

Japan-China Game: Navigating through the Risk Zone

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Abstract

This research aims to analyze the recent developments in the strategic interactions between Japan and China over their territorial disputes in the East China Sea from the perspectives of statistical and game-theoretical modeling. Two linear regression models were run in scope of this study. The first model assesses the effect of political deterioration between the two nations on their economic relationship. The second model deals with the test of the relationship between the dynamics of public opinion of China shared by the Japanese people on the volume of Sino-Japanese trade.

The methodology of this study also includes application of a deterrence model to Sino-Japanese territorial disputes. By analyzing the case studies of incidents between Japan and China over the disputed islands in the East China Sea, this study tracks the evolution of strategies of different administrations both in Japan and China. The importance of the signaling is assessed. The paper concludes with the demonstration of the implications of the model for the understanding of the motivations behind the actions of Japanese and Chinese leaderships.

Keywords: China, Japan, game theory, Senkaku/Diaoyu, statistics

Introduction

In the wake of the 21st century, the relationship between the two Asian giants has been dynamic and puzzling at the same time. The geopolitical structure of the Northeast Asian sub-region has undergone tectonic shifts, mainly caused by China's economic and military rise. At the same time, the decades-long stagnation of the Japanese economy has only contributed to the rapid shuffle of the relative power potential of Japan and China. Thus, in the year 2000, Japanese GDP was 2.5 times larger than that of China; while in 2015, the Chinese economy exceeded its eastern competitor by the same margin. In the mentioned period, China has also overtaken Japan as the regional leader in terms of military spending, with Beijing's current military budget being more than a threefold of Tokyo's military expenditure.

Such kind of profound power transitions were echoed by the aggravation of the uneasy situation in the East China Sea. The historic conflict between Japan and China over the Senkaku/Diaoyu islands, which was overlooked for decades, has unwound in recent years, greatly spoiling the atmosphere of the relationship, and defacing public perceptions of each other. Currently, the grim sentiments on both sides are at a record high, reaching the point where more than 90% of the populations have a negative opinion vis-à-vis the other.

However, one aspect of the Sino-Japanese relations that has been on the rise is bilateral trade. The East Asian paradox of "cold politics-hot economics" persisted throughout the first decade of the 21st century. Nevertheless, the advent of the new phase of aggravation over the Senkaku/Diaoyu islands in 2010, the application of economic leverage by China in the form of an embargo on rare ore following the detainment of a Chinese captain by Japanese officials, and the decline in investment between the two countries has led some authors (Chang, 2014) to announce the end of the "hot economics" era.

In this paper, the dynamics of contemporary Sino-Japanese relations are addressed, with the application of statistical and game theoretical models, with an attempt to reveal the motivations behind the administrations' decisions, and to figure out their interests and valuations in this conflict. In order to better understand their utility function, the following questions are answered:

What is the impact of the deterioration of political relations between China and Japan on their bilateral trade?

What is the impact of the deterioration of public perceptions of each other on bilateral trade?

In the next stage of analysis, the strategic interaction over the disputed islands is modeled, in the form of a dynamic game. The impact of several variables is assessed over time, and conclusions are drawn based on different response patterns of succeeding administrations.

Literature Review

The extensive literature on the Asia-Pacific region and China's role has been categorized (Evans, 2010) into three broad schools of thought: primacists, exceptionalists, and pragmatists. The first school (Aaron L. Friedberg, John J. Mearsheimer, Robyn Lim, Hugh White) is advancing the China threat theory and adheres to the (neo)-realist conceptual stream. The

second school of exceptionalists (David Kang, William H. Overholt, Kenneth D. Johnson and Edward Burman) propagates the exceptionalism of the East Asian region, and argues that China's rise has been possible so far and will be possible in the future. John Ikenberry's position (Ikenberry, 2005), underlying the importance of liberal world order as an environment of China's rise, which engages and constrains the latter by economic and other means of cooperation, is also somehow close to the exceptionalists' view. Finally, the pragmatists (Amitav Acharya, Muthiah Alagappa, Robert S. Ross, Ashlet Tellis and Michael Swaine and Avery Goldstein) combine "hard" alliance systems with soft projects of regional interdependence. Evelyn Goh (Goh, 2007/2008) even proposes the concept of "omnienmeshment policy".

More specifically, Sino-Japanese relations have undergone a transformation since the end of the Cold War, and the disintegration of the US-China-USSR triangle (Yunling, 1997). Currently, many scholars (Mochizuki, 2007; Terada, 2006; Rozman, 2007; Hughes, 2009; Sohn, 2010) see the logic of a balance of power as the backbone of the relationship. Yun Zhang (2013) emphasizes major power interactions as the determining force of Sino-Japanese relations, instead of a balance of power. Finally, other researchers (Bjorn & Hagstrom, 2012) argue there is Japan's accommodation policy towards the rising power of the PRC.

A specifically important aspect of Sino-Japanese relations is the interplay between economics and politics. While the effects of economic interdependence between Japan and China on political relations have been widely studied (Koo, 2009), the relationship between public opinion and trade has often been neglected. On one hand, it is argued by Victor Shih that "All kinds of policymaking, not just trade policy, are increasingly reactive to Internet opinion" (quoted in Bradsher, 2009). However, on the other hand, the "hot economics, cold politics" paradox, though questioned by some (Chang, 2014), is still a counterargument to that opinion applied to Sino-Japanese relations.

This literature review does not cover the arguments of all theories of international relations; rather some of them are systematized in the following table. Table 1 summarizes the debate between realism/neorealism and liberalism/neoliberalism applied to Sino-Japanese relations, in the form of a "draw". The peculiarity of the Sino-Japanese relationship is the intertwined nature of factors and processes that fall in the logic and worldview of both broad theoretical groups. This pretty much explains why there is no consensus between the two major International Relations theories concerning these puzzling interactions.

Table 1. Balance of Realism/Neorealism and Liberalism/Neoliberalism Arguments

Theory			
Process/Factor		Realism/Neorealism	Liberalism/Neoliberalism
	Maritime Conflicts	++	-
	Military Expenditure	+	-
	Economic Interdependence	-	++
	International Organizations	-	+
	US Involvement	+	+
		4/2	4/2

Much of the literature deals with investigating the effects of economic integration and engagement on political relationships, while the reverse connection of political climate on

economic and trade relations has been somewhat overlooked. The current research attempts to test for the relationship between political deterioration and trade turnover between Japan and China. Explanations for the aggravations in the Sino-Japanese relationship over the course of time and through different administrations in Tokyo are also proposed.

Methodology

This paper adopts a game theoretical approach to construct a model of interaction between Japan and China that would be explained in details in the Game section of this paper. One of the main assumptions analysts make about Sino-Japanese relations is that the challenge to the status quo is a tradeoff between economic (profit from trade) and political gains (the new or transformed status quo). It is argued that depending on the type of one of the two possible leaderships that differ in their valuation of political and economic gains, a respective decision (challenge-not, escalate-not escalate, etc.) is made. However, in this paper, before running a game theoretical model, the author aims to verify whether such a kind of tradeoff really exists, or political and economic gains can be obtained by the players independently of each other.

For that purpose, this study aims to empirically test for the existence of a relationship between public opinion and trade, as well as deterioration of the situation over the Senkaku/Diaoyu islands and trade, in the case of Sino-Japanese relations in 1988-2013.

Two linear regression models were run. In both cases the bilateral trade volume was selected as the dependent variable. In the case of the first model, the independent variables of interest were the favorable opinion of China in Japan, and the unfavorable opinion of China in Japan. The GDP of China, GDP of Japan and economic crises were selected as the control variables influencing the level of trade between the two countries.

In the second model, the concept of deterioration of political situation over the disputed islands was operationalized as the number of major incidents over the disputed islands, including incursions by Chinese vessels into the territorial waters that are currently under Japanese control, political standoffs, detainment of Chinese captains, etc. The GDP of China, GDP of Japan and economic crises were again selected as the control variables.

The data for China's and Japan's GDPs were taken from World Bank's databases (World Bank). The data describing the bilateral trade level throughout the period of 1994-2013 were obtained from China Statistical Yearbooks (National Bureau of Statistics of China). The public opinion data was supplied by the polls conducted by the Ministry of Foreign Affairs of Japan, whereas the major incidents were recorded from the timeline of Senkakau/Diaoyu dispute provided by the Center for a New American Security (Center for a New American Security). On the next stage of analysis, a game theoretical model was applied which will be described later in this paper.

Data Analysis

The data were analyzed with the SPSS 20 (Statistical Package for Social Sciences) software. First, the connections between the variables included in the first model are scrutinized. The correlational matrix is presented below.

Table 2. Correlational matrix

	Japan GDP	China GDP	Trade	Economic Crises	Opinion - Unfavorable	Opinion - Favorable
Japan GDP						

China GDP	0.687**					
Trade	0.624**	0.932**				
Economic Crises	-0.042	-0.043	-0.158			
Opinion - Unfavorable	0.727**	0.944**	0.957**	0.42		
Opinion – Favorable	-0.651**	-0.819**	-0.861**	-0.008	-0.927**	

** - Pearson correlation is significant at the 0.01 level (2-tailed)

Here the Japanese and Chinese GDPs are both positively correlated with the trade level between them, which is intuitive. However, the puzzling part is the statistically significant positive correlation between the percentage of the Japanese public that has unfavorable opinion of China and trade. At the same time, there is a significant negative correlation between the percentage of Japan's population that has favorable opinion of China and bilateral trade¹. In other words, the data suggest that years with higher percentages of unfavorable opinion correspond to higher levels of trade.

Naturally, this does not imply that there is a causal relationship between these two variables, while this would have been totally counterintuitive. Rather, this correlation occurred because of two sustained positive trends in both variables throughout the observed time period. Those trends had their separate causes (other variables). Thus, this positive correlation can be interpreted as the preliminary evidence of independence of these variables. However, it may be possible that controlling for the effects of other independent variables on trade, negative coefficients for the effects of "Opinion Unfavorable" variable could be derived. Therefore, the first linear regression model has been proposed. The output matrix for the model is presented in the following table.

Table 3. Effects of Public Opinion on Trade

	Unstandardized coefficients	Significance level
Constant	-18744193.992	.107
Economic Crises	.455	.658
China's GDP	.094	.959
Japan's GDP	-2006793.478	.369
Japanese Opinion (Unfavorable)	571116.566	.005

It occurred that the only significant variable was the level of unfavorable opinion of China in Japanese society. Again, the coefficient of the variable is positive, which is counterintuitive. This means that even controlling for the effect of other economic variables, the "Opinion Unfavorable" variable does not have a logically grounded influence on Sino-Japanese trade. On the other hand, the inclusion of this variable in the model cancelled out the effect of the economic variables that turned out to be statistically insignificant in this case. This is due to the high correlation between "Opinion Unfavorable", and those variables which causes

¹ The data for neutral opinion were not included.

multicollinearity when the results about any individual predictor may not be valid (as it is in this case).

Next, the relationship between the major incidents in the East China Sea that spoil the political atmosphere between the two countries and their level of trade is to be examined. The output table for the second model is presented below. The only variable that has a statistically significant effect on the level of trade is China's GDP, which sounds logical, because the booming Chinese economy led to increased levels of China's foreign trade, and namely the trade with Japan. On the contrary, Japan's GDP did not have any statistically significant impact captured by the model. This fact can be explained by the nation's long lasting stagnation, when the figures for GDP did not change dramatically, while trade with China boomed, mainly because of the latter's rapid economic growth.

Table 4. Effects of Crises on Trade

	Unstandardized coefficients	Significance level
Constant	9598908.905	.362
Economic Crises	-160453.038	.952
China's GDP	3.137	.000
Japan's GDP	-.893	.705
Incidents (Japan-China)	1283073.012	.193

Finally, our independent variable of interest, major incidents between Japan and China throughout the observed period, also did not have a significant impact on trade. This demonstrates that deterioration of the political climate between the two countries does not lead to the decline in their economic relations. Thus, the East Asian paradox of "cold politics-hot economics" is empirically sustained. This phenomenon presents great interest for the game theoretical modeling.

The Game

This paper applies the classical deterrence (Huth, 1999) model to the study of the Sino-Japanese dispute, making several adjustments and clarifications on the definitions of players' types and actions, broadly defined as "challenge (C)-not challenge (NC), resist (R)-accept (A), escalate (E)-not escalate (NE)".

First of all, the author assumes that the outcome of full-scale war between Japan and China, which happens after the terminal history "challenge, resist, escalate", is extremely unlikely. However, the model of gradual escalation (not necessarily to the stage of an all-out war) and backing captures the logic of strategic interaction between China and Japan, over challenging/preserving the status quo in East China Sea quite well.

Solution of the Game

The overall game tree is presented below:

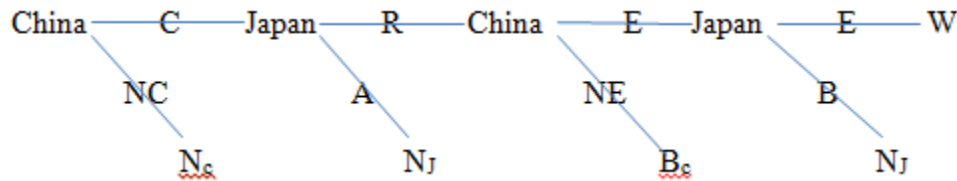


Figure 1. Game tree

The condition for China choosing “Not Challenge” as the rational decision is represented by the following formula:

$$pW + (1-p)N_J - c_c < N_C$$

where p is the probability that China assigns to Japan playing escalate after the non-terminal history “Challenge-Resist-Escalate”, i.e. being of the “aggressive² type”; W is the payoff China obtains in case of final escalation by Japan, N_J is China’s payoff in case of Japan accepting the altered status quo after China’s challenging or after the terminal history “Challenge-Resist-Escalate-Back”; c_c is China’s costs of challenging the status quo.

From the previous formula it is obvious that the probability that China assigns to Japan playing escalate after the non-terminal history “Challenge-Resist-Escalate” should be:

$$p > (N_J - N_C - c_c) / (N_J - W)$$

for the inequality to hold. It can be observed that the costs of challenging for China “ c_c ” decreases over the course of time. China’s remarkable military and economic rise has transformed the country into a much more powerful one, and continues to do so. It is intuitive to argue that costs of challenging the status quo are less for a more powerful country than for a weaker one, which can face political isolation and decline in its geopolitical positions as a result of the countermeasures taken by the status quo nation. Thus the lower values of c_c vector in the inequality correspond to higher values of the overall expression on the right side of the inequality. This means that for China **not to challenge** the status quo, the probability that it assigns to Japan acting escalates at the final decision node should grow parallel to the decline of c_c . In other words, the more assured China is that Japan is “aggressive”, the less likely it is to challenge the status quo. The irony of the deterrence model applied to Sino-Japanese relations is that Japan needs to become more and more “aggressive” for the preservation of the status quo, because of the ever decreasing value of the costs for China.

At the same time, it is noteworthy that the value of W is not negatively influenced by the decline in trade, while the economic relationship between China and Japan is independent of the escalations of disputes in East China Sea. Therefore, the operationalization of W , i.e. the payoff China receives in case of the escalation by Japan at the final decision node, requires more precise understanding of the risks that China actually runs in any realistic scenario of limited

² Note that the term “aggressive” is used in the meaning of preferring the payoffs from escalating to the payoffs from backing at the final decision node. It is not used in the meaning assigned to the words “aggressor”, “aggression” in international law.

escalation. Let's assume that the value of W , i.e. the loss that Japan can infringe on China in a realistic scenario, is proportionate to Japan's potential and will to do so. While Japan's potential has remained nearly constant in post-Cold War period, because of the "lost decades" of Japanese economy, current humble GDP growth and an invariable amount of military expenditure, it can be argued that the W value is solely dependent on Japan's will to infringe loss on China. In its turn, that will is mainly stipulated by the ruling administration at the time. Therefore, several case studies of the game, which reveal some patterns of reaction by different administrations, are proposed.

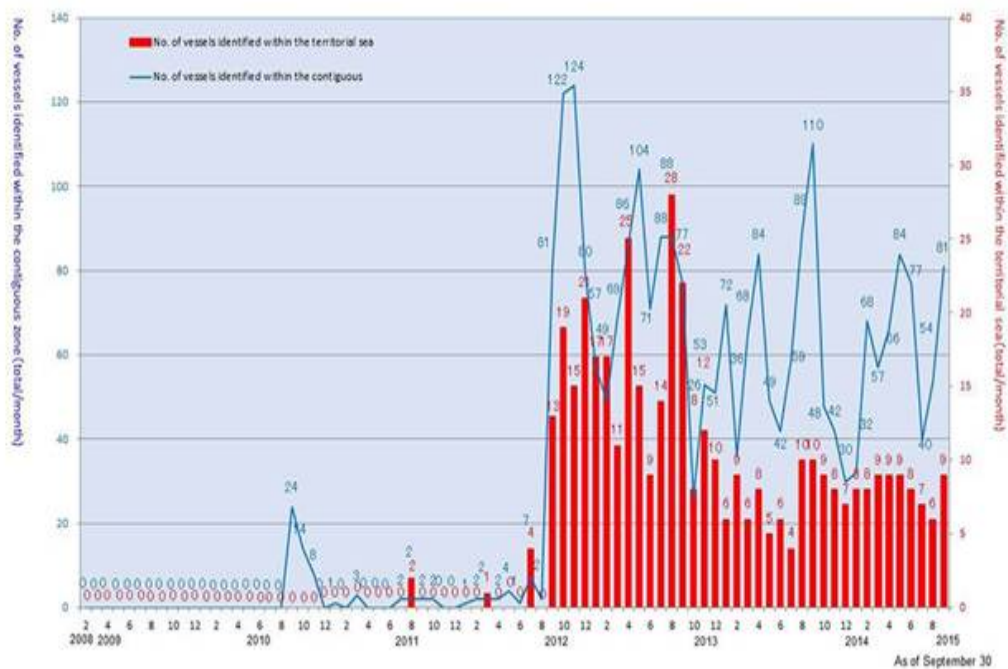
Cases

In the incidents which occurred during the incumbency of Junichiro Koizumi, the Game mainly followed the pattern of Challenge-Resist-Not Escalate. This could have been due to Koizumi's harsh stance on China, and an unambiguous inclination to taking "aggressive" action for the second time, after the non-terminal history "challenge-aggressive-escalate" that was known to policy makers in Beijing.

On the contrary, Yasuo Fukuda's administration followed a different pattern, though not in a boat incident with China, but with Taiwan in 2008 (Hsiu-Chuan & Wang Flora, 2008). Yasuo Fukuda's administration backed down and apologized. Thus, the Game resulted in "challenge-aggressive-escalate-back".

Naoto Kan's administration followed the same strategy in the infamous 2010 fishing boat incident. Thus, the Game again took place in the form of "challenge-aggressive-escalate-back" terminal history.

An unusual role change occurred in 2012. This time, the Japanese side played as the challenger of the status quo, with the purchase of three of the Senkaku/Diaoyu islands. China's "Resist" response phase was rather prolonged. An unprecedented wave of a number of incursions by Chinese vessels into the territorial waters surrounding Senkaku/Diaoyu islands began immediately after the purchase, and has lasted until now. However, Japan chose the action "escalate", without backing down and returning to the pre-purchase status quo, which in this case was the different legal status of the islands. China, in her turn, chose to back down. The last claim may sound somewhat arguable when examined against the background of severed rhetoric in official statements, as well as media and even academic narratives. However, the graph authored by the Japan Coast Guard (Japan Coast Guard, 2015) and presented below, shows a gradual trend of backing down.



Finally, the last case study of the Game is connected with the establishment of an Air-Defense Identification Zone (ADIZ) by China over the East China Sea (Gladstone & Wald, 2013). This step, which was perceived in Tokyo as an unfriendly act targeted against Japan (Szechenyi, Cha, Glaser, Green, & Johnson, 2013), can be considered as a “challenge” action aimed at altering the status quo. Japan, in its turn, chose to play “Resist”, by ordering its commercial aircraft not to comply with the Chinese request of submitting planned flights schedules. Furthermore, the US and Japan sent jet fighters to fly over the newly established ADIZ, in complete disregard of Beijing’s new rules. We can claim that China reacted to these “violations” with an action “not escalate”, while measures were not taken against any of the “violating aircraft”.

Conclusions

First of all, it was demonstrated that the paradox “cold politics-hot economics” is sustained by empirical tests. The level of political crises does not have an impact on the trade between the two countries. Besides that, another factor that becomes more and more important, the unfavorable/favorable public opinion of China shared by the Japanese people is also independent of the economic relationship. The dynamics of deterioration of the political atmosphere over the Senkaku/Diaoyu islands can be explained by the growing power of China, i.e. decreasing costs for challenging the status quo, and the effectiveness of Japanese deterrence. When speaking about deterrence, it should be noted that signaling a determination to escalate at the final decision node of the game and the perception of that determination by China is crucial in order for the deterrence to occur. That determination, as well as the deterrence itself, is mainly dependent on the incumbent administration. Different response patterns of several Japanese administrations ruling in the 21st century have been demonstrated.

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