

THWARTING SUCCESSFUL PIRACY

A Senior Scholars Thesis

by

ARIELLE D. CARCHIDI

Submitted to the Honors and Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

UNDERGRADUATE RESEARCH SCHOLAR

May 2012

Major: Maritime Studies

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ABSTRACT

Thwarting Successful Piracy. (May 2012)

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In recent years, maritime piracy has received more attention from governments, the maritime industry, and the media. Increased incidents of violent attacks, particularly in the Gulf of Aden and the Red Sea, create hazards for seafarers and shipping companies. The maritime industry has issued “Best Management Practices for Protection against Somalia Based Piracy (“BMP4”); however, not all practices are implemented, often to the detriment of the vessel under attack.

The purpose of this paper is to identify what prevents an attack from being successful. Using data from the International Maritime Bureau’s Piracy Reporting Center and the Sea-Web shipping database, I have compiled a list of vessel characteristics, defense and deterrence strategies with particular emphasis on BMP4, and cooperation with other companies or governments for each reported attack occurring between 2006 and 2011. From this list, we tested which of these variables have a relationship to the success or failure of an attack. Our study concluded that defense and cooperative strategies help

prevent negative outcomes in general. Deterrence strategies are shown to help prevent hostages being taken, while defense strategies appear to reduce the need for a shipping company to pay a ransom. The industry supported best practices are shown to reduce the risk of property being stolen and hostages being taken.

DEDICATION

This thesis is dedicated to the late Dr. William McMullen, former head of the Maritime Administration Department, who endlessly supported his students in their educational pursuits.

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I am exceptionally grateful for the guidance and support of my research advisor, Dr. Joan Mileski of Texas A&M University at Galveston. Before the beginning of this project, we had never met, yet she took a chance on me. This thesis would be a byproduct of a larger study she planned to conduct with Dr. Max Mejia of the World Maritime University. From our first meeting I felt more like a trusted colleague than an undergraduate student. Without her, I would not have had the opportunity or means to participate in this undergraduate research or to be the co-author on “How to Thwart Success in Piracy: Core Strategies of Security”, the paper which we presented at the International Conference on Piracy at Sea in October 2011. It was during our trip to Malmö, Sweden for ICOPAS that I realized that she was not just a mentor for my research, but also in other areas of my life including my quest for my perfect graduate school.

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NOMENCLATURE

BMP4	Best Management Practices, 4 th Edition
ICC	International Chamber of Commerce
IMB	International Maritime Bureau
IMO	International Maritime Organization
ISPS	International Ship and Port Facility Security Code
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
NATO	North Atlantic Treaty Organization
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea

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CHAPTER I

INTRODUCTION

Though piracy and armed robbery at sea has been a problem for maritime commerce for centuries, these attacks have increased both in frequency and violence in recent years. Waters of particular concern include the Strait of Malacca, the Niger Delta of Nigeria, off the coast of Somalia, and the northeast coast of South America [1]. More than ninety percent of world trade is maritime based [2], meaning that the maritime industry is especially important to the world economy. Piracy results in costly outcomes for shipping companies including increased insurance premiums, purchasing new security technology, replacing cargo, paying ransoms, rerouting vessels, and potentially hiring protective forces [3]. Also of concern is the safety of the seafarers in these dangerous waters.

Because pirates are looking to maximize the return on their attacks [4], certain vessels are targeted more than others because of perceived vulnerability. The vulnerability of a ship may be determined by the vessel's classification, speed, freeboard, and voyage [5]. Other factors incorporated into the study include the vessel's age, flag, and composition of crew.

This thesis follows the style of *Maritime Policy & Management*.

Because global naval forces are insufficient to protect and patrol all the areas considered “high-risk”, shipping companies have been responsible for implementing their own strategies to reduce the risk to the crew, the ship, and the cargo [4]. To advise shipping companies on such strategies, the maritime industry has developed and published *Best Management Practices for Protection against Somalia Based Piracy, 4th Edition* (“BMP4”). However, the guidelines can be effective in other waters, not just around Somalia. These practices include enhanced vigilance, access control, high pressure fire hoses, additional lighting, and physical barriers including razor wire, alarms, and guards [6]. Though BMP4 is readily available, only about forty-eight percent of vessels follow these practices [5].

This study evaluates the relationships between vessel characteristics, adherence to BMP4, and the success rate of pirate attacks.

What is considered piracy?

Under the United Nations Convention on the Law of the Sea (UNCLOS), piracy consists of:

(a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed:

(i) on the high seas, against another ship, or against persons or property on board such ship;

(ii) against a ship, persons or property in a place outside the jurisdiction of any State [7].

Piracy attacks can include armed robbery, hijacking, kidnapping, and demanding ransom for crew or property of a ship, including the ship itself [8]. Furthermore, under the Convention of the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA Convention), seizure or damage to maritime property, injury, death and related matters can be considered piracy offences [9].

What is a successful thwart of a pirate attack?

A pirate attack can be considered successful if it results in gains such as stolen property or receiving a ransom payment [4]. A successful thwart prevents pirates from obtaining their goals and includes protecting the lives of crewmembers and ship property. It can also include capturing the pirates.

Factors affecting pirate attacks

These factors have been researched a potential determinants of piracy attacks and may also determine whether an attack can be successfully thwarted [4].

1. **Region.** The location of an attack often will determine the type of attack [8]. For example, attacks in Asia tend to be theft of ship property, while attacks off of Somalia can involve holding the crew and ship for ransom. Also, politics of the region can determine to what extent the waters are patrolled and whether the pirates are prosecuted [4]. Therefore, the effectiveness of certain piracy prevention strategies may work differently according to the region.
2. **Movement/non-movement of the ship.** Tactics for both the pirates and the crew will be different depending on whether a ship is anchored, berthed, or steaming.
3. **Type of ship.** Some vessels are considered more valuable or easier to take than others.

4. Size of ship. The size of a vessel can determine its vulnerability to attack. Ships with low freeboard, the distance between the waterline and the vessel's deck, are considered easier targets for pirates.
5. Age of ship. It can be difficult to retrofit a ship with the new technologies and security systems after the ship is built, so the age of a ship may impact the success of a pirate attack [4].
6. Flag of ship. The flag of a ship determines the legal and political response for a ship if an incident occurs including military response and safety standards [4].
7. Size of crew. Smaller crews can make it easier for pirates to successfully attack a ship [8]. Strategies to thwart pirate attacks will be impacted by the number of crewmembers on board and when companies support certain implementations, they should keep in mind any deficiencies in crew numbers to maintain the highest level of security. This control variable was later dropped from the study because information regarding crew size was not available for all the vessels included.
8. Number of pirates. As with the size of crew, the number of pirates may determine how effective an attack is. It might be easier for a larger number of pirates to overcome a ship and its crew. Further, effectiveness of the tactics for both the pirates and the crew will depend upon this number. As with crew size, this variable was later dropped from the study as the number of pirates was not included in all reports.
9. Strategies used by the crew. Often, it is what the crew does to prevent an attack that determines how successful an attempt may be. The crew can adopt defense, deterrence, and cooperative strategies. As mentioned previously, BMP4 outlines the best practices believed to be effective in protecting a vessel and its crew.

CHAPTER II

METHODS

For this study, the success of piracy was analyzed by using each reported pirate attack and attempted attack occurring between 2006 and 2011. Details regarding the victim vessel and the attack are obtained through use of published reports from the International Maritime Bureau and the online shipping database Sea-web.

Independent variables include defense strategies, deterrence strategies, and cooperative strategies as determined by industry adopted best management practices. Dependent variables are the potential outcomes of an attack. The control variables in the study include region, movement/non-movement of a ship, type of ship, size of ship, age of ship, flag of ship, type of attack, size of crew, type of cargo, and number of pirates. These variables are used to determine what factors into a successful pirate attack and how these attacks might be thwarted.

Data sources

The International Maritime Bureau

“The International Chamber of Commerce-International Maritime bureau (IMB) was established in 1981 to act as a focal point in the fight against all types of maritime fraud, malpractice, and piracy. The United Nations (UN) International Maritime Organization (IMO) in its resolution A 504 (XII)(9) adopted on 20 November 1981, has among other things urged all governments, interests and organization to exchange information and provide appropriate cooperation with the IMB. The IMB also has observer status with the

IMO.” [10]

Companies are encouraged to report incidents involving piracy or attempted attacks to the IMB Piracy Reporting Center (PRC) through use of a 24-hour maritime security hotline. This information is published in an annual “Piracy & Armed Robbery Attack Report” and is shared publicly online to assist mariners in detecting threats of piracy.

Since the data are self-reported and voluntary, some incidents are not available through this source. It is estimated by the deputy director of the IMB, Michael Howlett, that 70% of all piracy incidents are actually reported to the IMB [11]. Though information is not available for all attacks, these reports from the PRC are the most comprehensive dataset on maritime piracy available for the industry.

For this study, data available from January 1, 2006 to June 30, 2011 is used for analysis. The reports provided information for each reported attack including vessel location, movement status and flag, as well as the number of pirates involved in the attack and type of attack. Also used is the published details of the attack including the outcome of the reported incidents.

Sea-web

Sea-web is a commercial database developed and maintained by IHS Fairplay (IHS Global Limited). It has information about 179,000 ships of 100 gross tons and above. The dataset also contains records for over 200,000 companies [12].

“IHS Fairplay manages the IMO (International Maritime Organization) Ship and Company Numbering Schemes on behalf of the IMO, providing unique identifiers for ships and shipowners. As the originating sole source of assigning and validating these numbers, IHS Fairplay is able to guarantee an unmatched level of comprehensiveness in its datasets.” [12]

The Sea-web database was used to obtain information regarding vessel type, tonnage, age, cargo, and crew capacity.

Independent variables

The independent variables represent the vessel’s defense strategies, deterrence strategies, and cooperative strategies to prevent the attack from being successful. These include the recommended actions from the best management practices of the maritime industry.

These are measured by a dummy variable (1/0), depending on whether or not a particular course of action was followed.

Defense strategies include any defensive action taken when a vessel is under attack.

These are listed as “returning fire”, “firing warning shots”, “activating fire hoses”, “retreating to a safe location”, “confronting pirates”, and “enforcing anti-piracy measures”.

Deterrence strategies include any action to deter an attack from occurring. These are listed as “sounding alarm, whistle, or horn”, “shouting”, “mustering crew”, “increasing

the watch”, “redirecting lights”, “engaging in evasive maneuvers”, “increasing speed”, “using barbed wire”, “using locking entrances”.

Cooperative strategies indicated the vessel obtained help from an outside source. These strategies are listed as “alerting authority”, “contacting naval or coast guard forces”, “alerting other ships”, “sending mayday/distress messages”, “authorities capturing pirates”, “authorities rescuing crew”, and “firing warning flares”.

Best practices indicated that in either in using the defense, deterrence, or cooperative strategies, the vessel had adhered to BMP4.

Dependent variables

The dependent variable evaluates the success of the pirate attack. These include whether any bad outcome occurred (“outcome”), if hostages were taken (“hostages”), property was stolen (“stolen”), ransom was paid (“ransom”), or pirates successfully escape (“escape”). Dummy variables (1/0) indicate the incident of each of these possible outcomes occurred as reported to the IMB PRC. Information on all possible outcomes, particularly regarding ransom payment, is not available for all incidents.

Control variables

The following variables represent other factors which may affect the success of a pirate attack and all are expressed by a dummy variable (1/0) based on its occurrence:

1. Region is operationalized by nine regional options, representing the location of the attack. The regions are “Malacca”, “Southeast Asia- Not Malacca”, “Far East”, “Indian Subcontinent”, “Americas”, “Somalia”, “Gulf of Aden/Red Sea”, “Africa- Not Somalia”, and “Other”.
2. Movement/Non-movement of the ship is operationalized by three status options, representing the movement of the ship at the time of the attack. The status options are “steaming”, “anchored”, or “berthed”.
3. Type of Ship is operationalized by seventeen ship options representing the type of ship that was attacked. The ship types are “barge”, “bulk carrier”, “chemical tanker”, “container”, “fishing vessels”, “general cargo”, “LNG tanker”, “passenger ship”, “product tanker”, “refrigerated cargo”, “research vessel”, “ro-ro vessel”, “supply ship”, “tanker”, “tug”, “vehicle carrier”, “yacht”, and “other”.
4. Size of Ship is operationalized by the gross tonnage of the vessel attacked.
5. Age of Ship is operationalized by subtracting the year the ship was built as reported by the Sea-web database from the year of the reported attack.
6. Flag of Ship is operationalized by eighty-three flag options of ships reporting attacks during the period of study. These flags are listed as “Algeria”, “Antigua and Barbuda”, “Argentina”, “Austria”, “Bahamas”, “Bahrain”, “Bangladesh”, “Barbados”, “Belgium”, “Belize”, “Bermuda”, “Brazil”, “Bulgaria”, “Canary Islands”, “Cayman Islands”, “China”, “Comoros”, “Croatia”, “Cyprus”, “Denmark”, “Dominica”, “Ecuador”, “Egypt”, “Ethiopia”, “France”, “Germany”, “Gibraltar”, “Greece”, “Honduras”, “Hong Kong”, “India”, “Indonesia”, “Iran”, “Isle of Mann”, “Italy”, “Jamaica”, “Japan”, “Jordan”, “Kenya”, “Kiribati”, “Kuwait”, “Liberia”, “Libya”, “Lithuania”, “Luxembourg”, “Malaysia”, “Malta”, “Marshall Islands”, “Mongolia”, “Mozambique”, “Netherlands Antilles”, “Nigeria”, “North Korea”, “Norway”, “Pakistan”, “Panama”, “Philippines”, “Portugal”, “Qatar”, “Russia”, “Saudi Arabia”, “Seychelles”, “Sierra Leone”, “Singapore”, “South Africa”, “South Korea”, “Spain”, “St. Kitt/Nevis”, “St. Vincent and Grenadines”, “Switzerland”, “Taiwan”, “Tanzania”, “Thailand”, “Togo”, “Turkey”, “Tuvalu”, “UAE”, “UK”, “Ukraine”, “USA”, “Vanuatu”, “Vietnam”, and “Yemen”.
7. Type of Attack is operationalized by four options, indicating whether the vessel was “boarded”, “fired upon”, “hijacked”, or if the attack was “attempted”.
8. Size of Crew is operationalized by using the crew capacity as listed on the Sea-web database. Information regarding size of crew is not available for all vessels, and these details are a general statement and may not actually reflect the size of the crew during the reported incident.

9. Type of Cargo is operationalized by twelve cargo options, representing what the vessel was carrying at the time of the attack. The type of cargo is listed as “bale”, “chemicals”, “containers”, “grain”, “liquid product”, “LPG”, “oil”, “passengers”, “vehicles”, “other cargo”, “multiple cargoes”, and “no cargo”.
10. Number of Pirates is operationalized by the number of pirates in the reports given to the IMB PRC.

Data analysis

All values are expressed as means+ or – SEM or percentages. Each of the variables was tested for differences between attacks and attempted attacks with and without a bad outcome by univariate statistical methodology with significance accepted at $p < 0.1$ (chi-square). Data were evaluated using a combination of chi-square analysis and logistic regression analysis [4]. A pooled cross-sectional multivariate logistic regression analysis was used to test the hypotheses that the three strategies of defense, deterrence and cooperative security affect the probability of an unsuccessful pirate attack by using the statistical analysis system package (SAS). Because the independent variable “best practice” was collinear with “defense” and “deterrence”, a subsequent analysis was completed to test the effectiveness of the published best practices. For this analysis the dependent variable was the outcome of either hostages being taken, ransom being paid, property being stolen, or successful escape by the pirates.

Specifically, the model estimated was

$$\text{Log}(\pi/1-\pi) = \log O_i = \alpha + \text{Bi}(\text{Df}) + \text{Bi}(\text{Dt}) + \text{Bi}(\text{COOP}) + C + E$$

Where $\log O_i$ is the log odds of a bad piracy attack outcome, $Bi(Df)$ is the vector of the defense strategies, $Bi(Dt)$ is the vector of the deterrence strategies, $Bi(COOP)$ is the vector of the cooperative strategies, C is the control variable and E is the error term. To determine significance of each variable, the chi-square probability (p) value, which within multiple logistic regressions corresponds to a standard probability value, was calculated for all variables in an analysis within their assigned category, and significance was accepted at $p < 0.1$. This chi-square probability value is reported in the tables for each independent variable in addition to the probability value from standard univariate analysis [4].

In conjunction with the above models, nested models based on sequential addition of significant variables along each additional time course were determined. This was performed by adding significant independent variables to subsequent models. Further analyses lead to models containing only the significant variables described in the regression equations. When variables were collinear, the strongest reasonable variable was retained. These include the values for “anchor”, “steaming”, “boarded”. Because ship classification was found to be collinear with type of cargo, the latter variable was not used. Tonnage was eliminated because it is directly related to vessel type and cargo and demonstrated collinearity. The variables of the vessels under the flags of Argentina, Brazil, Ecuador, Mozambique, South Africa, and Tanzania were also eliminated due to the minimal amount of attacks occurring on these vessels. The variables for “crew size”

and “number of pirates” were also discarded because this information was not available for the majority of vessels in the IMB reports.

CHAPTER III

RESULTS

Model A

Independent variables

The three independent variables “defense”, “deterrence”, and “cooperation” are individually tested against the five dependent variables and relationship significance is determined at the $p < .1$ level. For the dependent variable “outcome”, the independent variables “defense” and “cooperation” are found significant. For the dependent variable “hostages”, only “deterrence” is found significant. For the dependent variable “paid”, only the independent variable “defense” is found significant. No independent variable is found significant for the dependent variables “stolen” or “escape”.

Control variables

The nine region variables are tested individually against the five dependent variables and significance was determined at the $p < .1$ level. For the dependent variable “outcome”, t region variables “Southeast Asia”, “Americas”, and “Africa” are found significant. For the dependent variable “hostages”, only the variable “Indian” is found significant. Only the region variable “Somalia” is found significant for “stolen”. No region variables are found significant for the dependent variables “paid” and “escape”.

The ship type variables were tested individually with the five dependent variables and significance was determined at the $p < .1$ level. For the dependent variable “stolen”, three ship types are determined to have significance, “LPG”, “tanker”, and “tug”. Ship classification is not found significant for any other dependent variable.

The only movement variable tested against the five dependent variables was “berthed”. “Berthed” was found to be significant at the $p < .1$ level with only the dependent variable “hostages”. The age of the ship is tested individually against the five dependent variables. At the $p < .10$ level of significance, the age of the ship is found significant for the dependent variables “outcome” and “escape”.

The flag variables are tested individually with the five dependent variables. Significance was determined at the $p < .1$ level. For the dependent variable “outcome”, the flag variable “Netherlands” is found significant. For the dependent variable “hostages”, the flag variables “Italy” and “St. Vincent” are found to be significant. For the dependent variable “stolen”, the flag variable “Denmark” is found to be significant. No flag variable is found to be significant with the dependent variables “paid” or “escape”.

The types of attack are tested individually with the five dependent variables and significance is determined at the $p < .1$ level. For the dependent variable “outcome”, the attack variables “attempted” and “fired” are found to be significant. The attack variable “hijack” is found to be significant with the dependent variables “hostages”, “stolen”, and

“paid”. Type of attack is not found to be significant with the dependent variable

“escape”.

Table 1. Results for variables from Model A demonstrating significance at the $p < .1$ level

Dependent Variable	Independent/ Control Variable	Estimate	Pr > ChiSq
Outcome	Defense	-1.4087	0.0220
	Cooperation	-1.8199	0.0010
	Attempt	2.1905	0.0189
	Fired Upon	1.9629	0.0266
	Built	0.0591	0.0048
	Netherlands	-3.3671	0.0728
	Southeast Asia	2.6381	0.0663
	Americas	3.8318	0.0305
	Africa	4.0188	0.0135
Hostages	Deterrence	-0.6972	0.0008
	Berthed	-0.7318	0.0528
	Hijacked	3.1382	< .0001
	Italy	-2.7739	0.0478
	St. Vincent	-2.1507	0.0489
	Indian Ocean	-2.1708	0.0104
Stolen	Hijacked	1.6455	0.0043
	LPG	1.9978	0.0184
	Tanker	0.9389	0.0938
	Tug	1.6225	0.0113
	Denmark	2.3375	0.0655
	Somalia	-3.3482	0.0078
Paid	Defense	-2.9602	0.0080
	Hijacked	4.0282	0.0001
Escape	Built	0.7542	0.0791

Analysis

Table 1 shows the independent and control variables that have a significant relationship with the dependent variables at the $p < .1$ level (for full results of statistical analysis for Model A, see Table A-1). Those variables with a positive estimate value are the ones which are shown to be more likely to produce the undesirable outcomes that the dependent variables represent. The variables which have been deemed significant but have a negative estimate value are the variables which can reduce the likelihood of a bad outcome.

Independent variables

Adopting defense and cooperation strategies seem to be the most effective at preventing a bad outcome in general. Deterrence strategies are the most effective at preventing pirates from taking crewmembers hostage. To prevent a hostage situation that results in ransom being demanded and paid, a ship should adopt defense strategies. No independent variable stood out to prevent property from being stolen or pirates from escaping the scene of the crime.

Control variables

Older vessels and vessels in the regions of Southeastern Asia, the Americas, and Africa appear to have a higher chance of a negative outcome if attacked by pirates. Also, when an attack is attempted or a vessel is fired upon, it is likely that a negative outcome will

occur. However, ships under a flag from the Netherlands have a lower chance of encountering a bad outcome.

Hostages are more likely to be taken on vessels that have been hijacked. These hijack vessels also are the most likely to result in ransom being paid for the release of the ship and its crew. However, vessels that are berthed during the time of attack, have a flag from either Italy or St. Vincent, or are traversing the Indian Ocean region are less likely to have crewmembers taken hostage.

Tankers, tugs, and LPG tankers appear to be the types of ships that are more susceptible to property being stolen, as well as flags under a Danish flag. The significance between hijacked vessels and stolen property is likely because these vessels are considered stolen property in this study. Interestingly, though hijacked vessels are considered stolen property, ships traversing Somali waters are less likely to be theft victims.

Other than age of a vessel, no other control variable seems to prevent a pirates being able to successful escape. The older the vessel, the easier it appears for the pirates to get away.

Model B

Independent variables

As mentioned above, “best practices” was found to be collinear with “defense” and “deterrence”, requiring a separate test to test the effectiveness of industry-supported best practices. The independent variables “cooperation” and “best practices” are independently tested against the five dependent variables. Significance is determined at the $p < .1$ level. “Cooperation” is found to be significant with the dependent variable “outcome”. “Best practices” is found to be significant with the dependent variables “hostages” and “stolen”.

Control variables

When the model is completed again using only “best practices” and “cooperation” as dependent variables, the significance of the control variables, as determined at the $p < .10$ level, remains largely unchanged from that determined in Model A. However, there are minor changes in the results. For the dependent variable “outcome”, the flag variable “Netherlands” is no longer found significant, but the ship classification variable “supply” is. The ship classification variable “tanker” is no longer found significant for the dependent variable “stolen”. For the dependent variable “escape”, the age variable “built” has lost its significance.

Table 2, as in Table one, displays the relationships between the dependent variables and the independent and control variables considered significant at the $p < .1$ level (for full

results of statistical analysis for Model B, see Table A-2). Those variables with a positive estimate value are the ones which are shown to be more likely to produce the undesirable outcomes that the dependent variables represent. The variables which have been deemed significant but have a negative estimate value are the variables which can reduce the likelihood of a bad outcome.

Table 2. Results for variables from Model B demonstrating significance at the

p < .1 level

Dependent Variable	Independent/ Control Variable	Estimate	Pr > ChiSq
Outcome	Cooperation	-2.1430	0.0002
	Attempt	2.3026	0.0135
	Fired Upon	1.9932	0.0225
	Supply	-6.2978	0.0304
	Built	0.0540	0.0053
	Southeast Asia	2.8370	0.0526
	Americas	3.6793	0.0340
	Africa	4.1288	0.0122
Hostages	Best Practices	- 0.7533	0.0002
	Berthed	- 0.7328	0.0523
	Hijacked	3.1086	< .0001
	Italy	-2.7922	0.0481
	St. Vincent	-2.2097	0.0470
	Indian Ocean	-2.2229	0.0086
Stolen	Best Practices	-1.3963	< .0001
	Hijacked	1.5380	0.0054
	LPG	1.8671	0.0278
	Supply	-2.2395	0.0784
	Tanker	0.8714	0.0107
	Denmark	2.1125	0.0939
	Somalia	-3.1751	0.0099
	Aden	-2.5105	0.0474
Paid	Hijacked	3.9646	< .0001

Analysis

Independent variables

In Model B, which considered the effectiveness of best practices and cooperative strategies, cooperation continued to be method most likely to prevent a bad outcome in general. The industry adopted best practices appear to have a positive effect in preventing hostages being taken and property being stolen. Best practices and cooperation seem to have no impact on whether a ransom is paid or if the pirates successfully escape.

Control variables

Model B shows that supply ships, in addition to the control variables from Model A, are less likely to have a bad outcome if attacked. There is no change in the significance of control variables from Model A and the probability of hostages being taken and age of ship no longer influences whether or not the pirates escape. This model also shows that supply ships and vessels in the Gulf of Aden or Somali waters are less likely to be victims of theft, and tankers are no longer considered as at-risk as shown in Model A.

CHAPTER IV

CONCLUSIONS

Preventing an attack from being successful requires a company to be proactive and a crew to be alert and trained how to react in the event an incident occurs. This study is a comprehensive evaluation of the defense, deterrence, and cooperative strategies that have been used in incidents reported to the IMB's Piracy Reporting Center. The results validate the need for vessels to remain vigilant in their operations.

Piracy will continue to be a problem for the shipping industry; however, it is important for shipping companies to take precaution in order to safeguard the ship, its crew, and its cargo [5]. Industry developed BMP4, though initially developed to protect ships from Somali piracy, can be applied to maritime commerce in all regions susceptible to piracy. These best practices have been statistically shown to help prevent pirates from taking hostages and stealing property. Though not all recommendations are appropriate for all vessels in all situations, companies should consider implementing the practices that are applicable to them [6].

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APPENDIX

Table A-1. Complete results for all variables from Model A

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Defense	- 1.4087	0.0220	- 0.4449	0.1816	- 0.8260	0.0029	- 2.9602	0.0080	- 2.4799	0.7423
Deterrence	0.1546	0.7818	- 0.6972	0.0008	- 1.6127	<.0001	- 1.3123	1.3223	3.6575	0.3581
Cooperation	- 1.8199	0.0010	- 0.1437	0.4646	0.1151	0.5491	1.3980	0.1058	0	
Berthed	- 0.8893	0.3547	- 0.7318	0.0528	- 0.3308	0.3039	- 7.8578	0.7692	12.8260	0.6961
Attempted	2.1905	0.0189	-16.9850	0.8481	-24.9203	0.8859	-14.7188	0.2966	7.5892	0.8667
Fired Upon	1.9629	0.0266	-18.7234	0.8410	-23.9540	0.8964	-13.2484	0.3747	11.2349	0.9407
Hijacked	- 1.2737	0.1367	3.1382	< .0001	1.6455	0.0043	4.0282	0.0001	11.4052	0.9475
Barge	12.8282	0.9854	-13.7277	0.9867	14.0714	0.9865	0.2842	0.9986	0	
Bulk Carrier	- 0.2150	0.8669	0.6109	0.2627	0.8181	0.1008	0.5034	0.6309	-10.6013	0.9562
Chemical Tanker	- 0.2325	0.8597	- 0.2382	0.6814	0.8251	0.1077	0.1242	0.9061	2.9903	0.9891
Container	0.1911	0.8900	0.2035	0.7071	0.8585	0.0813	- 1.0022	0.5124	-10.2546	0.9572
Fishing Vessel	7.2366	0.9898	8.4488	0.9492	2.2165	0.1609	0.6873	0.7968	2.6852	0.9953
General Cargo	0.6444	0.6285	0.0908	0.8680	0.6304	0.2077	0.4105	0.7002	- 1.2999	0.9945
LNG Tanker	9.5603	0.9948	0.7768	0.6474	- 0.6626	0.7299	2.7685	0.9882	0	
LPG Tanker	- 0.8989	0.5896	0.4478	0.5596	1.9978	0.0184	- 0.7159	0.7061	12.0113	0.9556
Passenger Vessel	11.5427	0.9884	6.3845	0.9607	12.6601	0.9731	8.6242	0.8118	-25.7902	0.9732
Product Tanker	0.1199	0.9431	0.0334	0.9545	0.8981	0.1024	0.5576	0.6711	5.8267	0.9795
Refrigerated Cargo	10.0652	0.9819	- 1.7875	0.1306	0.4000	0.5960	- 5.4423	0.7552	-11.6494	0.9791
Research Vessel	10.9627	0.9845	- 8.7582	0.9847	-14.0351	0.9877	6.5227	0.9420	-23.9039	0.9592
Ro-Ro	9.9474	0.9820	1.3033	0.1871	1.3739	0.2214	- 8.8686	0.8773	- 8.0247	0.9698
Supply Ship	- 5.0716	0.1027	- 0.4533	0.7619	- 2.1202	0.1054	6.6863	0.5886	- 7.2343	0.9887
Tanker	- 0.9953	0.4695	0.5602	0.3432	0.9389	0.0938	- 5.1473	0.4732	-18.0568	0.9226
Tug	- 1.1655	0.4512	0.3405	0.5891	1.6225	0.0113	0.4353	0.7385	- 3.9759	0.9886
Vehicle Carrier	9.9469	0.9839	- 0.2133	0.8655	12.7187	0.9463	7.3448	0.9212	- 6.9618	0.9808
Yacht	14.2853	0.9871	3.7535	0.9973	8.6225	0.9968	10.0602	0.9678	0	
Year Built	0.0591	0.0048	- 0.0127	0.1886	0.0077	0.3903	- 0.0031	0.8994	0.7542	0.0791
Algeria	11.7467	0.9935	8.3327	0.9720	13.4434	0.9826	- 9.8070	0.9197	0	
Antigua	- 0.4135	0.8352	- 0.5396	0.5128	0.9514	0.1773	0.6513	0.6455	18.2036	0.9176
Austria	10.0916	0.9969	-13.8914	0.9933	14.7486	0.9965	0.1983	0.9995	0.5220	0.9991
Bahamas	- 0.3797	0.8444	- 0.0469	0.9553	1.1779	0.1342	0.4242	0.7874	- 3.2569	0.9840

Table A-1. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Bahrain	8.5501	0.9978	-13.9910	0.9933	15.8333	0.9962	- 0.8704	0.9980	10.5882	0.9802
Bangladesh	11.6945	0.9927	- 0.7101	0.7829	- 0.0474	0.9739	- 9.6431	0.9166	0	
Barbados	11.2905	0.9910	- 0.6768	0.6627	0.9499	0.4974	- 2.0349	0.9895	14.1202	0.9683
Belgium	10.7894	0.9965	-13.3139	0.9936	15.0531	0.9964	- 5.8599	0.9866	2.9379	0.9962
Belize	12.1159	0.9896	1.3212	0.3225	- 1.3205	0.2954	- 7.5294	0.9505	22.0066	0.9687
Bermuda	7.4959	0.9945	19.0849	0.838 0	-14.5943	0.9931	11.4742	0.5655	0	
Bulgaria	11.5623	0.9962	12.3475	0.9967	-16.8947	0.9960	14.7403	0.9957	0	
Canary Islands	4.6349	0.9986	5.0807	0.9987	14.6568	0.9965	15.4434	0.9963	0	
Cayman Islands	8.8093	0.9947	3.3827	0.9966	9.5159	0.9965	9.1695	0.9540	-21.0030	0.9862
China	10.9263	0.9862	- 1.5124	0.4169	1.9375	0.2416	2.4806	0.4993	0	
Comoros	11.1208	0.9901	- 1.2023	0.5749	1.7656	0.3911	7.7159	0.8634	8.1173	0.9890
Croatia	11.0310	0.9938	- 0.9627	0.6060	13.6106	0.9878	2.8570	0.9876	0	
Cyprus	10.3438	0.9735	- 0.4017	0.6469	0.4990	0.5027	- 7.8145	0.8279	4.6616	0.9772
Denmark	10.0516	0.9852	- 0.4111	0.7057	2.3375	0.0665	0.9675	0.6537	5.8895	0.9797
Dominica	13.2733	0.9956	-14.4705	0.9930	13.9565	0.9957	- 0.0515	0.9999	0	
Egypt	10.7038	0.9944	-11.6029	0.9888	13.1225	0.9693	6.5218	0.9725	- 4.3478	0.9954
Ethiopia	8.8733	0.9960	2.1315	0.9984	11.6859	0.9960	10.0548	0.9666	0	
France	10.0518	0.9694	0.2563	0.8641	- 0.1176	0.9461	- 3.1845	0.9173	4.7770	0.9954
Germany	- 3.1353	0.1567	- 0.8783	0.4706	1.0161	0.3569	2.4748	0.2859	2.2211	0.9925
Gibraltar	8.8517	0.9892	- 0.6356	0.6455	11.8934	0.9447	1.4888	0.6467	5.0409	0.9815
Greece	10.5742	0.9827	- 0.5596	0.6429	0.4308	0.6451	5.0622	0.4867	7.6242	0.9621
Honduras	11.9257	0.9950	16.7382	0.9937	- 1.5862	0.3146	- 0.2405	0.9992	0	
Hong Kong	10.7217	0.9624	0.4620	0.5838	1.1164	0.1372	- 0.6356	0.6701	0.7750	0.9966
India	- 1.0112	0.5999	- 0.5754	0.5950	- 0.5102	0.5525	2.4488	0.9690	- 8.9289	0.9564
Indonesia	12.0751	0.9763	0.2946	0.7704	0.6770	0.5232	- 0.9562	0.6248	1.1455	0.9972
Iran	13.2369	0.9885	- 1.2015	0.6974	14.0485	0.9784	7.0689	0.7845	0	
Isle of Man	10.0754	0.9836	- 1.3961	0.2823	1.7541	0.1637	- 6.0815	0.9183	-10.8585	0.9561
Italy	10.2806	0.9808	- 2.7739	0.0478	12.5141	0.9478	- 1.0317	0.5740	3.0785	0.9915
Jamaica	11.7417	0.9965	3.7632	0.9982	11.0584	0.9974	6.9287	0.9846	0	
Japan	9.8114	0.9931	0.7121	0.6687	0.4995	0.7923	- 7.1403	0.9625	0	
Jordan	11.2849	0.9900	- 0.8499	0.5684	13.4749	0.9763	1.4013	0.5962	0	
Kenya	7.0596	0.9978	4.5676	0.9988	14.9722	0.9964	15.3179	0.9964	0	
Kiribati	11.1102	0.9920	- 0.0028	0.9992	0.0827	0.9542	- 9.3216	0.8929	0	
Kuwait	10.1469	0.9955	- 12.7199	0.9900	-15.2546	0.9937	9.2139	0.9655	0	
Liberia	- 0.7853	0.6519	- 0.3873	0.6191	0.1915	0.7686	- 0.0802	0.9537	9.0972	0.9548

Table A-1. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Libya	10.9212	0.9926	-13.8459	0.9848	12.0906	0.9885	- 1.3050	0.9939	0	
Lithuania	- 1.1518	0.9995	2.4260	0.1414	0.2791	0.8513	8.9521	0.6098	0	
Luxembourg	9.4687	0.9939	0.2463	0.8647	- 1.9536	0.1664	3.3524	0.9826	- 0.6494	0.9988
Malaysia	13.3539	0.9625	0.3013	0.7313	0.9786	0.2497	- 0.0813	0.9574	- 1.7949	0.9940
Malta	0.2844	0.8829	- 0.5633	0.4987	0.0097	0.9888	- 0.5158	0.6885	14.5388	0.9332
Marshall Islands	- 1.2327	0.4945	- 0.1303	0.8698	0.6908	0.3139	0.0321	0.9815	9.1147	0.9581
Mongolia	12.4912	0.9900	- 1.4471	0.4869	13.4381	0.9761	- 9.5800	0.9130	0	
Netherlands	- 3.3671	0.0728	- 0.4311	0.6893	-0.2743	0.7467	1.5939	0.6508	10.8266	0.9581
Nigeria	9.6397	0.9961	16.0933	0.9939	-2.2382	0.1610	21.8112	0.9632	10.2771	0.9819
North Korea	12.1855	0.9809	7.2972	0.9283	-0.9485	0.5687	- 0.8984	0.6983	0	
Norway	- 1.3745	0.4869	- 0.9582	0.3686	0.0338	0.9674	- 5.4895	0.8918	17.9928	0.9203
Pakistan	11.0564	0.9873	3.8474	0.9962	8.3123	0.9953	7.0784	0.9571	- 7.6363	0.9728
Panama	- 1.0121	0.5303	- 0.8336	0.2707	0.4436	0.4766	- 1.6789	0.1304	7.4644	0.9630
Philippines	10.7575	0.9889	- 2.1345	0.2411	-1.5886	0.2450	- 9.6939	0.8993	0	
Portugal	8.9856	0.9963	0.3617	0.8210	14.9481	0.9949	10.4315	0.6189	0	
Qatar	11.0531	0.9946	-12.6498	0.9897	13.8817	0.9869	5.0002	0.9798	0	
Russia	9.3142	0.9962	10.3618	0.9186	10.7934	0.9802	- 8.5028	0.9713	0	
Saudi Arabia	10.4857	0.9953	14.8731	0.9898	-1.2872	0.4183	5.8346	0.8489	0	
Seychelles	6.3921	0.9967	-12.2854	0.9907	13.5144	0.9848	- 4.7591	0.9787	0	
Sierra Leone	9.4984	0.9966	5.0645	0.9966	10.8194	0.9964	6.1601	0.9803	- 5.1207	0.9980
Singapore	- 0.8596	0.6300	- 0.0829	0.9161	0.0917	0.8904	- 0.2136	0.8872	- 2.0252	0.9901
South Korea	10.7268	0.9891	2.1277	0.1391	12.4063	0.9730	1.7986	0.9847	0	
Spain	2.9395	0.9981	- 1.0319	0.9949	11.1449	0.9793	9.4236	0.8968	0	
St. Kitt/Nevis	12.4769	0.9800	- 0.6617	0.5739	0.6705	0.5282	0.2927	0.8580	16.6015	0.9628
St. Vincent	- 0.2243	0.9072	- 2.1507	0.0489	-0.0318	0.9690	- 0.5215	0.6944	1.5462	0.9985
Switzerland	8.4071	0.9957	0.2562	0.8639	15.7132	0.9933	- 7.8635	0.9631	- 7.6315	0.9820
Taiwan	11.6096	0.9964	3.4355	0.9983	9.4284	0.9978	7.1299	0.9840	4.3973	0.9975
Thailand	10.9286	0.9837	0.5787	0.6191	0.0013	0.9989	- 2.2144	0.2527	1.1068	0.9975
Togo	11.6126	0.9919	7.8364	0.9486	13.6445	0.9765	7.9479	0.8609	0	
Turkey	11.4920	0.9806	- 1.1451	0.3770	0.2508	0.8241	1.0145	0.7255	22.1361	0.9439
Tuvalu	11.6368	0.9898	- 0.1945	0.8844	0.4481	0.7330	1.8705	0.9879	17.9844	0.9693
UAE	11.7362	0.9889	7.8910	0.9342	14.0534	0.9616	13.5045	0.1975	-14.8680	0.9877
UK	10.1428	0.9827	- 0.6477	0.5829	0.1901	0.8348	- 0.6450	0.7267	10.1806	0.9783
Ukraine	10.8149	0.9970	16.6552	0.9956	16.0159	0.9962	- 7.9640	0.9818	15.0440	0.9755
USA	9.9591	0.9540	- 1.7838	0.1344	1.1090	0.3027	- 4.2887	0.7255	0	
Vanuatu	9.6240	0.9932	1.3977	0.3335	11.8755	0.9586	- 6.6998	0.9566	22.8780	0.9453

Table A-1. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Vietnam	9.9541	0.9903	0.6013	0.5933	0.6332	0.6282	- 6.1409	0.9348	0	
Malacca	- 0.8738	0.6131	- 1.1325	0.3518	-0.8731	0.5593	3.9782	0.1087	- 5.3800	0.8574
Southeast Asia	2.6381	0.0663	- 1.0521	0.1900	-0.3850	0.7356	- 9.7233	0.5549	5.9336	0.8810
Far East	1.8551	0.2060	- 0.6724	0.4144	-0.1754	0.8807	- 9.3990	0.7335	-10.7223	0.7198
Indian	1.7883	0.1959	- 2.1708	0.0104	0.4523	0.6951	-10.0716	0.7075	- 1.1142	0.9695
Americas	3.8318	0.0305	- 0.4725	0.5595	0.0068	0.9953	-14.5098	0.6222	1.8003	0.9811
Somalia	1.3499	0.3176	- 0.9273	0.3237	-3.3482	0.0078	- 0.1186	0.9521	- 5.2310	0.9702
Aden	2.1133	0.1254	0.4359	0.6699	-2.8270	0.0284	0.7073	0.7211	3.9582	0.9802
Africa	4.0188	0.0135	- 0.8432	0.2891	-0.0658	0.9539	- 0.5860	0.7770	0.8305	0.9799

Table A-2. Complete results for all variables from Model B

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Cooperation	- 2.1430	0.0002	- 0.1138	0.5597	0.1928	0.3032	- 0.1857	0.7876	- 9.8169	0.4340
Best Practice	- 0.0459	0.9361	- 0.7533	0.0002	- 1.3963	< .0001	- 0.1583	0.8472	- 0.4027	0.9761
Berthed	- 0.6260	0.5109	- 0.7328	0.0523	- 0.2954	0.3488	- 9.6163	0.7397	6.9831	0.8270
Attempted	2.3026	0.0135	-16.8542	0.8489	-25.1462	0.8866	-12.0239	0.4121	3.9612	0.9375
Fired Upon	1.9932	0.0225	-18.6879	0.8415	-24.3404	0.8957	-12.9658	0.4059	15.1066	0.9347
Hijacked	- 0.6691	0.4337	3.1086	<.0001	1.5380	0.0054	3.9646	<.0001	7.8355	0.9613
Barge	12.5219	0.9859	-13.7018	0.9866	14.1578	0.9860	1.2235	0.9946	0	
Bulk	- 0.4550	0.7320	0.6332	0.2408	0.8024	0.1077	0.4301	0.6795	-11.8171	0.9540
Chemical	- 0.6170	0.6485	- 0.2609	0.6502	0.7318	0.1516	- 0.0942	0.9280	- 1.7205	0.9939
Container	- 0.0407	0.9775	0.1739	0.7456	0.7076	0.1491	- 1.2855	0.3825	- 4.7927	0.9816
Fishing	6.7045	0.9891	8.2322	0.9502	1.9041	0.2365	1.8648	0.3854	- 7.1775	0.9897
General Cargo	0.1110	0.9353	0.0767	0.8871	0.5713	0.2545	0.0599	0.9550	-11.8407	0.9544
LNG	9.1344	0.9950	0.8374	0.6220	- 0.5824	0.7547	2.1810	0.9905	0	
LPG	- 1.1780	0.4819	0.4472	0.5582	1.8671	0.0278	- 0.8188	0.6674	5.4710	0.9808
Passenger	10.3633	0.9868	6.6294	0.9542	13.2135	0.9678	8.1952	0.6854	- 8.4099	0.9929
Product Tanker	- 0.1174	0.9440	0.0264	0.9638	0.8008	0.1432	0.0074	0.9956	- 5.4557	0.9793
Refrigerated Cargo	9.8376	0.9821	- 1.7469	0.1382	0.3930	0.5980	- 5.4212	0.7211	- 4.0369	0.9920
Research Vessel	10.3276	0.9837	- 8.6762	0.9846	-14.1363	0.9877	4.8622	0.9622	-21.4463	0.9626
Ro-Ro	9.5907	0.9831	1.2675	0.1909	1.1028	0.3151	-10.3958	0.8355	-10.2723	0.9651
Supply Ship	- 6.2978	0.0304	- 0.5087	0.7281	- 2.2395	0.0784	6.7847	0.6621	-15.2653	0.9785
Tanker	- 1.2255	0.3831	0.5683	0.3326	0.8714	0.1183	- 5.3828	0.4794	-15.9429	0.9379
Tug	- 1.6623	0.2988	0.3103	0.6009	1.6151	0.0107	0.3925	0.7592	- 7.9299	0.9786
Vehicle	9.8846	0.9844	- 0.2012	0.8728	12.5693	0.9416	5.3279	0.9292	- 5.7424	0.9869
Yacht	12.7025	0.9901	3.3050	0.9975	8.7108	0.9969	3.4063	0.9885	0	
Built	0.0540	0.0053	- 0.0119	0.2199	0.0091	0.3066	- 0.0040	0.8636	0.2760	0.6785
Algeria	12.5841	0.9932	8.3385	0.9721	13.4639	0.9833	- 9.8240	0.9196	0	
Antigua	0.4190	0.8190	- 0.5042	0.5429	1.0481	0.1368	0.9395	0.4872	2.6551	0.9904
Austria	11.2385	0.9965	-13.9044	0.9933	14.8027	0.9965	1.2343	0.9970	6.8588	0.9868
Bahamas	0.1904	0.9104	- 0.0592	0.9438	1.0189	0.1860	0.3959	0.7921	- 3.3285	0.9875
Bahrain	9.3321	0.9975	-13.9558	0.9933	15.6984	0.9963	- 2.3293	0.9948	2.7211	0.9954
Bangladesh	10.6723	0.9968	- 0.7054	0.7866	- 0.1142	0.9365	- 9.6326	0.9164	0	
Barbados	11.8944	0.9898	- 0.6603	0.6639	- 0.6439	0.6413	- 6.0420	0.9670	14.6040	0.9665
Belgium	10.6723	0.9968	-13.7781	0.9934	14.2580	0.9966	- 7.4181	0.9818	2.6860	0.9963
Belize	12.1803	0.9900	1.2654	0.3389	- 1.4937	0.2294	- 5.2952	0.9488	8.1038	0.9889

Table A-2. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Bermuda	6.5811	0.9948	18.8278	0.8404	-14.6699	0.9930	11.0055	0.5374	0	
Bulgaria	12.3734	0.9959	12.2447	0.9968	-17.3082	0.9959	14.6889	0.9956	0	
Canary Islands	5.7451	0.9982	5.3059	0.9986	14.8688	0.9965	14.1652	0.9966	0	
Cayman Islands	9.7466	0.9943	3.3551	0.9966	9.7259	0.9950	4.8651	0.9763	-14.5739	0.9896
China	11.3107	0.9859	-1.4817	0.4351	1.9780	0.2589	1.8125	0.5207	0	
Comoros	12.1826	0.9896	-1.3843	0.4933	1.2429	0.4942	6.9206	0.8216	4.1967	0.9950
Croatia	11.9261	0.9933	0.9677	0.6062	13.0032	0.9847	2.5338	0.9891	0	
Cyprus	10.9228	0.9723	-0.3441	0.6959	0.5038	0.4932	-7.8264	0.8274	-8.8361	0.9670
Denmark	11.0776	0.9836	-0.4048	0.7087	2.1125	0.0939	1.1122	0.5812	-1.2203	0.9964
Dominica	14.2392	0.9952	-14.4463	0.9930	13.9962	0.9967	0.6535	0.9985	0	
Egypt	11.0317	0.9944	-11.9741	0.9885	12.1769	0.9755	3.4708	0.9840	-8.4699	0.9897
Ethiopia	9.4214	0.9959	1.4745	0.9989	10.7815	0.9963	6.0063	0.9786	0	
France	10.1766	0.9607	0.3501	0.8156	0.1021	0.9551	-2.7210	0.8772	-7.5612	0.9935
Germany	-2.3718	0.2270	-0.8190	0.5025	1.1058	0.3218	2.4264	0.8274	-0.0015	1.000
Gibraltar	9.7238	0.9983	-0.8315	0.5425	11.7785	0.9523	0.7909	0.7389	3.7622	0.9891
Greece	11.4748	0.9808	-0.5054	0.6768	0.3849	0.6794	5.2010	0.4987	5.8094	0.9819
Honduras	12.6715	0.9946	16.7355	0.9937	-1.4631	0.3531	0.9753	0.9970	0	
Hong Kong	11.2421	0.9625	0.4793	0.5699	0.8995	0.2250	-1.0773	0.4553	3.6526	0.9874
India	-0.4492	0.7956	-0.5723	0.5984	-0.5429	0.5233	2.0646	0.9743	-8.8742	0.9670
Indonesia	11.7159	0.9791	0.3264	0.7468	0.7274	0.4869	-0.8634	0.6548	-8.3876	0.9850
Iran	13.2468	0.9900	-1.1866	0.6865	13.7842	0.9780	5.9739	0.8281	0	
Isle of Man	10.9906	0.9825	-1.3563	0.2976	1.5559	0.2056	-5.2317	0.9317	-10.3662	0.9666
Italy	11.1451	0.9792	-2.7922	0.0481	12.4238	0.9464	-1.1015	0.5469	-12.8545	0.9622
Jamaica	12.1891	0.9965	3.1341	0.9985	10.0005	0.9976	4.0008	0.9905	0	
Japan	10.7511	0.9922	0.7043	0.6732	0.3506	0.8482	-5.9384	0.9698	0	
Jordan	12.0506	0.9892	-0.8965	0.5357	13.6843	0.9811	1.5249	0.5516	0	
Kenya	7.9594	0.9975	4.8196	0.9987	15.2428	0.9964	13.9997	0.9966	0	
Kiribati	12.1892	0.9918	0.0688	0.9795	-0.0766	0.9583	-11.2925	0.8662	0	
Kuwait	11.7969	0.9943	-12.6706	0.9900	-15.3353	0.9963	7.1820	0.9773	0	
Liberia	-0.0971	0.9484	-0.3929	0.6154	0.0979	0.8791	0.0419	0.9748	4.7109	0.9824
Libya	11.7531	0.9924	-13.8913	0.9848	11.7827	0.9869	-1.3893	0.9935	0	
Lithuania	-0.5538	0.9997	2.4006	0.1458	0.2464	0.8665	8.1651	0.5926	0	
Luxembourg	9.6674	0.9942	0.1174	0.9357	-2.0111	0.1468	2.6411	0.9885	-17.3227	0.9673
Malaysia	14.7953	0.9546	0.3365	0.7023	0.9919	0.2400	-0.3947	0.7873	-9.5847	0.9716
Malta	0.7199	0.6722	-0.5645	0.5006	-0.0766	0.8860	-0.7739	0.5277	8.5896	0.9694

Table A-2. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Marshall Islands	- 0.5686	0.7162	- 0.1818	0.8198	0.4972	0.4633	0.0485	0.9708	0.3011	0.9988
Mongolia	12.3266	0.9909	- 1.5093	0.4606	13.7005	0.9808	- 9.5902	0.9129	0	
Netherlands	- 2.5151	0.1211	- 0.4090	0.7056	- 0.3369	0.6902	1.1571	0.6798	9.7157	0.9676
Nigeria	10.2735	0.9959	16.1058	0.9939	- 2.1654	0.1761	21.4521	9.9633	- 6.8862	0.9888
North Korea	12.4413	0.9825	7.0235	0.9359	- 1.4358	0.3485	- 1.9038	0.2995	0	
Norway	- 1.0069	0.5731	- 0.9385	0.3760	- 0.1373	0.8656	- 5.5079	0.9035	3.1277	0.9888
Pakistan	10.9751	0.9883	3.3575	0.9966	8.5091	0.9956	2.4455	0.9841	4.4859	0.9863
Panama	- 0.2522	0.8531	- 0.8166	0.2823	0.3731	0.5449	- 1.5804	0.1355	- 2.3947	0.9910
Philippines	11.4742	0.9883	- 2.2115	0.2295	- 1.6519	0.2203	- 9.6892	0.8983	0	
Portugal	10.0718	0.9958	0.3701	0.8171	15.0234	0.9949	9.9936	0.6510	0	
Qatar	11.8626	0.9943	-12.5846	0.9900	13.4244	0.9845	3.3495	0.9874	0	
Russia	10.2268	0.9958	10.3466	0.9191	10.9299	0.9808	- 6.9412	0.9768	0	
Saudi Arabia	11.1921	0.9950	14.9372	0.9898	- 1.3015	0.4071	5.7811	0.8313	0	
Seychelles	7.4778	0.9963	-12.2362	0.9909	13.0649	0.9827	- 6.1647	0.9715	0	
Sierra Leone	10.9402	0.9958	5.0744	0.9966	10.8950	0.9963	5.0958	0.9839	- 9.9430	0.9924
Singapore	- 0.1048	0.9458	- 0.0391	0.9605	0.0815	0.9014	- 0.2506	0.8620	- 6.6039	0.9753
South Korea	11.4486	0.9886	2.1508	0.1360	12.1400	0.9698	2.4830	0.9798	0	
Spain	3.7663	0.9974	- 0.8639	0.9957	11.6688	0.9814	5.4717	0.8513	0	
St. Kitt/Nevis	12.8643	0.9809	- 0.7147	0.5509	0.4775	0.6463	0.0810	0.9592	- 0.6746	0.9986
St. Vincent	0.1635	0.9239	- 2.2097	0.0470	- 0.0714	0.9297	- 0.7128	0.5755	- 3.5086	0.9967
Switzerland	9.3899	0.9952	0.2617	0.8617	15.5694	0.9934	- 7.6443	0.9665	- 1.3303	0.9972
Taiwan	11.8977	0.9966	2.8045	0.9987	8.7264	0.9979	5.5445	0.9869	-13.2749	0.9838
Thailand	11.5200	0.9825	0.6694	0.5687	0.2227	0.8213	- 1.7138	0.3494	1.9357	0.9962
Togo	12.5662	0.9914	7.7678	0.9472	13.5505	0.9761	7.5409	0.8117	0	
Turkey	11.9257	0.9816	- 1.1747	0.3688	0.1523	0.8955	0.1064	0.9622	2.0700	0.9956
Tuvalu	11.7971	0.9900	- 0.2464	0.8536	0.3960	0.7651	1.5297	0.9905	- 5.0846	0.9922
UAE	11.9935	0.9894	7.5031	0.9377	13.1186	0.9668	10.0474	0.3712	- 4.8003	0.9954
UK	10.9832	0.9813	- 0.6714	0.5688	- 0.0143	0.9871	- 0.7177	0.6885	- 8.8240	0.9859
Ukraine	11.7974	0.9966	16.6649	0.9956	15.7844	0.9962	- 8.0294	0.9818	10.5208	0.9809
USA	10.1345	0.9419	- 1.8384	0.1307	1.0175	0.3456	- 4.8835	0.7521	0	
Vanuatu	9.9287	0.9930	1.2511	0.3874	11.8061	0.9638	- 6.5807	0.9600	- 3.4964	0.9924
Vietnam	19.7956	0.9895	0.6193	0.5835	0.6008	0.6434	- 5.1249	0.9480	0	
Malacca	- 0.5760	0.7460	-1.1568	0.3424	- 0.9230	0.5343	3.6424	0.1627	- 3.7156	0.9779
Southeast Asia	2.8370	0.0256	-1.0826	0.1774	- 0.5040	0.6573	- 9.1977	0.5573	9.5173	0.9433
Far East	2.0225	0.1763	-0.7270	0.3774	- 0.2509	0.8294	0.1274	0.7541	- 5.0788	0.9691

Table A-2. Continued

Independent/ Control Variable	Outcome		Hostages		Stolen		Ransom Paid		Escape	
	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq	Estimate	Pr > ChiSq
Indian	2.0573	0.1406	-2.2229	0.0086	0.2755	0.8104	- 9.6324	0.6749	2.3775	0.9855
Americas	3.6793	0.0340	-0.5247	0.5163	- 0.1901	0.8692	-12.6128	0.6814	16.6643	0.9098
Somalia	0.5974	0.6579	-0.9210	0.3126	- 3.1751	0.0099	- 0.3340	0.8771	- 4.5939	0.9806
Aden	1.4806	0.2852	0.5739	0.5694	- 2.5105	0.0474	0.6561	0.7630	4.2075	0.9811
Africa	4.1288	0.0122	-0.8595	0.2796	- 0.1289	0.9095	- 0.3914	0.8611	3.5747	0.9784

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