Looking for Trouble: Analyzing Search Engine Data during International Crises

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Abstract

Many theories of crisis bargaining and conflict are predicated on the idea that actors constantly observe and process information obtained from words and deeds. However, very few studies have explicitly evaluated whether individuals inform themselves about developments in the midst of crisis, and little thought has been put into the specific mechanisms that would motivate such behavior. This paper uses search engine data from Baidu (China's largest service) to address these issues through the lens of the current South China Sea dispute. Baidu search data provides unique access to daily, province-level, and unbiased statistics on behavior in an illiberal and autocratic country. We use this resource to show that citizens indeed seek information in response to crisis events, and that these patterns of information seeking are best explained as attempts to resolve uncertainty and anxiety that the South China Sea dispute and its related events imply.

1 Introduction

A great deal of conflict literature orbits around the notion of information. Important concepts such as audience costs and rallying around the flag rely on the assumption that individuals actively receive and think about signals sent through words and actions. It is only through their knowledge that leaders risk incurring costs or experience bouts of domestic support.

However, our understanding of whether and how information is processed is quite thin. Very few empirical approaches have allowed scholars to test the extent to which private citizens care and learn about events taking place around them. Perhaps as a result, little consideration has been given to understanding the precise reasons why people might seek out information regarding current events.

This study attempts to directly address both issues. In doing so, it relies on a resource that has slowly become more prevalent in political science: internet search engine data (Ripberger 2011; Reilly et al. 2012; Pelc 2013).[1] Specifically, we use data from Baidu, China's most prominent search engine, to evaluate the effect of events on information-seeking behavior as it relates to the current South China Sea dispute.

The South China Sea conflict (further discussed below) is easily one of today's most pressing crises. Tensions are rising and arguably edging closer to a major confrontation with armed hostilities. It provides an important case for which any insights would prove valuable. Looking at China also permits us to investigate the potential relevance of audience costs, public opinion, diversionary conflict, and the like in an autocracy. Most theories about these concepts have investigated Western democracies, likely for two reasons. First, there may be an implicit belief that the marketplace of ideas is not as relevant in a non-democratic setting. Second, even if agreement exists that autocracies are also subject to these phenomena, considerable difficulties arise in getting reliable data on security-related issues from an authoritarian regime. Our study indicates that both alleged obstacles can be overcome through a combination of event and search engine data, allowing for a uniquely comprehensive and unbiased look at citizens' behavior and sentiments in China—not

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[1]Also, see Goel et al. (2010); Scheitle (2011); Drake et al. (2012); Wilde and Pope (2013), and MacInnis and Hudson (2015) for a sample of research across disciplines that utilize search engine data.

only a non-democracy, but a rapidly ascending power with increasing relevance in international relations.

We find that information seeking does indeed occur during crises. However, it is not simply a consequence of political factors such as mobilization or intent to keep leaders accountable, nor is it a direct reaction to levels of media coverage. Rather, information seeking in response to new events is more effectively understood as an attempt to alleviate uncertainty in the midst of an escalatory conflict that could endanger individuals' lives. Verbal and material actions taken by governments may be designed to shape and clarify the adversary's beliefs, but they may serve to increase anxieties. This suggests that information in the form of signals can actually generate more ambiguities, pushing people to seek more information on their own to address these concerns. Several hypotheses developed on this logic are tested on daily-level Baidu search data to assess the role of uncertainty on information seeking during crises.

The paper proceeds as follows. In Section 2, we discuss past research on information in crises and outline the role that uncertainty can play in information seeking. We describe extant empirical approaches used to measure individuals' sentiments, and then make a case for search engine queries as a new source of data. Section 3 provides an overview of the South China Sea dispute before we develop explicit testable implications in Section 4. The Baidu search index, as well as the event data and other variables, are explicated in Section 5. Afterward, Section 6 presents preliminary results. We close with some further thoughts in Section 7.

2   Interacting with Information

Substantial literature on crisis behavior has investigated the dynamics that may occur short of war but entail actual risk of active hostilities.[2] Governments interact in a multitude of ways that fall short of war.

An idea stitched into many of these studies is that information is relayed, received, processed, and sought by relevant actors. For example, audience cost theories rely on the assumption that citizens and/or elites in a state are aware enough of the threats and actions prosecuted by all involved

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[2]Snyder and Diesing (1970) represent a foundational work.

leaders, and that they will inflict punishment should their government back down from a prior commitment (Fearon 1994; Smith 1998; Schultz 2001). Studies in public opinion, mass media, and foreign policy also presume that citizens are able to obtain information about a specific policy, such as the use of force (Baum 2004; Tomz 2007). In debates about the determinants of the quality of information, scholars typically disagree on whether information is revealed honestly (through mechanisms like political competition, press freedom, and the like) or can be readily manipulated (through elite cues, media exaggeration, etc.).[3]

These theoretical frameworks all suggest that citizens process signals obtained through the actions of their and other governments, and that this is primarily done with the intent of holding leaders accountable for their actions or to update one's opinion about the issue at hand. In the realm of trade, Pelc (2013) suggests that US citizens seek information (about the World Trade Organization) due to concerns about being deemed a violator of international law; searches are a form of political mobilization. However, one additional and oft-overlooked mechanism comes into play during crises: rises in uncertainty. We do not mean uncertainty in a game-theoretical sense, but the general sense of anxiety and lack of confidence often associated with vague grasp of a topic or problem (Kuhlthau 1993). Signals sent between governments may ostensibly help leaders update their beliefs about the adversary's type, but each additional action that takes place could risk escalation that overflows into armed hostilities that jeopardize economic, social, and even existential well-being. Individuals, particularly average citizens with no classified knowledge or control over events, may feel mounting concern about the future and seek information to allay their fears.

A large trove of studies in communication, information science, health, and psychology investigate the idea of information seeking in the face of uncertainty (Shannon and Weaver 1949; Kuhlthau 1993; Kalbach 2009; Case 2008; Chowdury et al. 2011; Rains and Tukachinsky 2015).[4] Theoretical and experimental methods both show that individuals faced with uncertainty, or "anomalous states of knowledge" (Belkin 1980), would make efforts to seek information to mitigate those concerns and "solve their problems" (Wilson 1999). A surge of research has also acknowledged and investigated

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[3]For an example of the former point, see Berliner and Erlich (2015). For the latter point, see Zaller (1994) and Berinsky (2007).

[4]In a classic work in communication, Shannon and Weaver (1949) define information as the reduction in uncertainty about the state of an event after a message has been sent relative to the uncertainty about the state of the event before the message was sent.

information-seeking dynamics in the digital realm.[5] However, such insights have not made their way into international relations. This may perhaps be because very little data existed to address such questions even if they arose. It may also result from the somewhat unsettling implication (especially for a rational framework often predicated on Bayesian updating) that more signals, which are forms of information, can actually serve to increase uncertainty.

2.1   Does Anyone Care?

Most studies of public sentiment regarding crises and wars rely on surveys (Trager and Vavreck 2011; Tomz and Weeks 2013; Kertzer and Brutger 2016). The experimental nature of these works permits clean identification, but they force an issue upon the respondent that may not be of any actual importance to the individual. This may either produce overinflated treatment effects, or may create noise if the question relates to a topic that the respondent has never really considered. Hiscox (2006) also shows that lack of familiarity with a topic makes subjects especially vulnerable to framing effects. These studies may thus lack external validity, as strong treatment effects within a particular study may not translate into strong practical effects in everyday behavior. The generalizability of some of these survey results, particularly when discussing infrequent events such as crises, is not immediately obvious.

Many theoretical studies of crisis provide no systematic evidence of whether individuals seek out any of the information that their theories require. Having no informational channels obviously precludes the possibility of finding information, but the current digital world makes it increasingly difficult to argue that citizens in almost any country have no opportunities to even search for information. Given the availability of information (regardless of quality), it is imperative to find out whether or to what degree citizens spend a part of their limited time to obtain information, incurring a small temporal cost. The questions of media accessibility and quality becomes severely diluted if citizens do not opt to actively learn, effectively precluding any information revelation.[6]

Observational data that records what citizens do when left to their own devices would provide an ideal alternative. Until recently, such a measure of unprompted behavior (as opposed to artificially

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[5]See the literature review in Chowdury et al. (2011).

[6]In terms of a market dynamic (Baum and Potter 2008), supply becomes less relevant when demand is lacking.

elicited preferences) did not exist. Internet search engine data now provides a compelling solution that has been used to great effect by a nascent pool of political science literature (Ripberger 2011; Reilly et al. 2012; Pelc 2013).[7] Search engine data captures a very meaningful image of people's actions, is granular across time and space, and is increasingly relevant as the internet becomes the most prevalent way to obtain and consume information.

Findings using search data would also provide more telling evidence about the existence of a "rational public" (Page and Shapiro 1992) that seeks information out when significant events take place. Search data may be a better metric than surveys that ask respondents about issues which they find most salient, or presidential approval ratings where it is difficult to disaggregate what individual factors dictated an individual's evaluation. Indeed, in autocratic states, such surveys would not be feasible or would likely be biased by unwillingness to express opinions freely (Carnaghan 2012).

One particular criticism of search engine data may be that it tracks a biased sample of technology-literate individuals that tend to be younger, wealthier, and more familiar with the internet. However, as long as this bias remains relatively constant, it is still meaningful to find any effects of diplomatic or military actions on public information-gathering. Moreover, by 2011 (the first year of our data), a large portion of individuals are connected to the internet and can perform basic searches for information. Mellon (2013, 2014) has also shown that search engine data provides valid measures of Gallup surveys regarding the "most important" issue for respondents. Although his findings apply to Google and the United States, they still provide an initial validity check for the broad idea that internet search behavior echoes sentiments of the general population that may not be as fully connected to the internet.

3 About the South China Sea

Search engine data is only available for recent crises. The South China Sea dispute presents a contemporary and highly salient case.

The South China Sea is a semi-enclosed body of hand that features approximately 60 islands

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[7]We consider this paper to be a complementary work to Pelc (2013) that analyzes issues of security rather than trade disputes and the WTO.

around the Paracel and Spratly archipelagos. Disagreements over claims to the sea have existed for centuries, but recent years have seen a much sharper renewal in animosity as China has bolstered its claims over much of the area demarcated by the "nine-dash line" (Gao and Jia 2013); see Figure 1. Almost every other nation in the region—a list that includes Indonesia, the Philippines, Vietnam, Malaysia, Brunei, Cambodia and Singapore—asserts overlapping claims. The presence of large amounts of hydrocarbons and natural gas, first tapped in the 1970s, play a large role in motivating this dispute. Moreover, the South China Sea is an enormously rich area for fishing, but over-exploitation has pushed Asian nations to fish in deeper and therefore more contested waters (Wray 2015).[8] The sea is also one of the world's busiest sea lanes (Buszynski 2013); China's efforts have thus also raised concerns for the United States and Japan. The nations of the Association of Southeast Asian Nations (ASEAN) are caught in a difficult position where they seek to challenge China's maritime claims but also cannot jeopardize their economic ties to China (Emmers 2014). Despite these concerns, Vietnam and the Philippines have remained active and vocal regional opponents to China's activities.

On a political level, China's increasing assertiveness in the South China Sea has been linked to its expanding military power, as well as an augmented level of nationalism partially in response to the financial crisis in many of the Western states (Yahuda 2013). The dispute has also been framed as one involving national dignity and an extension of China's "century of humiliation" narrative (Chubb 2014). This rise has arguably been blunted by the United States' pivot to the Asia-Pacific, which began under the Obama Administration and took fuller form in late 2011 (Manyin et al. 2012). The United States' "rebalancing" in the area has caused consternation, particularly among Chinese hard-liners in Beijing who see this an attempt to undermine their rising influence.[9] Vietnam and the Philippines have welcomed the American counterbalance, as shown by their willingness to engage in periodic joint military drills.

The year 2011 began the most recent and aggressive phase of activity punctuated by several clashes between China and the Philippines and Vietnam. On multiple occasions, Chinese fishing boats,

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[8]It is perhaps no surprise, then, that the capture of fishermen has sparked several of the more tense moments in the dispute.

[9]As part of this pivot, in July of 2010, former U.S. Secretary of State Hillary Clinton openly affirmed the nation's interests in open access to the South China Sea. The Chinese government saw this as an affront (Council on Foreign Relations 2015).

Figure 1: Map of the South China Sea and maritime claims. The nine-dash line (China's claim to the South China Sea) is colored red. Image is from Voice of America (2012).

likely with naval support, were accused of threatening to cut Vietnamese ship cables. The Chinese navy increased its presence around the South China Sea as both the Philippines and Vietnam staged military drills in the same area in cooperation with the United States. Despite apparent progress in diplomatic resolutions, as well as a set of preliminary guidelines forged by China, the Philippines and Vietnam, no lasting solutions developed. In October 2011, China's *Global Times* newspaper (an English-language paper under the party's *People's Daily*) ominously warned of "sounds of cannons" if other states interfered with matters pertaining to the South China Sea.

The dispute underwent a serious shock in 2012. In April, the Chinese government sent warships to confront a group of Philippine fishing ships in the Scarborough Shoal in the South China Sea. Constant surveillance of the islands, as well as a quarantine on fruits, severely undermined diplomatic relations and inflicted greats costs on the Philippines in terms of trade. Three months later, for the first time in its history, a meeting of ASEAN ended without issuing a communiqué, primarily due to disagreement on the South China Sea. Increasing shows of military force were complemented

with violent anti-China protests in several nations. The Japanese government's purchase of three disputed Diaoyu/Senkaku Islands, while a separate matter from the South China Sea, also escalated tensions with regard to China's willingness to realize its maritime objectives.

Xi Jinping's presidency, which began on March 14, 2013, raised concerns about the new leadership and whether it would become more assertive in its maritime claims (Chan and Li 2015). However, the year had fewer flash points than the previous two. In May 2014, a massive Chinese oil rig was moved closer to the South China Sea, drawing incredible ire from Vietnam. Both Vietnam and the Philippines engaged in multiple diplomatic efforts with China, but to little avail. Fishermen were arrested on both sides as prominent shows of resolve.

2015 brought the dispute to a new level, as China began to convert two reefs—Mischief and Fiery Cross—into artificial islands that would ostensibly grant them the surrounding territorial waters, even though the United Nations has stated that this is not the case. In late October, the United States sent a warship within twelve miles of these disputed islands to emphasize freedom of navigation through these waters. In response, Beijing publicly pronounced that it was "not frightened to fight a war" with the United States (Guardian 2015).[10]

Many of the actions states have taken concerning the South China Sea can be considered crisis behavior, particularly given the constant concern over the outbreak of war and the repeated placement of military forces in very tense situations. It therefore provides an ideal albeit unfortunate case to analyze information-seeking behavior in times of uncertainty. Territorial affairs should also be some of the most salient concerns (Hensel et al. 2008), giving the greatest opportunity to see reactive trends in data. Indeed, a survey by the Pew Research Center (2014) suggests that, even in China, where citizens may be hesitant to reveal their true preferences, 62% of respondents stated that they were somewhat or very concerned about a territorial dispute transforming into a military conflict.[11]

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[10]That being said, data for 2015 is not yet incorporated into the analysis.

[11]These numbers are even higher in several neighboring states: Vietnam (84%), the Philippines (93%), Japan (85%), and South Korea (83%).

4 Hypotheses

At the most basic level, citizens that learn of activity concerning a potential crisis will experience increased levels of uncertainty regarding the future. This is true regardless of political considerations such as holding leaders accountable or updating one's policy beliefs. Mounting uncertainty will motivate information seeking. As previously discussed, people will attempt to make sense of situations they do not understand or feel they cannot control. If citizens perceive events concerning the South China Sea, then we should see increased information seeking in response.

> **Hypothesis 1 (Information)** *Information seeking will tend to increase in light of any events reported concerning the South China Sea.*

Not all signals imply equal degrees of uncertainty or caution. At least two other dimensions of events may influence perceived levels of uncertainty. One is a distinction between cooperative and conflictual occurrences. Events that imply discord and hostility should be sow greater uncertainty, while events that appear to show concord should still raise interest but generate relatively less unease. This is consistent with findings that uncertainty-based information seeking is more sharply triggered by negative emotional reactions (Boyle et al. 2004).

> **Hypothesis 2 (Conflict)** *Information seeking will tend to increase more in light of conflictual events than cooperative events.*

Another is the directionality of events. Actions that the Chinese government initiates against other states should spark less uncertainty than actions first taken by dissatisfied parties against China. While both kinds of events still raise questions for Chinese citizens that are not privy to elite discussions,[12] actions by the Chinese government are more likely to show some form of resolve or control than deeds committed by the other side. Events perpetrated by states such as the Philippines or Vietnam are more surprising and pull some of the initiative away from China, causing greater concern.

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[12]Of course, there is no guarantee that policy-making elites are any more certain about the trajectory of events or the next appropriate course of action. However, they at least have some awareness of private information being used to formulate policy that private citizens do not.

Hypothesis 3 (Directionality) *Information seeking will tend to increase more in response to actions perpetrated against China than to events perpetrated by China.*

Many of these ideas assume that reactions to events, if they occur systematically at all, should also be somewhat homogenous across the country (barring differences in internet availability). It is more than likely that geographical variation should exist in search volumes—particularly for a country as expansive as China. For example, coastal regions may respond to events differently than those not bordering the sea. Areas simply closer to the sea may also react in a different manner.

It may seem likely that regions at closer proximity to the focal point of conflict should respond more markedly to events, since they are the ones at greatest physical risk of danger. This seems especially reasonable when considered through a "rational" viewpoint where new signals should trigger a response. However, this intuition is somewhat memoryless. It ignores the fact that citizens closer to the sea are much more likely to experience a higher latent level of anxiety or concern over their well-being, regardless of whether explicit actions are taking place. Should armed hostilities actually break out with Vietnam, the Philippines, and/or the United States, all attacks would originate from the sea, implying the most immediate danger for those near the water. Regions that have a coastline may additionally feel concerned about the maintenance of their fishing industries, which are significant parts of their economic well-being. Overfishing has been a primary driver for fisheries to engage in increasing competition, explore further waters, and become participants in the competition over the South China Sea (Stratfor Global Intelligence 2016). All of these considerations involve forces over which the average citizen has no control, further augmenting a sense of unease that may even feel existential (Fels and Vu 2016).

Now, consider the marginal change in uncertainty that would occur after an explicit event takes place involving the South China Sea. Individuals living further away from the sea do not consider the crisis to be as salient of an issue on an everyday basis. As such, news about something happening is a sudden and novel signal that triggers uncertainty with far less context and fewer reference points. Information seeking behavior should increase substantially in an attempt to address this unforeseen circumstance. On the other hand, a person living near the sea is already experiencing a consistent stream of uneasiness regarding the crisis; reports on recent activities do not sow as much

new uncertainty. This implies that people living closer to the South China Sea should respond less strongly to current events than people further away that are learning about something relatively unusual—at least to them.[13]

> **Hypothesis 4 (Habituation)** *Citizens closer to the South China Sea should seek more information in general than citizens further away from the sea. However, citizens further away from the South China Sea should seek more information in response to relevant events than citizens closer to the sea.*

This may sound somewhat counterintuitive.[14] However, it is conceptually analogous to the notion of *habituation*, which is well-documented and studied in psychology and neurobiology (Thompson and Spencer 1966; Lozada et al. 1990; Turk-Browne et al. 2008). In an important review, Rankin et al. (2009) define habituation as "a behavioral response decrement that results from repeated stimulation and that does not involve sensory adaptation/sensory fatigue or motor fatigue" (136).[15] Habituation is often studied in the context of animals and human infants, but the general expectations map neatly onto the logic outlined above. Citizens that live in an environment defined by a constant stimulus of looming threat (in both an economic and existential sense) will gradually engage in less conscious processing of new signals. That being said, we exercise caution in claiming that they are completely analogous. Theories of habituation do suggest that unfamiliar and potentially dangerous stimuli may trigger significant responses at first, but that repeated exposures without any actual harm will temper later responses. This is fully consistent with our hypothesis. Nonetheless, most treatments of habituation do not specifically rely on uncertainty or information seeking as their primary mechanisms.

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[13]As an informal aside, this logic is similar to the way in which Americans and South Koreans respond differently to occasional North Korean provocations. People in the United States do not typically think about the North Korean threat, but experience sudden shocks of attention and concern when the North Korean regime perpetrates a hostile act. Meanwhile, South Korean citizens are generally cognizant of their neighbor's behavior on a constant basis, yet react to provocative acts with substantially more equanimity.

[14]This hypothesis contradicts the findings of at least one experiment, where individuals who perceived themselves to be "closer" to a disaster (a media report on Hurricane Katrina) were also more interested in obtaining information about catastrophes (Lachlan et al. 2010). However, the experiment only involved about 200 participants, and "distance" was manipulated by changing the device used to obtain the information (HDTV, standard definition TV, and iPod). This is an arguably weak test of proximity.

[15]Note that adaptation and fatigue in this definition refer to an organism being physically less capable of detecting or responding to a stimulus—not just a simple or conscious adjustment in behavior.

5   Methodology

These hypotheses require two separate sets of fine-grained data: search volumes and events. We discuss each in turn.

5.1   Search Data

Search data is obtained through Baidu, China's largest search engine. It alone is responsible for between 63% and 71% of the nation's search engine page views. Baidu provides analytic information on specific search terms in a manner similar to Google Trends, and has done so since 2011.[16]

We obtained search levels for the following terms:

- "South China Sea Dispute" (南海争端)
- "South China Sea Conflict" (南海冲突)
- "South China Sea Crisis" (南海危机)
- "South China Sea Problem" (南海问题)

These terms were chosen to best reflect what internet users may have searched in order to find information on the South China Sea dispute. While there may be some noise in the data from searches that use these terms but not with the goal of finding any information, the specificity of the terms used is an attempt to overcome this issue. This results in 1,460 days' worth of data across 34 provincial-level administrative units, starting on January 2, 2011 and ending on December 31, 2014. See Figure 2. Note that for the remainder of this paper, we use the term "province" as shorthand for the more proper term.[17]

The Baidu index has several features which make it a more useful measure of information-seeking behavior than Google Trends data, which is used in most other studies. First, it is disaggregated to the daily level, while Google Trends data is provided at the weekly or monthly level. Weekly data is still quite good (especially compared to monthly or annual time series), but more fine-grained measures may help to reveal dynamics that are swamped out by aggregation (Freeman 1989).

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[16]Some past studies refer to Google Insights. This is a slightly different and older version of the service. Google Insights and Google Trends were combined in late 2012.

[17]Places like Beijing and Shanghai are municipalities, while places likes Inner Mongolia and Guangxi are technically autonomous regions.
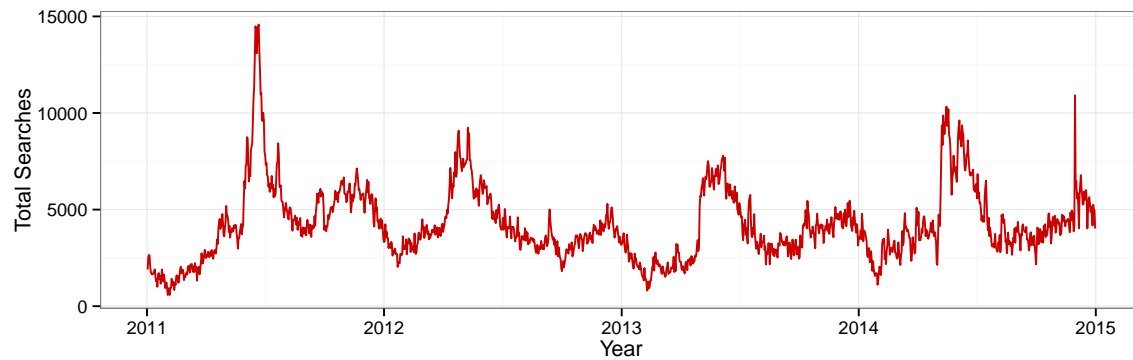
Figure 2: Total search volume for the four terms mentioned previously.

Second, the Baidu index is a measure directly proportional to total search volume, while Google's data is scaled. That is, with Google Trends, the day with the highest search volume for a term during a given time period is scored as 100 and all other days' volumes are calibrated accordingly. Information on the absolute magnitude of search queries is thus lost. It is impossible to truly know whether a move from an index of 100 to 50 corresponds with 2 million to 1 million searches or 20 to 10 searches, and measures are not additive or comparable across terms. Baidu indices circumvent both issues, and can also be scaled if desired.

5.1.1   Censorship Concerns

One may be worried about the veracity of the Baidu index. It seems plausible that the Chinese government would attempt to regulate internet searches via Baidu. However, we stress that this is not the case; the Chinese government does not manipulate this data, nor does it coerce Baidu into adjusting this data. Censorship efforts are not placed on the searches themselves, but rather on the quality and availability of results. For example, the Hong Kong protests (also known as the Umbrella Movement) began on September 26, 2014 after activists took to the streets to oppose proposed electoral reforms that were viewed to undermine universal suffrage. These protests were highly controversial and disconcerting in China, as they appeared to be pro-democratic and to challenge China's authority. Figure 3 shows that as protests began in late September, Baidu searches in China (the top line) began to spike; they were not suppressed. However, media coverage of the protests (the bottom line) remained extremely low until several days later, when the protests

had spread and were difficult to deny. Subsequent days saw even higher jumps in searches.
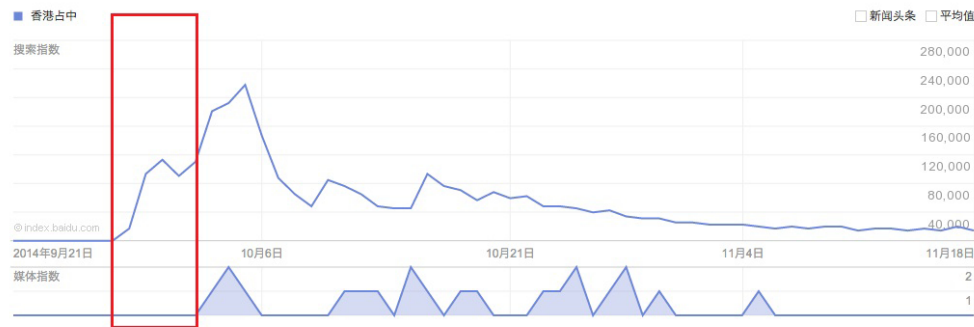

Figure 3: Baidu measures regarding the Hong Kong protests ("Hong Kong Occupy Central"). The initial days of the protests are marked by the red rectangle.

Also, it is worth noting that a term such as "South China Sea" is not blocked. While some searches for much more politically sensitive topics may result in redirects, filtered results, or citizens' efforts to circumvent restrictions by using other terms, such concerns would not apply to this specific query.[18] Indeed, the South China Sea is not a matter that could risk major collective action by the public, which means that the government should have no interest or concern in censoring searches on the topic (King et al. 2013).

5.2   Event Data

To generate our event data, we searched multiple periodicals and sources to collect a complete set of events related to the South China Sea. The foundation of this data is based on coverage by *The New York Times* and *China Daily* (the highest-circulating English-language newspaper in China). These two were selected for their ostensibly complete coverage in both the United States and China.

Relevant articles from these two periodicals were obtained by performing the following search on ProQuest:

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"south china sea" OR "south sea" OR "Scarborough Shoal" OR "spratly islands"
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Entries that were not relevant (such as those that focused on the disappearance of Malaysian Airlines Flight 370 in early 2014) were then removed. This resulted in the collection of 163 events

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[18]Table 4 near the end of the paper shows other related and more sensitive terms that Baidu users freely search, including "start the war."

between January 1, 2011 and December 31, 2014.

Each event is then coded for several attributes. One is the event type expressed by the article's abstract and/or lead paragraph. Each entry is also associated with a sender, receiver, and type code. The event types are based on the Conflict and Mediation Event Observations (CAMEO) project (Gerner et al. 2002) and are shown in Table 1.[19] In several cases, multiple events were coded based on a single news event. This was most common for stories about military cooperation. For example, on June 27, 2013, the United States performed joint naval exercises with the Philippines in the South China Sea, clearly upsetting China. This single news story is coded as four sub-events: the US militarily cooperating with the Philippines (06), the Philippines military cooperating with the US (06), the US displaying force toward China (15), and the Philippines displaying force toward China (15). Figure 4 shows the timing of conflictual and cooperative events.
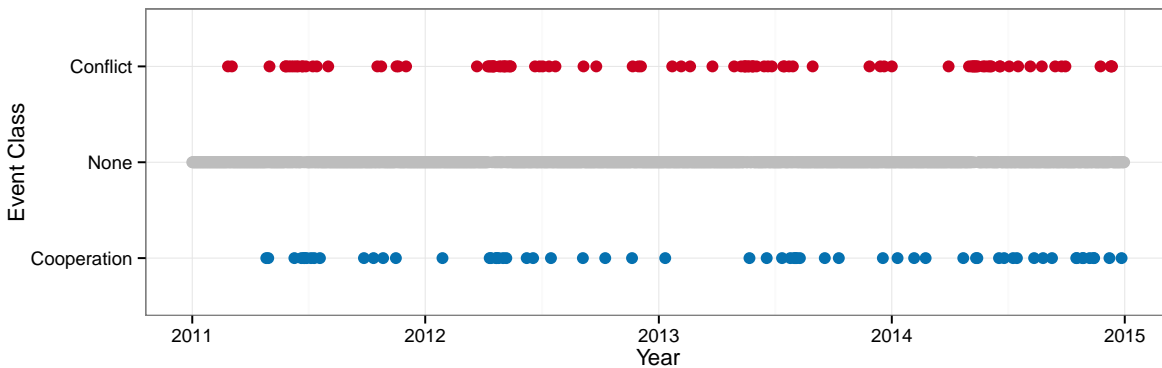

Figure 4: Cooperative and conflictual events between 2011 and 2014.

We recognize that least one other alternative exists for event data: the Global Database of Events, Language, and Tone, or GDELT (Leetaru and Schrodt 2013). GDELT is a massive computational effort that automatically scrapes internet resources to ostensibly record every event between 1979 and the present. As of this writing, GDELT contains far more than 300 million events.[20] This sounds quite impressive and would obviate the need to collect events manually. However, GDELT has been challenged on multiple fronts regarding its quality and ownership, and these issues are

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[19]Baggott (2014) also uses this classification system and she finds verbal conflict to be sufficient to create diversionary effects for American presidents in the midst of economic downturn.

[20]As of December 2014, GDELT had about 20,500 events involving the South China Sea since January 1, 2011—a disconcertingly high number that, upon investigation, involved large pools of identical events not being properly grouped together. Even with some mild attempts at cleaning, over 10,000 events remain.

Code	Event	# Events	
—	No event	1,161	
01	Make public statement	7	⎫
02	Appeal	5	⎪
03	Express intent to cooperate	11	⎬ Verbal Cooperation
04	Consult	13	⎪
05	Engage in diplomatic cooperation	2	⎭
06	Engage in material cooperation	7	⎫
07	Provide aid	1	⎬ Material Cooperation
08	Yield	7	⎪
09	Investigate	6	⎭
10	Demand	6	⎫
11	Disapprove	16	⎪
12	Reject	5	⎬ Verbal Conflict
13	Threaten	9	⎪
14	Protest	7	⎭
15	Exhibit force posture	31	⎫
16	Reduce relations	8	⎪
17	Coerce	13	⎬ Material Conflict
18	Assault	1	⎪
19	Fight	0	⎪
20	Use unconventional mass violence	0	⎭

Table 1: Summary of CAMEO event codes and counts of each in the data.

ongoing. This has even caused at least one journal to turn away manuscripts using GDELT.[21] Until these questions are fully resolved, GDELT will not be applied to this analysis.

5.3 Variables

The main outcome variable is total search volume per day regarding the South China Sea, at the province level. We exclude four provinces that have such low usage of Baidu that the data becomes unreliable.[22] This leaves 30 provincial-level administrative units, each with 1,460 daily observations. Being a count variable, the search index is not normally distributed by any means. We therefore use a quasipoisson regression with a lagged dependent variable.[23] Robust standard

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[21]See the updated policy by *International Studies Quarterly* at
`http://www.isanet.org/Publications/ISQ/Posts/ID/321/GDELT`.

[22]These are Tibet, Macau, Hong Kong, and Taiwan. Tibet has very little internet traffic overall, while the other three overwhelmingly use Google.

[23]We note that variable auto-regression (VAR) models may seem like another alternative. However, the non-normality of this data dissuaded us from its use. Simply taking the log of the outcome may induce more normal-looking distributions, but are an inefficient method. The Poisson auto-regression model (Brandt and Williams 2001), designed for count data, does not work for panels. We are open to any suggestions regarding a preferable method for

errors are reported for all results.

Several explanatory variables align with the hypotheses. All are based on the event data described above. The simplest representation of this data is an indicator for whether any event related to the South China Sea took placed on that day. To test the differing effects of conflictual and cooperative events, we rely on the four-level classification shown in Table 1. This is a standard classification scheme that is less prone to error CAMEO's 20-level root event coding system. In this paper, these are simplified to the occurrence of conflictual or cooperative events, without distinction between material and verbal. To address the role of directionality, we create two variables which record whether the event was targeted at China, perpetrated by China, or both. To assess the distance, we try two different measures. One is a simple dummy variable for whether the province has a coast. Another measures the distance from the province's capital to the South China Sea. The sea is enormous, so a standard geolocation for designating the sea (12° N, 113° E) is used to calculate these distances in thousands of miles. The interaction of these two geographical variables with events helps to test the effect of events on information seeking conditional on proximity to the sea.

People may learn of these events at somewhat different times, and their effects should not be immediately forgotten. To address this, an exponentially weighted mean of each of these measures is created to track events in the analyses. The exponential weighting further reflects the idea that more recent observations should weigh more heavily on an outcome. For the time being, we use a 14-day window, but reasonable choices within one week of this choice do not affect the results.

Several province-level control variables are included that particularly pertain to internet search activity. These include logged GDP per capita, proportion of citizens with college education and higher, levels of internet penetration. A measure of media coverage regarding the South China Sea, also based on Baidu data, is included to account for the possibility that searches are affected by the mere volume of reporting. Fixed effects for month, year, and province are also included, as is a time trend. Figure 2 suggests that some systematic changes do depend on temporal considerations.

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dynamic panel *count* data.

6 Results

Table 2 displays results concerning Hypotheses 1, 2, and 3. Models 1 and 2 attest to the idea that any prominent events regarding the South China Sea will trigger increased levels of information seeking via internet searches. The effect is highly robust to the inclusion of controls and fixed effects.

Models 3 and 4 sort events by whether they are cooperative or conflictual to look for differing effects on search indices. In support of Hypothesis 2, conflictual events result in larger bumps in search activity than cooperative events. A general linear hypothesis test indicates that the difference between the coefficients for cooperative and conflictual events is indeed highly significant ($p \ll 0.01$).

Models 5 and 6 look at directionality of events. Here, the results are slightly less clear-cut. Model 5 looks at the effects of events targeted at and emanating from China. The coefficients are very similar and are not significantly different from one another ($p = 0.78$). However, once more controls are included in Model 6, the difference becomes quite pronounced in the expected direction and with great magnitude ($p \ll 0.01$). Greater emphasis should arguably be placed on a model that more comprehensively accounts for potential confounders. However, it may be somewhat open to question whether citizens are fully aware or concerned about agency regarding events concerning the South China Sea.

Table 2: Regression results for Hypotheses 1 − 3, with robust standard errors.

	Dependent variable:					
	Baidu Index					
	(1)	(2)	(3)	(4)	(5)	(6)
Any Event	0.786***	0.502***				
	(0.031)	(0.022)				
Cooperation			0.498***	0.318***		
			(0.040)	(0.034)		
Conflict			0.937***	0.617***		
			(0.035)	(0.029)		
To China					0.793***	0.628***
					(0.042)	(0.034)
From China					0.781***	0.408***
					(0.035)	(0.027)
Logged GDPPC		−0.041***		−0.041***		−0.041***
		(0.010)		(0.010)		(0.010)
Higher Ed.		0.006***		0.006***		0.006***
		(0.001)		(0.001)		(0.001)
Internet Penetration		−2.958***		−2.958***		−2.966***
		(0.232)		(0.232)		(0.232)
Media Volume		0.001***		0.001***		0.001***
		(0.00004)		(0.00004)		(0.00004)
Time		−0.001***		−0.001***		−0.001***
		(0.0002)		(0.0002)		(0.0002)
Lagged DV	0.003***	0.002***	0.003***	0.002***	0.003***	0.002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	4.435***	17.820***	4.440***	15.839***	4.435***	17.953***
	(0.014)	(3.461)	(0.014)	(3.477)	(0.014)	(3.454)
Province FE	✓	✓	✓	✓	✓	✓
Year FE		✓		✓		✓
Month FE		✓		✓		✓
Observations	43,410	41,963	43,410	41,963	43,410	41,963

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table 3 presents findings involving the effect of geographical proximity on information seeking. Models 7 and 8 use an indicator variable for coastal provinces as the main factor, while Models 9 and 10 use thousands of miles between the province capital and the South China Sea. Both point to the same story. The positive coefficient for the coastal indicator shows that citizens bordering the South China Sea tend to seek more information on the sea at all times. However, coastal provinces are also less responsive to actual events that occur involving the South China Sea. This supports the hypothesis that individuals more closely placed to the South China Sea are habituated to a different environment in which uncertainty is always more pervasive; explicit events involving the dispute motivate a much smaller increase in search volumes compared to non-coastal provinces.

In Model 9, the negative coefficient for distance suggests that provinces further away from the South China Sea tend to search less about the sea in general. The positive coefficients for the interactions between distance and events again show that provinces further the sea tend to be more reactive to actual events that take place. Overall, provinces that are closer to the South China Sea have higher average search rates but much weaker responses to actual news.

It is also worth noting that all the regressions feature a negative and significant coefficient for the linear time trend. This admittedly naive observation suggests that search volumes have gradually decreased over time, which may provide further evidence that citizens across China have become more accustomed to the uncertainty related to the dispute and are therefore less interested in seeking information to mitigate it. Note that levels of internet penetration and use have increased over this same time period, which makes this downward trend even more conspicuous.

7   Tentative Conclusions

In this paper, we show evidence that the Chinese public cares about the South China Sea and uses its own time and resources to obtain information on the dispute. This, at minimum, provides evidence to support a necessary condition for audience costs and other dynamics related to public opinion to obtain. This does not, however, tell us to what extent the public's activities are perceived by leaders as being a factor in escalatory crisis behavior. Future studies on Chinese elite are necessary to draw this line between the dots.

Table 3: Regression results for Hypothesis 4, with robust standard errors.

	Dependent variable:			
	Baidu Index			
	(7)	(8)	(9)	(10)
Coastal	0.264***	1.251***		
	(0.016)	(0.067)		
Coastal × Cooperation	−0.169***	−0.101*		
	(0.068)	(0.062)		
Coastal × Conflict	−0.497***	−0.396***		
	(0.042)	(0.037)		
Dist. to SCS			−2.270***	−13.214***
			(0.174)	(0.730)
Dist. to SCS × Cooperation			0.082	0.086*
			(0.050)	(0.044)
Dist. to SCS × Conflict			0.186***	0.109***
			(0.032)	(0.028)
Cooperation	0.570***	0.360***	0.298**	0.110
	(0.046)	(0.044)	(0.133)	(0.113)
Conflict	1.149***	0.792***	0.484***	0.354***
	(0.040)	(0.032)	(0.084)	(0.073)
Logged GDPPC		−0.044***		−0.040***
		(0.010)		(0.010)
Higher Ed.		0.006***		0.006***
		(0.001)		(0.001)
Internet Penetration		−2.948***		−2.982***
		(0.232)		(0.232)
Media Volume		0.001***		0.001***
		(0.00004)		(0.00004)
Time		−0.001***		−0.001***
		(0.0002)		(0.0002)
Lagged DV	0.003***	0.002***	0.003***	0.002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	4.409***	15.767***	9.554***	45.550***
	(0.015)	(3.474)	(0.388)	(3.839)
Province FE	✓	✓	✓	✓
Year FE		✓		✓
Month FE		✓		✓
Observations	43,410	41,963	43,410	41,963

Note: $^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$

Source Terms	Destination Terms
information	start the war in south china sea
latest news about south china sea situation	start the war
start the war	information
start the war in south china sea	latest news about south china sea situation
latest news about 2015 south china sea	latest news about south china sea
south china sea situation and china's strategy	military exercise
latest news about china's south china sea situation	south china sea problem
latest news about south china sea	south china sea military exercise
analysis about south china sea situation	nanhai [South Sea]
dispute	south china sea military exercise shocked

Table 4: Top 10 most frequent source and destination terms related to "South China Sea situation" during the week of July 27 − August 2, 2015. Translated from original Chinese, with the exception of "nanhai," which was searched in English.

However, we also provide evidence that information seeking should not simply be understood as a political activity designed to assess leaders or policies. Signals sent and received between states may often be meant to clarify one's intentions and type, but we cannot ignore the fact that such signals can also sow greater uncertainty about the future. A natural response to these fluctuations in uncertainty is to seek information in an attempt to alleviate one's concerns. Varying levels of uncertainty according to signal type and geographical location provide additional leverage to show that the interaction of uncertainty and information seeking is a dynamic process.

This manuscript is in its early stages and could be improved on several fronts. For starters, we have started to obtain search indices for the year 2015. Their addition to the analysis would increase the data's size by 25% and incorporate the unprecedented Chinese efforts at building artificial islands in the sea.

Beginning in late July 2015, Baidu released an interface to obtain weekly data on related search terms—both terms that brought users to search for the South China Sea, as well as subsequent searches made afterward. An example is shown in Table 4. These related queries would help us to distinguish whether individuals were looking for basic information about the sea in general or expressing more direct concern regarding the possibility of conflict. Table 4 suggests that anxieties about war have had a conspicuous role in searches, at least in this first week when related terms were accessible. Changes in the order and composition of these terms can help to better distinguish simple searches, politically-motivated queries, and attempts to allay uncertainty.

Data for other countries such as Vietnam and the Philippines could be collected to see whether

events at the South China Sea instigate similar patterns of information seeking in light of uncertainty. In both countries, Google holds at least 89% of the search engine market share (Return on Now 2015). Although we previously noted that Google search data is not as rich or granular as Baidu's, this would still reveal a great deal of knowledge about the informational dynamics involved in crisis behavior across multiple parties. We would indeed expect that the specter of uncertainty should be far more accentuated in these nations, as they are relatively smaller and less powerful, and thus more vulnerable to danger than their Chinese opponent.

Search engine data has proven valuable in a growing collection of scholarly works regarding the interaction between behavior and information. This resource is only getting richer by the year, both in quantity and quality. We believe that this paper, at the very least, suggests another application that may prove useful to the field of conflict studies. The specific use of Baidu data to track honest behavior also points to the enormous potential that search engine queries can have on our ability to study activities inside non-democratic regimes.

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