Beyond a dyadic approach:

the effect of balanced triangular relationships on rivalry duration

Bomi Lee

(University of Iowa)

February 28, 2020

Abstract: What affects the duration of international rivalries? Rival relationships tend to be stable but some of them last longer than others. Many scholars have suggested monadic-, dyadic-, and systemic-level variables such as democracy, power ratio, security levels, and world wars to explain rivalry duration and termination but network-level variables rarely have been discussed. In this paper, I focus on international rivalries and alliances as networks, and apply network concepts to models, particularly, triangle terms. Specifically, one rivalry which is embedded in a balanced triangle with one rivalry and two alliances can last longer than that embedded in an imbalanced triangle. In this paper, I test the balanced triangle hypothesis by replicating Bennett's (1998) models of rivalry duration. Analyses of rivalry duration show that rivalries embedded in one or more than one balanced triangle are more likely to last longer than those in imbalanced triangles.

Wars and armed conflicts have waned (Mueller 2005; Holsti 2005; Goldstein 2011) and the number of international rivalries has decreased (Diehl, Goertz, and Gallegos 2019). As Diehl et al. (2019) point out, some rival relationships have moved to more peaceful relationships such as negative peace or warm peace. Despite the decrease of conflicts and rivalry relationships, 60 out of 301 rivalry dyads which experienced severe or lesser rivalries in the past are still ongoing and 66 out of 195 countries have at least one rival relationship in 2015.[1] Moreover, the rivalries not just exist but they are involved in militarized disputes. For instance, among 21 unsettled militarized disputes as of 2010, 17 disputes occurred between either severe or lesser rivalries.[2] Given the fact that some rival relationships disappeared while others are still existing, why do some rivalries last longer?

Most rivalry literature focuses on temporal interdependence of conflictual events in states' dyadic relationships (Maoz and Mor 2002; Klein, Goertz, and Diehl 2006). By focusing on dyadic interactions within each rivalry, rivalry studies provide a better understanding of disputes, but interdependence of rivalries is rarely considered. Indeed, a considerable number of rivalries have been connected to other rivalry or alliance relationships. A prototype of interstate rivalry is the US-USSR rivalry during the Cold War but the relationship between the US and USSR was connected to the Sino-US and Sino-USSR relationships as well. The US's strategic choices were made based on the dynamics between China and the Soviet Union, so Dittmer (1981) and Goldstein and Freeman (1990) examine triangular relationships among the US, USSR, and China. On the other hand, rivalries are closely connected to alliance relationships. It is difficult to explain the dynamics of two Koreas rivalry without influence from the US. The existence of alliance between the US and South Korea has constrained North

---

[1] The Peace data version 2.01 (Goertz et al. 2016) is employed for the percentages.
[2] The Peace data version 2.01 (Goertz et al. 2016) and the Militarized Interstate Dispute Data version 4.3 from the Correlates of War Project are employed to figure out the number.

Korea's behaviors and the enmity and amity relationships still last.

This paper examines the effect of triangular relationships on rivalry duration. In order to capture a triangular relationship in which a rivalry is involved, network analysis is employed. When both rivalries and alliances are presented as a cross-network, there can be four types of triangular relationships: a triangle with three rivalries (RRR); one with two rivalries and one alliance (RRA); one with one rivalry and two alliances (RAA); and one with three alliances (AAA). In network studies, some scholars have found that dynamics of a three-positive-tie triangle are different from the dynamics of a three-negative-tie triangle (Everett and Borgatti 2014; Harrigan and Yap 2017). However, the dynamics of cross-network triangles (two rivalries and one alliance; one rivalry and two alliances) are rarely examined.

By adopting Heider's (1946) balance theory, this paper shows the effects of balanced triangular relationships on rivalry duration. The condition of balanced triangle is added to Bennett's (1998) rivalry duration model and the results partly support the expectation that rivalries embedded in balanced triangles are more likely to last longer. This paper proceeds as follows. I discuss the concepts of rivalry and factors which can affect rivalry duration, and hypothesize triangular relationships based on Heider's (1946) balance theory. I test the hypothesis by adding balanced triangle components to Bennett's (1998) model and discuss the results.

Defining Rivalry

There are various approaches in conceptualizing international rivalry. In the 1990s, Goertz and Diehl (1993; 1995; 2000) suggest the concept of enduring rivalries. For an operational definition, Goertz and Diehl identify that if a pair of states have a competition that involves six

or more militarized disputes (MIDs) over a period of 20 years, then the pair is an enduring rivalry (Goertz and Diehl 1995). Another approach is strategic rivalries (Thompson 2001; Colaresi, Rasler, and Thompson 2007). Thompson (2001) and Colaresi et al. (2007) point out a mutual perception of threat when defining a rivalry. From the different emphases in defining a rivalry, the pool of enduring rivalries and that of strategic rivalries are not identical. Colaresi et al. (2007) argue that there can be non-militarized rivalries or rivalries with less frequent disputes (Colaresi et al. 2007, 51-52).

Some scholars highlight the existence of contentious issues (Bennett 1996; 1998; Mitchell and Thies 2011; Dreyer 2012). For example, Bennett (1996; 1998) points out that two states' disagreement over the resolution of some issues is the key characteristic of a rivalry. In fact, disagreement over some issue areas can be closely related to the initiation of a rivalry. Dreyer (2012) provides an example of Ecuador and Peru related to this. After their disagreement over territorial delineation started, their rival relationship began (Dreyer 2012, 472). Even though scholars provide some empirical results about the effect of resolving contended issues on rivalry termination (Bennett 1996; Dreyer 2012), they rarely focus on these issues to explain rivalry initiation. According to Mitchell and Thies (2011), the contentious issues are rarely incorporated in the operational definition of rivalries (Mitchell and Thies 2011).

The issue-based approach is partially incorporated in the concept of a rivalry in Klein et al. (2006; 2008) and Goertz et al. (2016). First, Klein et al. (2006) suggest four dimensions in rivalry—spatial consistency, duration, competition severity, and linked conflict, and the existence of common issue is considered in the dimension of linked conflict. The main change from enduring rivalry to the rivalry with four dimensions is the duration of rivalries. Based on the dimension of linked conflict (distinction between isolated v. linked conflict), rivalries with shorter duration are included (Klein et al. 2006).

The new rivalry concept and dataset are expanded to the Peace scale data (Klein et al. 2008; Goertz et al. 2016). The five levels of the peace scale are severe rivalry, lesser rivalry, negative peace, warm peace, and security communities, which are coded as 0, 0.25, 0.5, 0.75, and 1 respectively. In the scale, severe and lesser rivalries are categorized as rivalry (negative relationships) and warm peace and security community as positive peace (Goertz et al. 2016, 27). Similar to the enduring rivalries, severe rivalries are specified based on the frequency and severity of militarized disputes. In the scaling process, Klein et al. (2008) use anchor cases, and compare other cases to the anchor ones for classification. For the severe rivalry, the US-USSR rivalry (1946-1989), the Indo-Pakistan rivalry (1947-present), and the Franco-German rivalry during the nineteenth and twentieth centuries are selected as anchor cases. On the other hand, lesser rivalries are differentiated from severe rivalries based on the level of frequency and severity of militarized disputes. The anchor cases of lesser rivalries are the Bulgaria-Greece relationship (1908-1913), the Colombia-Venezuela relationship (1814-1982), and the Russia/USSR-Ottoman Empire/Turkey relationship in the nineteenth and twentieth centuries.

Persistence and Termination of Rivalries

In order to explain the changes in rivalries, systemic-, dyadic-, and monadic-level variables are discussed. First, some scholars point out the effects of political shocks on rivalry (Goertz and Diehl 1995; Diehl and Goertz 2000; Bennett 1996; 1998; Rasler et al. 2013). Goertz and Diehl (1995; 2000) argue that domestic or international political shocks can alter rivalry relationships which are in a punctuated equilibrium. According to their work, political shocks indicate dramatic changes in the environment both at the system and state levels. When it comes to the system level, political shocks can be generated by world wars, changes in territorial sovereignty, and shifts in power distribution. At the state level, a state's independence and civil war can

5

create political shocks (Diehl and Goertz 2000). Goertz and Diehl (1995) argue that political shocks are a necessary but not sufficient condition of rivalry termination.

Rasler et al. (2013) also highlight the impacts of political shocks on rivalry dynamics. Although Rasler et al. use the same term—political shocks—to point out the effects of dramatic changes in the environment, they focus on the events which can affect a rival state's decision-making process. Specifically, they suggest four types of changes as political shocks: shift in perception of threat, change in regime orientation/strategies, change in competitive ability, and domestic resource crises (Rasler et al. 2013, 25). Among the four types of political shocks, change in regime orientation/strategies and domestic resource crises are generated at the state/domestic level and other two—shift in perception of threat and change in competitive ability are at the system or dyad level. Since Rasler et al (2013) emphasize a leader's change in calculations of costs and benefits after political shocks, similar to Goertz and Diehl (1995), political shocks are a necessary condition on rivalry de-escalation (Rasler et al. 2013).

Figure 1. Variables at the Systemic, Dyadic, and Monadic Levels
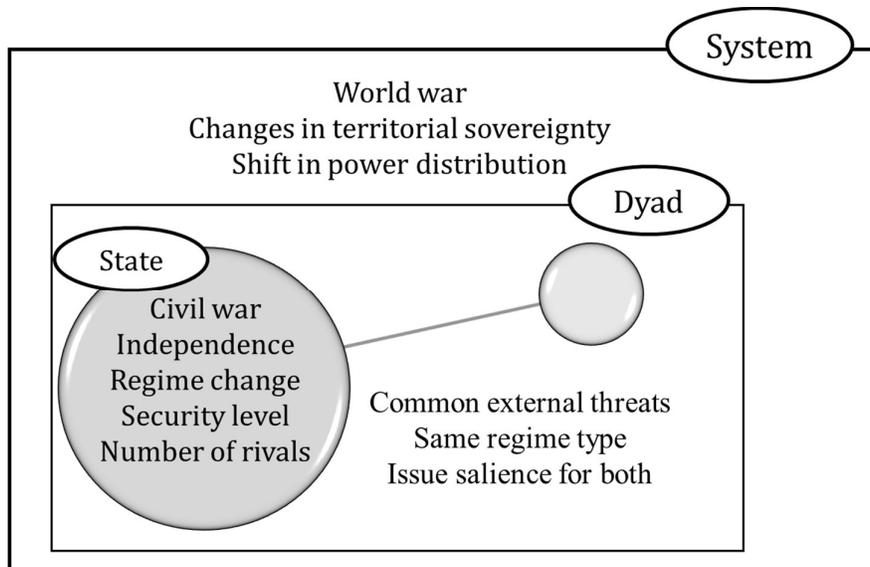
On the other hand, Bennett (1996; 1998) provides an integrated model of rivalry duration including political shocks at the system and state levels, security concerns, democracy and democratization, and issue salience. Particularly, security concerns are measured at the monadic and dyadic levels: one rival state's level of security and its common security threats with its rival state. The first variable, security level, focuses on the ratio between one state's total military capabilities (including itself and allies) and those of its enemies. Thus, it captures the security concerns one state faces at a given time. The second variable, common security threats, is the sum of the capabilities of common rival states which a rivalry faces (Bennett 1998, 1208). Bennett (1998) shows a significant negative impact of changes in polity scores, a positive impact of issue salience on rivalry duration, and mixed findings about the significance of common security threats (Bennett 1998).

In terms of contentious issues, some empirical results show that rivalry termination is closely related to the settlement of contentious issues. Bennett (1996) claims that if the rivals reach compromise over the disputed issues or any party gives up the claim, this leads to the end of the rivalry (Bennett 1996; 1998). Owsiak and Rider (2013) also point out that the settlement of border issues affects the rivalry termination. On the other hand, some other scholars focus on the varying salience levels of issues. Bennett's (1998) findings show that issue salience influences rivalry termination. He argues that leaders' decision to continue or terminate a rivalry is depending on calculation of gains and losses from the issues at stake. If the contentious issues are important, the leaders are more likely to accept the costs to continue their rival relationships (Bennett 1998, 1209). Consistently, Dreyer (2012) shows that rivalries concerning territorial disputes are more likely to be enduring since territorial issues are more salient and intractable.

Non-independence of Rivalries

Although most rivalry studies focus on dyadic interactions of rivalries, a considerable number of rivalries are connected to others, and thus, some countries have multiple rivals. Table 1 shows the frequency of countries with rivals and they are classified by the number of rivals (country-year). For this table, both the Peace data and the strategic rivalry data are transformed into the country-year format, which means each observation is a country with a particular number of rivals in the given year. The population is countries with at least one rival in the given year, thus countries with no rivals are excluded. In Table 1, in the Peace data, 53% of observations in the Peace data and 49% of observations in the strategic rivalry data have more than one rival. This means when we focus on the countries with rival relationships in all time points as a population, half of them have multiple rivals.

Table 1. Number of Countries with Rival Relationships (Country-Year)

	Number of rival countries (percent)					
	1	2	3	4	5 and over	Total
Rivalries (Severe and Lesser rivalries, 1900-2015)	3,483 (47.12)	1,735 (23.47)	826 (11.18)	602 (4.62)	745 (10.08)	7,391
Severe rivalries	2,657 (54.57)	1,185 (24.34)	439 (9.02)	250 (5.13)	338 (6.94)	4,869
Lesser rivalries	3,266 (65.58)	1,081 (21.71)	345 (6.93)	117 (2.35)	171 (3.43)	4,980
Strategic rivalries (1816-2010)	3,712 (51.25)	1,623 (22.41)	756 (10.44)	794 (10.96)	358 (4.94)	7,243
Positional rivalries	2,163 (49.94)	1,056 (24.38)	364 (8.40)	552 (12.75)	196 (4.53)	4,331
Spatial rivalries	3,641 (54.46)	1,537 (22.99)	836 (12.50)	549 (8.21)	123 (1.84)	6,686

Since rivals are pairs of countries with hostile interactions, scholars often take the

dyadic-level approach to understand the dynamics of each rivalry. However, if we don't consider the interconnected rivalries or countries with multiple rivals, they are dealt with separately as shown in Figure 2.

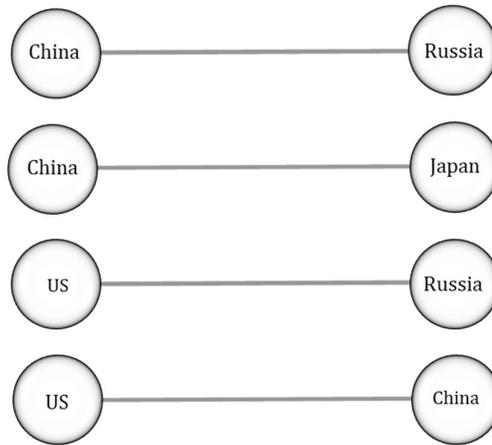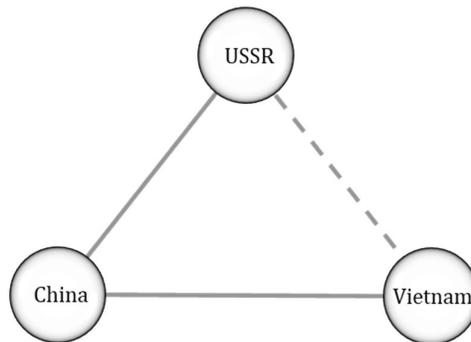Figure 2. Rivalries in a dyadic approach

Figure 3. A triangle with two rivalries

Indeed, this concern is briefly mentioned in Rasler et al. (2013) when they conduct a series of case studies focusing on ten rivalries—Egypt-Israel, Israel-Syria, Palestine-Israel, India-Pakistan, China-US, China-Soviet Union, China-Taiwan, China-Vietnam, Thailand-Vietnam, and North Korea-South Korea. In their rivalry list, Israel and China were involved in several rival relationships. Particularly, Rasler et al. (2013) point out that the China-Soviet Union

rivalry influenced the China-Vietnam rivalry because the Soviet Union supported Vietnam to maintain its rivalry with China. The two rivalries can be described as a triangular relationship in Figure 3. In Figure 3, the China-Soviet Union rivalry and the China-Vietnam rivalry are presented as solid lines and the Soviet Union's support toward Vietnam as a dashed line. According to Rasler et al. (2013), the rivalry level between China and Vietnam was varying depending on the China-Soviet Uniron rivalry and the Soviet Union's support toward Vietnam.

Figure 4 shows two types of triangular relationships in 2012 based on the Peace Scale data (Goertz et al. 2016). The left-side triangle is composed of three rivalries, when rivalry = R, (RRR) and the right-side one is made up of two rivalries and one alliance (RRA), when alliance = A. Drawn from the Heider's (1946) rule, the left-side triangle shows a relationship that the enemy of one's enemy is also one's enemy. On the other hand, the right-side triangle represents a relationship that the enemy of one's enemy is one's friend. In the example below, the US and Japan share a common enemy—China—which can strengthen their friendship. Contrarily, the left-side RRR triangle is changeable, particularly if one rival relationship is weaker than other two rivalries. Likewise, when focusing on triadic relationships, we can assume different dynamics among rivalries which cannot be captured when we just focus on dyadic relationships.
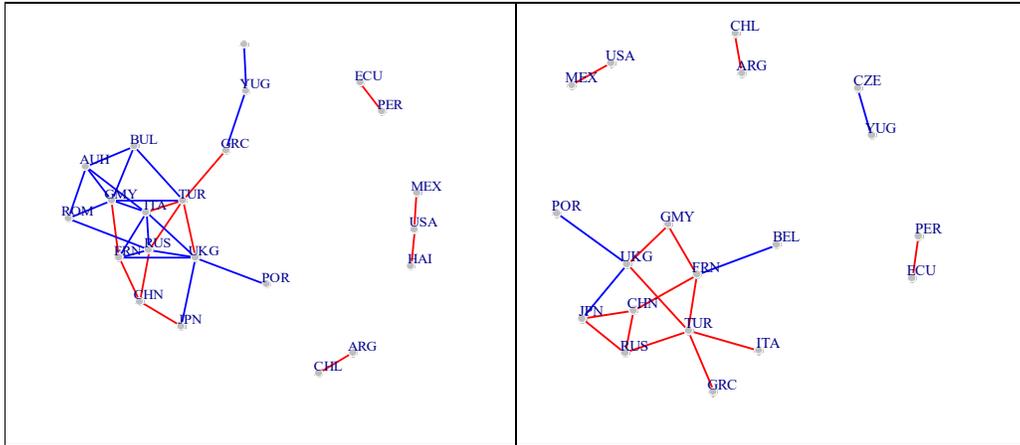
Figure 4. Triangular relationships: *RRR*, *RRA*
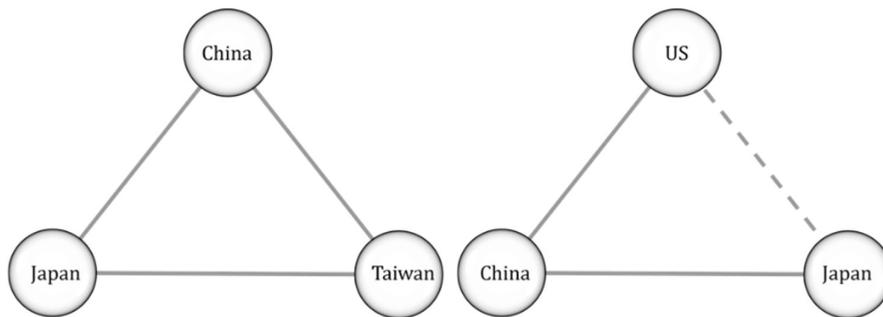
If we look at a bigger picture, those triangular relationships are a part of a network. Figure 5 shows rivalry and alliance cross-networks at four time points from 1905 to 1920. Of course, there are some isolated rivalries such as Argentina-Chile and Ecuador-Peru. However, most countries had more than one relationship, thus, they are connected to multiple countries and some of them are embedded in triangular relationships. In 1905, we can see a RRR triangle—the United Kingdom-Russia-Turkey, a RRA triangle—Russia-China-France, and a RAA triangle—France-Germany-Russia. For the RRR triangle with UK-Russia-Turkey, this triangle did not last long, thus, it is not found in 1910, 1915, and 1920. For the RRA triangle of Russia-China-France, we can find the triangle in 1910 and 1915 as well. Lastly, for the RAA triangle of France-Germany-Russia, this triangle cannot be found in 1910, 1915, and 1920. When considering that a country has multiple relationships regardless of rivalries and alliances and a rivalry is embedded in rivalry and alliance cross-networks, we can expect that the rise and fall of one rival relationship can be influenced by dynamics with other relationships.

Figure 5. Rivalry and Alliance Networks in 1905 (top left), 1910 (top right), 1915 (bottom left), and 1920 (bottom right)
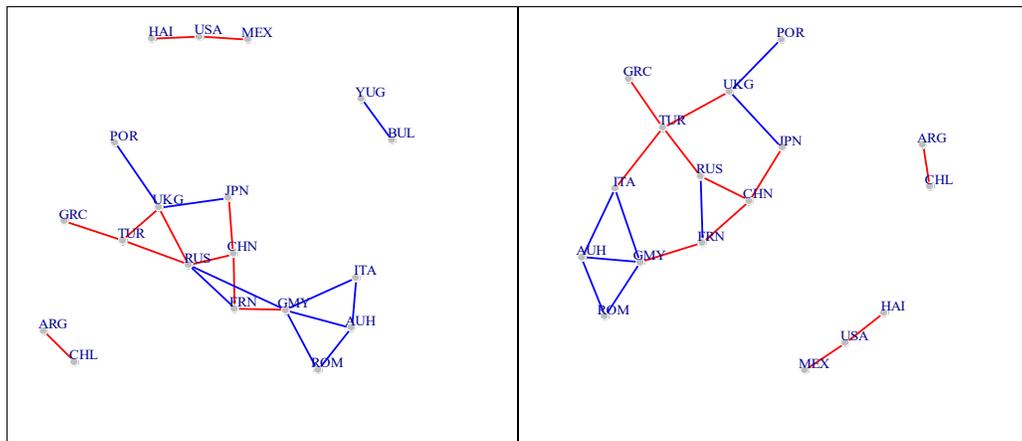
Triangular Relationships

As mentioned above, "The friend of my friend is my friend, and the enemy of my enemy is my friend" is a well-known phrase from Heider's (1946) balance theory. In the field of psychology, Heider (1946) suggests a theory focusing on balanced cognitive units. In this article, he argues that cognitive units or entities have a tendency to attain balance. When there are three entities, a balanced state can be achieved if all relations are positive or if two of three are negative and one is positive (Heider 1946, 110). Also, he argues that because of the tendency toward balance, if the three entities are in an imbalanced state, some of the relations will be changed to attain a balanced state (Heider 1946).

In terms of relationships among states, extended deterrence is basically triadic—Challenger, Defender, and Protégé (Croco and Teo 2005). This triad consists of two negative relationships—Challenger-Protégé, and Challenger-Defender—and one positive relationship—Defender- Protégé. In spite of asymmetric capabilities between challenger and protégé, because of the tie between defender and protégé, the challenger's attack can be deterred (Huth and Russett 1984; Leeds 2003). A similar logic can be found in rivalries.

12

Although Vasquez (1993; 2009) conceptualizes a rivalry as a pair of states with roughly equal power, many rivalries are asymmetric in capabilities, i.e., China-Taiwan, India-Pakistan. Those asymmetric rivalries can maintain when a weaker party of the rivalry is supported from a stronger country, i.e., US for Taiwan. In the field of Asian rivalries, Ganguly and Thompson (2011) and Chan (2013) emphasize China's central position in rivalries (the star-like nature) and the role of US. Since the US supported Taiwan, Philippines, and Japan, their rival relationships with China could maintain.

On the other hand, triangular relationships are examined in network studies. However, most studies have focused on a triangle composed of positive relationships such as friendship (triadic closure). For example, in a friendship network, when two people have one or more shared friend, they are more likely to be friends themselves (from an open triangle made up of two lines to a closed one of three lines). However, the dynamics within a negative relationship network or cross-network of negative and positive relationships are rarely studied. Exceptionally, Harrigan and Yap (2017) focus on the dynamics within a negative relationship among persons. A triangle within a negative tie network indicates that the enemy of my enemy is also my enemy (RRR in rivalry and alliance cross-networks). According to Heider (1946), this negative-tie triangle is imbalanced and tends not to last long. Consistent with Heider's (1946) theory, Harrigan and Yap (2017) find that triadic closure tends to be absent in a negative tie network.
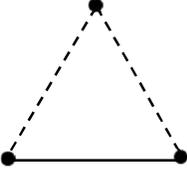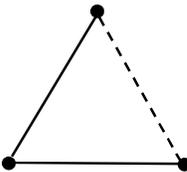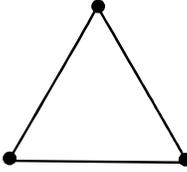
When focusing on a rivalry, one rivalry can be embedded in three types of triangles as shown in Figure 6. Type I consists of one rivalry and two alliances, Type II of two rivalries and one alliance, and Type III of three rivalries.[3] Based on Heider's (1946) balance theory, Type II

---

[3] In rivalry and alliance cross-networks, one more type of triangle can be found, which consists of three alliances (AAA). However, this type of triangle is not considered in this paper because it does not include any rival

triangle is balanced, thus, it is more likely to last long while Type I and III are less likely because they are imbalanced. Harrigan and Yap's (2017) findings are related to Type III triangle. They show that Type III triangle is less likely to be realized in a negative tie network.

Although Type I triangle has two alliance relationships, this type is also imbalanced. This triangle indicates that two rival countries have a mutual alliance partner. According to Dittmer (1981), this triangle is a romantic triangle since for a pivot state, two other countries are competing with each other but the pivot state has favorable relationships with these two countries. Although Dittmer (1981) claims that being a pivot state in Type I is strategically the best, he does not provide explanations whether romantic triangle is maintainable. On the other hand, we can expect that the pivot state or a group of pivot states can be potential mediators for two rival countries.

Figure 6. Types of triangular relationships

No Triangle	I: RAA	II: RRA	III: RRR
Isolated Rivalry	Imbalance	Balance	Imbalance

Note: A solid line indicates a rivalry and a dotted line an alliance.

On the other hand, Type II triangle can be more maintainable since two alliance partners share a common enemy. In Type II, the enemy of my enemy is my friend. When considering the purpose of joining an alliance, if a common enemy is a severe threat to both alliance partners, then this triangular relationship can last longer.

Based on Heider (1946) and Harrigan and Yap (2017), I make a hypothesis focusing

_____

relationships.

on the stability of triangular relationships. In the case that a rivalry is imbedded in any triangular relationships, rivalries in Type II triangle (RRA) is more likely to last longer than rivalries in Type I (RAA) and Type III (RRR).

Hypothesis: If a rivalry is embedded in one or more than one balanced triangle, the rivalry is likely to last longer than one embedded in one or more than one imbalanced triangle.

Research Design

I test the triangular relationship hypothesis by replicating Bennett's (1998) empirical models of rivalry duration. Given the list of rivalries in Bennett (1998), the total number of rivalries is 63 and the temporal domain is from 1816 to 1992. The list of 63 rivalries and each rivalry's start and end dates are generated based on Goertz and Diehl's (1995) operational definition of enduring rivalries using the Militarized Interstate Dispute dataset (version 2.1). For rivalry duration, the mean is 25.38 years and it ranges from 1(US-Peru) to 95 (Russia-China).[4]

The key independent variable is a balanced triangular relationship in rivalry and alliance networks. For the measure of a balanced triangle, I create a cross-network of rivalries and alliances by utilizing the list of rivalries from Bennett (1998) and defense pacts from the Alliance Treaty Obligations and Provisions (ATOP) data (Leeds at al. 2002). To make a distinction between rivalry ties from alliance ties, the cross-network is weighted, thus, the rivalry and alliance ties have different values. Also, the ties in the cross-network is undirected, because if A has a rival country or alliance partner B, then A is country B's rival or alliance

---

[4] Both US-Peru and Russia-China rivalries are censored, which means the rivalries did not end in 1992.

partner as well. From the weighted cross-network of rivalries and alliances, I create a list of triangles for each year.[5] Among all types of triangles including at least one rivalry (RRR, RRA, and RAA), RRA-type triangles are classified as balanced triangles. Since Bennett's (1998) data are aggregated into 5-year periods, I aggregate the balanced triangular relationship into 5-year periods as well. Thus, if one rivalry is embedded in one or more than one balanced triangle at any points within a 5-year period, then the balanced triangle variable is coded 1 and 0 otherwise. 32 rivalries (out of 63) have at least one balanced triangular relationship (50.79%).

For model specification, I employ a parametric hazard model with a Weibull distribution and time-varying covariates in Bennett (1998) as well as a Cox proportional hazards model. Cox model is utilized because it imposes fewer assumptions than parametric hazard models. Thus, Cox model with time-varying covariates is also implemented. I, also, control for several variables which can influence rivalry termination. First, I control for rivalries which are not embedded in any types of triangles. If a rivalry is isolated from other rivalries and alliances for a 5-year period, no triangle variable is coded 1 and 0 otherwise. Second, the variables such as democratic dyad, polity change, democracy growth, security level, common threats, issue salience, and political shocks in Bennett (1998) are included as controls.

Empirical Findings

I test the hypothesis of balanced triangle by adding the balanced triangle variable to Bennett's (1998) model. Given the models in Bennett (1998), a Weibull model is employed. I expect that

---

[5] Since the rivalries are undirected, a triangle is defined to be three nodes with three edges, $\{(i, j), (j, k), (k, i)\}$, where $I \neq j \neq k$, such as $\sum_{\langle ijk \rangle} N_{ij}^t N_{ik}^t N_{jk}^t$.

a rivalry embedded in any balanced triangles lasts longer that in imbalanced triangles but the effects of balanced triangle are not statistically significant from the Weibull specification. Model 1 in Table 2 shows that the coefficient of balanced triangle is negative and the hazard ratio is 0.417, which means rivalries embedded in any balanced triangles have roughly a 58% lower hazard than those in imbalanced triangles but the effects are not significant at $p<.05$ level. Model 3 in Table 2 replicates Model B in Bennett (1998) that include two separate democratic dyads (both vs. one) instead of combining them. Still, the effect of balanced triangle is not significant.

Since a Cox proportional hazards model needs fewer assumptions than a Weibull specification, I also test the hypothesis of balanced triangle by employing a Cox model. Model 2 in Table 2 shows that the coefficient of balanced triangle is negative and significant, and the hazard ratio is 0.257. This means that rivalries embedded in any balanced triangles have a 74% lower hazard than those without balanced triangles. Additionally, no triangle variable is also significant at $p<.1$ level, and the coefficient is negative (hazard ratio: 0.396). This implies that when rivalries which are not located in triangles have a lower hazard than those embedded in any types of triangles. When including separate democratic dyad variables (Model 4), the effect of balanced triangle is significant and the coefficient is negative (hazard ratio: 0.223).

Table 2. Effect of Triangular Relationships on Rivalry Duration

	Model 1: Weibull	Model 2: Cox	Model 3: Weibull	Model 4: Cox
Balanced Triangle	-0.874	-1.359**	-1.079	-1.503**
	(0.705)	(0.574)	(0.734)	(0.686)
No Triangle	-0.510	-0.927*	-0.402	-0.892
	(0.649)	(0.528)	(0.654)	(0.544)
Controls				
One or Both Democratic	1.082*	1.268**		
	(0.640)	(0.561)		
Only One Democratic			0.933	1.122*
			(0.639)	(0.590)
Both Democratic			2.397***	1.915**
			(0.805)	(0.818)
Polity Change	0.400**	0.575***	0.371**	0.570***
	(0.191)	(0.206)	(0.182)	(0.209)
Democracy Growth	-0.002	-0.003	-0.004	-0.004
	(0.005)	(0.005)	(0.006)	(0.005)
Common Threats (5 yr. lag)	0.757	0.938	1.177	0.996
	(1.491)	(1.044)	(1.331)	(1.009)
Security (5 yr. lag)	-0.001	-0.004	0.002	-0.002
	(0.006)	(0.006)	(0.006)	(0.006)
Issue Salience	-0.654**	-0.542*	-0.622**	-0.565*
	(0.272)	(0.299)	(0.269)	(0.310)
Civil War Shock (20 yr. lag)	-0.377	-0.242	-0.543	-0.356
	(0.427)	(0.434)	(0.447)	(0.503)
World War Shock (20 yr. lag)	1.319**	1.375***	1.231**	1.262**
	(0.521)	(0.478)	(0.524)	(0.507)
Territorial Shock (20 yr. lag)	0.540	0.590	0.670	0.645
	(0.452)	(0.464)	(0.451)	(0.455)
Power Shock (20 yr. lag)	-0.045	0.009	0.007	-0.006
	(1.016)	(0.982)	(1.011)	(0.963)
Constant	-6.129***		-6.055***	
	(0.938)		(0.901)	
p	0.365**		0.351**	
	(0.156)		(0.156)	
Observations	318	318	318	318
Log-Likelihood	-36.59	-65.28	-34.74	-64.84

Note: Unexponentiated coefficients reported. Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

When I compare hazard functions with and without the condition of balanced triangle

from Model 1 and 2 (Figure 7), rivalries embedded in balanced triangles have a lower hazard

in general. A similar pattern can be found from Model 3 and 4 (Figure 8).

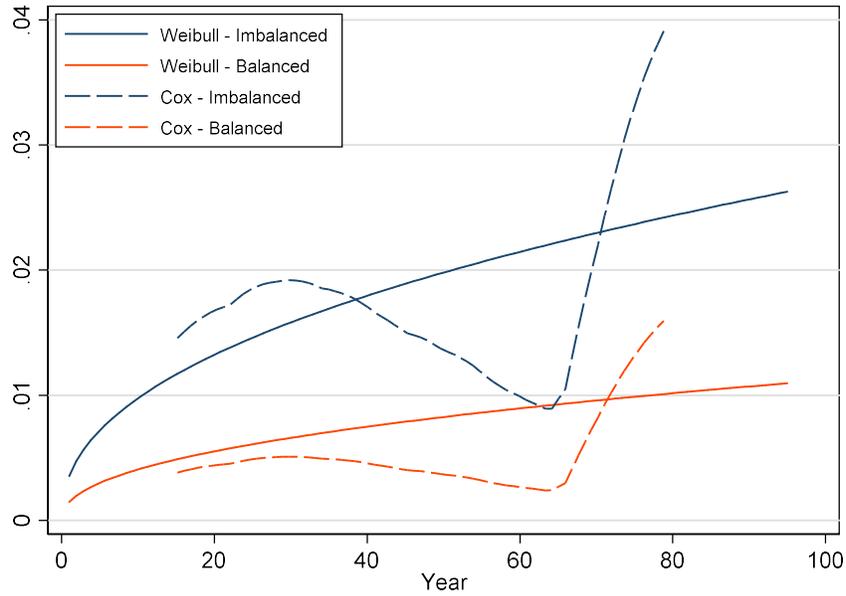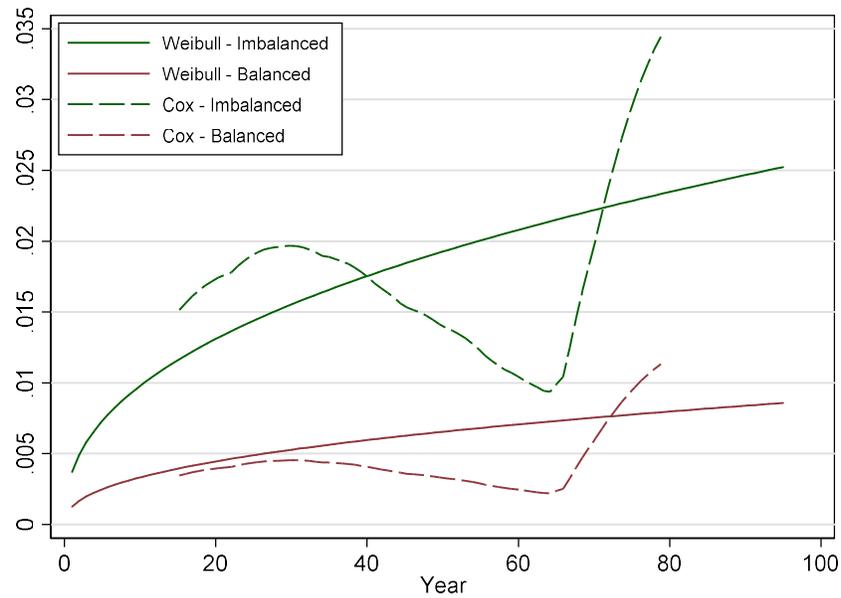Figure 7. Comparison of hazard functions from Model 1 and 2

Figure 8. Comparison of hazard functions from Model 3 and 4

Conclusion

Rivalries are connected to other rival and alliance relationships and how they are connected can affect the longevity of rivalries. If a rivalry is embedded in two alliance relationships, which means rival countries have a common alliance partner, the dynamics among two rivals and their common alliance partner would be different from three countries which have two rival and one alliance relationships. In the latter case, the enemy of one's enemy is one's friend, which means alliance partners have a common enemy, and thus, the two rival and one alliance relationships can be more stable.

This paper examines the effect of being embedded in at least one balanced triangle on rivalry duration by counting triangles a rivalry is involved in. The empirical results show that the characteristics of triangular relationships can affect the duration of rivalries. For the next steps, I would do further research how the characteristics of third country in a balanced or imbalanced triangle affect rivalry duration.

References

Bennett, D. Scott. 1996. "Security, Bargaining, and the End of Interstate Rivalry." *International Studies Quarterly* 40:157-184.

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. 42 (4): 1200-32.

Chan, Steve. 2013. *Enduring Rivalries in the Asia-Pacific*. New York: Cambridge University Press.

Colaresi, Michael, and William R. Thompson. 2002. "Strategic Rivalries, Protracted Conflict, and Crisis Escalation." *Journal of Peace Research* 39(3): 263-287.

Colaresi Michael P., Karen Rasler, and William R. Thompson. 2007. Strategic Rivalries in World Politics: Position, Space, and Conflict Escalation. Cambridge: Cambridge University Press.

Croco, Sarah E., and Tze Kwang Teo. 2005. "Assessing the Dyadic Approach to Interstate Conflict Processes: A.k.a. "Dangerous" Dyad-Years." *Conflict Management and Peace Science* 22:5-18.

Diehl Paul F., and Gary Goertz. 2000. *War and Peace in International Rivalry*. Ann Arbor, MI: University of Michigan Press.

Diehl, Paul F., Gary Goertz, and Yahve Gallegos. "Peace Data: Concepts, Measurement, Patterns, and Research Agenda." *Conflict Management and Peace Science*. Forthcoming.

Dreyer, David R. 2012. "Issue Intractability and the Persistence of International Rivalry." *Conflict Management and Peace Science*. 29(5): 471-489.

Everett, Martin G., and Stephen P. Borgatti. 2014. "Network Containing Negative Ties." *Social Networks*. 38: 111-120.

Ganguly, Sumit, and William R. Thompson 2011. "Conflict Propensities in Asian Rivalries." In Sumit Ganguly, and William R. Thompson (eds.). *Asian Rivalries: Conflict, Escalation, and Limitations on Two-level Games*. Stanford: Stanford University Press.

Goertz, Gary and Paul F. Diehl. 1993. "Enduring Rivalries: Theoretical Constructs and Empirical Patterns." *International Studies Quarterly*. 37: 147-171.

Goertz, Gary and Paul F. Diehl. 1995. "The Initiation and Termination of Enduring Rivalries: The Impact of Political Shocks." *American Journal of Political Science*. 39(1): 30-52.

Goertz, Gary, Paul F. Diehl, and Alexandru Balas. 2016. *The Puzzle of Peace: the Evolution of Peace in the International System*. New York: Oxford University Press.

Goldstein, Joshua S. 2011. *Winning the War on War: the Decline of Armed Conflict Worldwide*. New York, N.Y.: Dutton.

Goldstein, Joshua S., and John R. Freeman. 1990. *Three-Way Street: Strategic Reciprocity in World Politics*. Chicago: University of Chicago Press.

Harrigan, Nicholas, and Janice Yap. 2017. "Avoidance in Negative Ties: Inhibiting Closure, reciprocity, and Homophily." *Social Networks*. 48: 126-141.

Holsti, Kalevi J. 2006. "The Decline of Interstate War: Pondering Systemic Explanations." In Raimo Väyrynen eds. *The Waning of Major War: Theories and Debates*. London: Routledge. Pp.135-159.

Huth, Paul, and Bruce Russett. 1984. "What Makes Deterrence Work? Cases from 1900 to

1980." *World Politics* 36 (496)

Klein, James, Gary Goertz, and Paul F. Diehl. 2008. "The Peace Scale: Conceptualizing and Operationalizing Non-Rivalry and Peace." *Conflict Management and Peace Sciecnce* 25: 67-80.

Leeds, B. Ashley. 2003. "Do Alliances Deter Aggression? The Influence of Military Alliances on the Initiation of Militarized Interstate Disputes." *American Journal of Political Science* 47(3): 427-439.

Leeds, Brett Ashley, Jeffrey M. Ritter, Sara McLaughlin Mitchell, and Andrew G. Long. 2002. Alliance Treaty Obligations and Provisions, 1815-1944. *International Interactions* 28: 237-260.

Levy, Jack S., and William R. Thompson. 2010. *Causes of War*. Wiley-Blackwell.

Maoz, Zeev. 2018. "Democracy and Cooperative Networks." in Jennifer N. Victor et al. ed. *The Oxford Handbook of Political Networks*. Oxford University Press.

Maoz, Zeev, and Ben D. Mor. 2002. Bound by Struggle: the Strategic Evolution of Enduring International Rivalries. Ann Arbor: The University of Michigan Press.

Mitchell, Sara McLaughlin, and Cameron G. Thies. 2011. "Issue Rivalries." Conflict Management and Peace Science 28(3): 230-260.

Mueller, John. 2006. "Accounting for the Waning of Major War." In Raimo Väyrynen eds. *The Waning of Major War: Theories and Debates*. London: Routledge. Pp.64-79.

Rasler, Karen, William R. Thompson, and Sumit Ganguly. 2013. *How Rivalries End*. Philadelphia: University of Pennsylvania Press.

Rider, Toby J., and Andrew P. Owsiak. 2015. "Border Settlement, Commitment Problems, and the Causes of Contiguous Rivalry." *Journal of Peace Research* 52(4): 508-521

Singer, J. David, Stuart Bremer, and John Stuckey. 1972. "Capability Distribution, Uncertainty, and Major Power War, 1820-1965." in Bruce Russett (ed). *Peace, War, and Numbers*. Beverly Hills: Sage, 19-48.

Thompson, William R. 2001. "Identifying Rivals and Rivalries in World Politics." *International Studies Quarterly*. 45: 557-586.

Vasquez, John A. 1993. *The War Puzzle*. New York: Cambridge University Press.

Vasquez John A. 1998. "The Evolution of Multiple Rivalries Prior to the Second World War in the Pacific." in Paul F. Diehl ed. *The Dynamics of Enduring Rivalries*. Urbana/Champaign: University of Illinois Press. 191-224.

Vasquez, John A. 2009. *The War Puzzle Revisited*. New York: Cambridge University Press.