINC of Mexico and The United States. To represent economic strength of a state, GDP and GDP per capita data is obtained from the Angus Maddison historical dataset. GDP is multiplied with GDP per capita to obtain GDP x GDP per capita index for both countries A and B, an approach suggested by Beckley (2018). Economic Ratio, the 2nd column from the right, is calculated by dividing the GDP x GDP per capita index of the powerful riparian by the GDP x GDP per capita index of the relatively less powerful riparian. Power asymmetry, the last column, is calculated as the sum of the CINC ratio and Economic Ratio. 13.13 corresponds to the median value. Anything below represents lower power asymmetry, anything above represents higher power asymmetry.

XI. Calculations for economic partnership between Mexico and United States

Years	Trade volume between A and B			Trade of A and B with rest of World					Calculated Economic partnership
	(1) Imports to A from B	(2) Exports from A to B	(3) Sum of A Imports Exports	(1) A Imports from World	(2) B Imports from World	(3) A Exports to World	(4) B Exports to World	(5) Sum of A and Bs world trade	
1945	n/a	n/a	0.00	n/a	n/a	n/a	n/a	0.00	n/a
1946	n/a	n/a	0.00	n/a	n/a	n/a	n/a	0.00	n/a
1947	n/a	n/a	0.00	n/a	n/a	n/a	n/a	0.00	n/a
1948	n/a	359.60	n/a	n/a	n/a	474.90	12478.00	12952.90	n/a
1949	n/a	368.10	n/a	n/a	n/a	461.00	11920.00	12381.00	n/a
1950	n/a	433.40	n/a	n/a	n/a	498.20	10227.00	10725.20	n/a
1951	n/a	443.90	n/a	n/a	n/a	624.60	14924.00	15548.60	n/a
1952	n/a	466.00	n/a	n/a	n/a	589.80	14953.00	15542.80	n/a
1953	n/a	367.00	n/a	n/a	n/a	494.00	15338.00	15832.00	n/a
1954	n/a	365.20	n/a	n/a	n/a	500.70	14700.00	15200.70	n/a
1955	n/a	462.60	n/a	n/a	n/a	621.30	15419.00	16040.30	n/a
1956	n/a	480.70	n/a	n/a	n/a	659.10	18872.00	19531.10	n/a
1957	n/a	452.20	n/a	n/a	n/a	585.70	20612.00	21197.70	n/a
1958	n/a	439.30	n/a	n/a	n/a	735.50	17843.20	18578.70	n/a
1959	n/a	439.60	n/a	n/a	n/a	749.80	17569.00	18318.80	n/a
1960	856.40	455.30	1311.70	1183.10	16170.70	764.40	20535.00	38653.20	0.03
1961	797.90	502.00	1299.90	1136.20	15738.60	825.60	20959.00	38659.40	0.03
1962	782.50	553.30	1335.80	1139.00	17522.90	930.70	21616.00	41208.60	0.03
1963	850.20	597.50	1447.70	1234.70	18374.90	971.00	23275.00	43855.60	0.03
1964	1023.30	609.50	1632.80	1486.50	20078.50	1054.40	26484.00	49103.40	0.03
1965	1025.20	627.00	1652.20	1553.00	22912.90	1141.50	27374.80	52982.20	0.03
1966	1025.80	649.50	1675.30	1604.10	27730.30	1222.70	30404.40	60961.50	0.03
1967	1102.00	620.80	1722.80	1748.00	28748.30	1142.90	31561.40	63200.60	0.03
1968	1235.60	708.40	1944.00	1959.10	35359.30	1253.00	34564.60	73136.00	0.03
1969	1297.90	807.30	2105.20	2076.80	38400.90	1429.50	37962.00	79869.20	0.03
1970	1433.60	747.90	2181.50	2329.80	42692.50	1312.70	43218.80	89553.80	0.02

1971	1325.90	807.00	2132.90	2252.20	48743.10	1396.20	44142.60	96534.10	0.02
1972	1557.50	1118.30	2675.80	2719.50	59337.00	1694.90	49812.50	113563.90	0.02
1973	2293.30	1318.20	3611.50	3811.70	74288.60	2261.40	71428.70	151790.40	0.02
1974	3783.10	1703.40	5486.50	6057.20	110107.20	2992.82	98597.70	217754.92	0.03
1975	4113.20	1667.60	5780.80	6581.40	105516.00	2916.40	107695.30	222709.10	0.03
1976	3774.40	2110.70	5885.10	6035.70	132224.00	3468.90	115105.30	256833.90	0.02
1977	3493.10	2738.10	6231.20	5485.90	160441.10	4170.60	121347.50	291445.10	0.02
1978	4563.80	4056.90	8620.70	7559.90	186068.20	5953.60	143814.10	343395.80	0.03
1979	7563.10	6251.70	13814.80	12085.90	222398.80	8983.00	182065.40	425533.10	0.03
1980	11979.00	10072.00	22051.00	19455.90	257080.00	15562.20	220912.80	513010.90	0.04
1981	15397.60	10716.00	26113.60	24127.70	273453.20	19380.60	233896.40	550857.90	0.05
1982	9006.40	11128.60	20135.00	15071.70	254928.60	21208.90	212441.30	503650.50	0.04
1983	5454.00	13033.50	18487.50	9020.00	269918.50	22312.70	200592.60	501843.80	0.04
1984	7083.50	14129.70	21213.20	11360.30	341221.10	24382.80	217998.20	594962.40	0.04
1985	9849.80	13341.40	23191.20	14788.40	361678.50	22105.60	213221.60	611794.10	0.04
1986	8331.14	10424.20	18755.34	12659.04	387116.80	16120.76	217426.10	633322.70	0.03
1987	9076.83	13265.12	22341.95	14033.80	424114.90	20535.78	252852.80	711537.27	0.03
1988	14347.17	13453.91	27801.08	21519.89	459784.30	20409.47	319109.00	820822.66	0.03
1989	17109.57	16163.43	33273.00	25076.84	493332.90	23047.19	363546.26	905003.18	0.04
1990	21830.18	18837.10	40667.28	33021.24	517014.20	27167.34	392743.00	969945.79	0.04
1991	40554.47	33952.97	74507.44	54857.38	509316.70	42709.77	421587.60	1028471.45	0.07
1992	48706.50	37468.07	86174.56	68343.30	552607.50	46200.57	447215.00	1114366.37	0.08
1993	51196.38	43116.56	94312.94	71903.97	603000.30	51761.60	465538.70	1192204.57	0.08
1994	62709.50	51943.48	114652.98	87283.81	689362.40	60889.73	512207.07	1349743.01	0.08
1995	59394.04	66475.22	125869.26	79699.69	771083.80	79548.95	583021.00	1513353.44	0.08
1996	74391.90	80672.62	155064.51	98419.09	817846.30	96013.32	622661.80	1634940.51	0.09
1997	90399.76	94530.82	184930.58	120789.01	898712.60	110439.42	687710.70	1817651.73	0.10
1998	102576.75	103306.24	205882.99	137709.16	944693.10	117493.76	680522.20	1880418.22	0.11
1999	115794.05	120392.85	236186.90	156172.24	1048483.00	136391.12	690792.50	2031838.86	0.12
2000	135186.51	147399.95	282586.45	186434.67	1238248.20	165952.53	772146.80	2362782.19	0.12
2001	120592.80	136446.39	257039.19	178485.72	1180171.10	156056.22	731026.00	2245739.04	0.11
2002	112950.13	141897.66	254847.79	178769.86	1202414.80	161047.93	693254.80	2235487.39	0.11

2003	111682.33	144293.36	255975.69	180750.60	1305311.50	164773.71	723792.10	2374627.91	0.11
2004	117476.32	164521.99	281998.30	208590.89	1525472.20	188002.39	816546.20	2738611.68	0.10
2005	125660.17	183562.84	309223.01	235101.84	1732492.60	214230.28	904308.30	3086133.02	0.10
2006	138129.69	211799.38	349929.07	271348.82	1919201.80	249921.83	1036986.20	3477458.65	0.10
2007	147841.21	223133.26	370974.46	298749.08	2017388.20	271871.42	1162694.90	3750703.60	0.10
2008	160414.67	233522.73	393937.40	327049.71	2165986.70	291338.43	1300121.40	4084496.24	0.10

Notes: Economic partnership represents trade relevance between country A and B. It is calculated by dividing values of the “Sum of A and B world trade” column by values from the “Sum of A Imports and Exports” column. Values below 0.0029 indicate low economic partnership and values above indicate high economic partnership. Sources of data include IMF DOTS database.

XII. Calculation of Power Asymmetry between Pakistan and India

Year	*CINC Pakistan*	*CINC India*	*CINC ratio*	*GDP Pakistan*	*GDP per capita Pakistan*	*GDP India*	*GDP per capita India*	*GDP x GDP per capita Index Pakistan*	*GDP x GDP per capita Index India*	*Economic Ratio*	*Calculated Power asymmetry*
1955	0.01	0.05	4.57	28,238	635	265,527	676	17,945,192	179,400,987	10.00	14.57
1956	0.01	0.05	4.62	29,069	638	280,978	701	18,557,013	196,879,393	10.61	15.23
1957	0.01	0.05	4.60	30,339	650	277,924	680	19,718,424	188,855,134	9.58	14.18
1958	0.01	0.05	4.55	30,762	643	299,137	716	19,768,576	214,074,031	10.83	15.37
1959	0.01	0.05	4.56	31,095	633	305,499	717	19,690,795	219,083,660	11.13	15.69
1960	0.01	0.05	4.47	32,621	647	326,910	753	21,119,174	246,244,581	11.66	16.13
1961	0.01	0.05	4.61	34,602	669	336,744	758	23,150,256	255,397,571	11.03	15.65
1962	0.01	0.05	4.67	37,111	699	344,204	758	25,936,138	260,961,219	10.06	14.73
1963	0.01	0.05	4.79	39,439	723	361,442	779	28,527,278	281,552,412	9.87	14.66
1964	0.01	0.05	4.76	42,417	758	389,262	821	32,135,270	319,672,795	9.95	14.70
1965	0.01	0.05	4.68	44,307	771	373,814	771	34,144,052	288,117,333	8.44	13.11
1966	0.01	0.05	4.69	47,919	812	377,207	762	38,888,708	287,444,689	7.39	12.08
1967	0.01	0.05	4.50	49,718	820	408,349	807	40,761,908	329,543,292	8.08	12.58
1968	0.01	0.05	3.88	53,195	854	418,907	809	45,433,440	338,770,414	7.46	11.34
1969	0.01	0.05	3.79	56,642	885	446,872	845	50,153,460	377,494,488	7.53	11.31
1970	0.01	0.05	3.93	62,522	952	469,584	868	59,492,324	407,595,440	6.85	10.78
1971	0.01	0.05	5.33	62,824	931	474,338	856	58,479,403	406,130,935	6.94	12.27
1972	0.01	0.05	6.70	63,323	913	472,766	834	57,839,871	394,193,458	6.82	13.52
1973	0.01	0.05	6.07	67,828	954	494,832	853	64,687,393	422,170,187	6.53	12.59
1974	0.01	0.05	6.37	70,141	962	500,146	843	67,475,515	421,831,402	6.25	12.63
1975	0.01	0.05	5.93	73,043	978	544,683	897	71,411,723	488,763,708	6.84	12.77
1976	0.01	0.05	5.40	76,898	1,006	551,402	889	77,342,433	490,393,815	6.34	11.74
1977	0.01	0.05	5.33	79,951	1,023	593,834	937	81,790,694	556,212,649	6.80	12.13
1978	0.01	0.05	5.61	86,406	1,079	625,695	966	93,265,154	604,157,767	6.48	12.08
1979	0.01	0.05	5.42	89,580	1,087	594,510	895	97,416,017	532,292,380	5.46	10.88
1980	0.01	0.05	5.48	98,907	1,161	637,202	938	114,793,429	597,977,009	5.21	10.69
1981	0.01	0.05	5.24	106,753	1,207	675,882	977	128,891,422	660,139,419	5.12	10.37

1982	0.01	0.05	5.27	114,852	1,256	697,705	985	144,218,573	687,559,699	4.77	10.04
1983	0.01	0.05	5.66	122,649	1,303	753,942	1,043	159,766,571	786,208,215	4.92	10.58
1984	0.01	0.05	5.63	127,518	1,321	783,042	1,060	168,502,964	829,708,760	4.92	10.55
1985	0.01	0.06	5.66	138,632	1,399	814,344	1,079	193,980,175	878,352,517	4.53	10.19
1986	0.01	0.06	5.72	147,421	1,444	848,990	1,101	212,930,976	934,869,027	4.39	10.11
1987	0.01	0.06	5.77	155,994	1,483	886,154	1,125	231,294,468	996,534,152	4.31	10.08
1988	0.01	0.06	5.86	166,031	1,532	978,822	1,216	254,283,331	1,190,177,028	4.68	10.54
1989	0.01	0.06	5.70	174,001	1,560	1,043,912	1,270	271,467,655	1,325,732,681	4.88	10.58
1990	0.01	0.06	5.60	182,014	1,588	1,098,100	1,309	289,067,734	1,437,215,268	4.97	10.57
1991	0.01	0.06	5.45	191,942	1,631	1,112,340	1,303	313,055,759	1,449,297,754	4.63	10.08
1992	0.01	0.06	5.30	205,962	1,715	1,169,301	1,345	353,214,597	1,573,214,315	4.45	9.75
1993	0.01	0.06	5.23	209,584	1,711	1,238,272	1,399	358,504,848	1,732,673,795	4.83	10.06
1994	0.01	0.06	5.18	217,417	1,732	1,328,047	1,474	376,559,205	1,957,119,180	5.20	10.38
1995	0.01	0.06	5.24	228,206	1,773	1,425,623	1,553	404,541,366	2,214,494,382	5.47	10.72
1996	0.01	0.07	5.25	239,266	1,810	1,537,383	1,645	433,063,388	2,528,690,187	5.84	11.09
1997	0.01	0.07	5.09	241,694	1,782	1,611,108	1,693	430,742,982	2,726,941,211	6.33	11.42
1998	0.01	0.07	5.05	247,857	1,782	1,715,943	1,771	441,765,599	3,038,179,090	6.88	11.92
1999	0.01	0.07	5.11	256,929	1,803	1,819,937	1,845	463,181,044	3,357,575,173	7.25	12.36
2000	0.01	0.07	5.18	265,634	1,814	1,899,526	1,892	481,959,778	3,593,379,926	7.46	12.64
2001	0.01	0.07	5.26	270,575	1,799	2,009,448	1,966	486,773,840	3,951,087,721	8.12	13.38
2002	0.01	0.07	5.34	279,284	1,820	2,080,337	2,001	508,238,587	4,162,584,877	8.19	13.53
2003	0.01	0.07	5.32	292,390	1,872	2,257,166	2,134	547,335,687	4,817,757,996	8.80	14.12
2004	0.01	0.07	5.31	314,348	1,974	2,426,453	2,278	620,436,486	5,527,966,055	8.91	14.22
2005	0.01	0.08	5.39	338,553	2,084	2,649,687	2,423	705,384,099	6,420,152,472	9.10	14.50
2006	0.01	0.08	5.39	359,205	2,166	2,909,356	2,617	777,869,274	7,613,785,861	9.79	15.18
2007	0.01	0.08	5.40	379,320	2,240	3,182,835	2,817	849,670,517	8,966,053,176	10.55	15.95
2008	0.01	0.08	5.52	386,906	2,239	3,415,183	2,975	866,297,504	10,159,856,762	11.73	17.25

Notes: 'CINC Ratio' has been calculated as the ratio of the CINC of Pakistan and India. Economic Ratio is calculated by dividing the GDP x GDP per capita index of both countries. Power asymmetry is the sum of the CINC ratio and Economic Ratio, representing both capabilities a state possesses and economic strength. Values below 13.13 indicate low power asymmetry and values above indicate high power asymmetry. Sources of data include National Materials Capabilities dataset and Maddison dataset.

XIII. Calculation of Economic partnership between Pakistan and India

Years	*Imports to A from B*	*Exports from A to B*	*Sum of A Imports Exports*	*A Imports from World*	*B Imports from World*	*A Exports to World*	*B Exports to World*	*Sum of A and Bs world trade*	*Calculated Economic partnership*
1955	18.30	52.80	71.10	n/a	n/a	395.60	1,232.30	n/a	n/a
1956	17.00	36.60	53.60	n/a	n/a	339.60	1,209.90	n/a	n/a
1957	14.20	24.40	38.60	n/a	n/a	335.90	1,303.60	n/a	n/a
1958	15.00	10.00	25.00	n/a	n/a	296.90	1,193.40	n/a	n/a
1959	13.30	10.20	23.50	n/a	n/a	318.10	1,285.20	n/a	n/a
1960	22.00	27.30	49.3	643.70	2,249.40	391.80	1,313.50	3,284.90	0.0150
1961	24.70	23.70	48.40	633.80	2,213.30	393.90	1,382.40	3,241.00	0.0149
1962	22.50	41.60	64.1	728.10	2,311.20	418.50	1,389.40	3,457.80	0.0185
1963	19.50	27.40	46.9	880.40	2,438.80	459.50	1,576.30	3,778.70	0.0124
1964	22.00	33.40	55.40	983.80	2,661.10	488.90	1,691.70	4,133.80	0.0134
1965	20.10	28.80	48.9	1,035.00	2,772.90	523.70	1,651.50	4,331.60	0.0113
1966	0.70	0.10	0.8	899.20	2,731.70	596.00	1,599.40	4,226.90	0.0002
1967	0.20	0.10	0.30	1,098.00	2,672.60	597.10	1,605.40	4,367.70	0.0001
1968	0.30	n/a	n/a	1,048.50	2,507.48	733.20	1,747.50	4,289.18	n/a
1969	n/a	0.02	n/a	1,007.27	2,116.14	673.34	1,828.35	3,796.75	n/a
1970	0.27	0.09	0.36	1,101.94	2,093.31	723.72	2,024.11	3,918.97	0.0001
1971	0.33	0.01	0.34	915.96	2,408.93	665.06	2,108.94	3,989.95	0.0001
1972	0.05	0.31	0.36	666.43	2,235.36	679.17	2,437.72	3,580.96	0.0001
1973	0.03	0.06	0.09	973.61	3,233.58	951.70	2,957.97	5,158.89	0.0000
1974	n/a	n/a	n/a	1,739.91	5,063.86	1,115.59	3,891.34	7,919.36	n/a
1975	0.15	15.10	15.25	2,129.29	6,197.19	1,051.13	4,364.03	9,377.61	0.0016
1976	4.91	0.04	4.95	2,132.65	5,098.09	1,160.56	5,017.90	8,391.30	0.0006
1977	47.93	19.44	67.37	2,451.88	6,663.01	1,173.55	6,024.09	10,288.44	0.0065
1978	33.74	19.51	53.25	3,285.27	7,819.49	1,490.28	6,625.45	12,595.04	0.0042
1979	26.54	36.44	62.98	4,060.73	9,898.31	2,055.78	7,678.44	16,014.82	0.0039
1980	3.85	70.71	74.56	5,349.54	14,821.82	2,619.42	8,440.10	22,790.78	0.0033
1981	2.77	67.40	70.17	5,631.60	14,549.56	2,882.59	6,826.39	23,063.75	0.0030

1982	3.98	50.49	54.47	5,449.98	15,634.83	2,401.63	8,271.36	23,486.44	0.0023
1983	7.02	28.50	35.52	5,326.06	13,892.73	3,074.84	7,857.42	22,293.63	0.0016
1984	12.73	25.25	37.98	5,853.80	15,115.25	2,558.73	8,230.25	23,527.78	0.0016
1985	15.51	37.50	53.01	5,888.53	16,329.00	2,738.42	8,265.21	24,955.95	0.0021
1986	12.78	20.75	33.53	5,367.24	15,051.44	3,383.04	9,135.05	23,801.72	0.0014
1987	11.80	21.39	33.19	5,818.74	16,838.04	4,168.54	10,797.33	26,825.32	0.0012
1988	28.67	50.18	78.85	6,588.44	19,034.72	4,509.33	13,191.87	30,132.49	0.0026
1989	30.47	30.39	60.85	7,107.04	19,297.49	4,660.14	15,835.74	31,064.67	0.0020
1990	45.69	48.96	94.65	7,382.99	23,991.42	5,587.26	17,811.16	36,961.68	0.0026
1991	44.27	47.09	91.36	8,431.48	19,509.43	6,494.45	17,870.18	34,435.36	0.0027
1992	52.24	135.53	187.77	9,375.04	23,196.57	7,268.51	19,229.72	39,840.12	0.0047
1993	67.08	53.05	120.13	9,492.43	21,268.79	6,700.42	20,987.42	37,461.64	0.0032
1994	72.24	45.93	118.16	8,884.52	25,484.48	7,331.64	24,192.53	41,700.63	0.0028
1995	80.60	38.78	119.38	11,460.54	34,486.53	7,991.17	30,534.38	53,938.24	0.0022
1996	211.55	41.43	252.98	12,149.84	36,054.76	9,300.06	32,322.36	57,504.66	0.0044
1997	141.63	33.08	174.71	11,611.89	40,896.43	8,639.70	34,622.08	61,148.01	0.0029
1998	153.93	202.60	356.54	9,308.16	42,162.08	8,439.31	33,665.15	59,909.55	0.0060
1999	134.12	87.05	221.17	10,297.65	47,900.50	8,443.74	35,921.63	66,641.90	0.0033
2000	177.64	57.85	235.49	10,721.95	50,259.70	8,876.49	42,463.55	69,858.13	0.0034
2001	241.06	66.18	307.24	10,165.52	50,129.32	9,211.43	43,182.53	69,506.27	0.0044
2002	162.53	48.85	211.38	11,238.13	58,811.45	9,886.05	50,333.49	79,935.63	0.0026
2003	226.39	83.53	309.92	13,048.55	73,931.35	11,929.02	60,931.35	98,908.92	0.0031
2004	455.41	157.71	613.13	17,757.67	99,815.19	13,287.48	75,045.79	130,860.34	0.0047
2005	577.40	337.39	914.79	25,410.79	139,666.58	16,049.33	97,898.38	181,126.70	0.0051
2006	1,114.99	326.70	1,441.70	29,825.75	176,526.42	16,895.11	120,156.18	223,247.28	0.0065
2007	1,266.23	291.70	1557.92	32,593.94	234,639.50	17,782.03	153,348.71	285,015.47	0.0055
2008	1,691.48	354.64	2046.11	42,326.57	321,398.91	20,207.50	195,055.03	383,932.98	0.0053

Notes: Economic partnership represents trade relevance between country A and B. It is calculated by dividing values of the "Sum of A and B world trade" column by values from the "Sum of A Imports and Exports" column. Values below 0.0029 indicate low economic partnership and values above indicate high economic partnership. Sources of data include IMF DOTS database.