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Research Article

On the Path of Piracy Legal Regulation from the Degree of Pirate Legal Interest Infringement: The Statistical Research Method as an Approach to Intervention

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The article encodes the data of piracy cases in recent ten years provided by the international maritime administration and splits the cases into nine variables: the occurrence sea area, whether the pirates boarded the vessel, the status of infringed ship, the type of vessel infringed, the registry of the infringed ship, carrying weapons by the pirates, the number of pirates, the treatment method, and the degree of infringement of legal interests, of which the first eight are independent variables and the degree of infringement of legal interests is dependent variables. It is concluded that the occurrence sea area, ship status, ship type, weapon carrying situation, and handling measures after piracy will generate significant impact on the dependent variables. In the dependent variables, there are five categories divided into potential damage offense, attempted infringement of property, accomplished infringement of property, complete violation of human health, complete violation of property, and human health, with the degree of legal interest violation increasing gradually. The Chi-square test shows that any of the independent variables will have an impact on the dependent variables. The evaluation of piracy by means of combined punishment for several crimes will fully take into account the development of piracy and the situation of the accomplished and attempted acts, so as to achieve the compatibility of crime and punishment.

1. Introduction

More than 90% goods of the world's trade are transported by sea [1]. Piracy and armed robbery against ships are one of the challenges facing the contemporary shipping industry and have a global impact on maritime trade and security [2]. Therefore, the rampant piracy poses a great threat to maritime security [3]. Specifically, the emergence of piracy poses a major threat to maritime trade, economic development, and the safety of seafarers [4]. For example, in January, 2021, sailors on a Liberian ship were kidnapped and killed by pirates in Sao Tome and Principe; in October 2020, a ship of Cyprus was shot and robbed by pirates in Ecuador; in March 2020, a Panamanian ship was robbed of its goods by pirates in Peru, with the crew being kept as hos-

tage and two crew members were injured. In May 2019, a Chinese ship was robbed of their cargo by pirates in Indonesia, and three people were kept as hostage; in May 2019, the crew of a ship of Cayman islands were injured by pirates, leaving one death and one injury [5]. Piracy poses a great threat to crews and the safety of maritime traffic.

As the international crime with universal jurisdiction recognized by the international community at the earliest time, all countries have been making efforts to eliminate piracy, such as signing a series of international law conventions on the piracy regulation, such as the *Geneva Convention on the High Seas*, the *United Nations Convention on the Law of the Sea*, the Convention for the *Suppression of Unlawful Acts against the Safety of Maritime Navigation*; regional treaties on piracy regulation were also reached, such

as the 10 ASEAN countries, together with China, Japan, South Korea, India, Sri Lanka, and Bangladesh signed the *Regional Cooperation Agreement on Combating Piracy and Armed Robbery against Ships in Asia* on November 11, 2004; deployment of escort warships, for example, the United Nations Security Council, with the consent of the transitional government of Somalia, successively adopted resolutions 1816, 1838, 1846 and 1851 in 2008, authorizing countries to send warships and aircraft to escort into Somalia to combat piracy. In December 2008, China also sent warships to the waters of Somalia to ensure the safety of Chinese ships, materials, and personnel, as well as the safety of ships carrying humanitarian supplies from international organizations.

The degree of the threats and attacks of the ships and crews are determined by the number of pirates, the possession of weapons by pirates, the time of the case, and many other factors with varying degrees. Piracy is defined as a crime by most countries in the world, for example, article 74 of the Canadian Criminal Code stipulates that anyone who engages in piracy constitutes a crime of piracy [6]. Another example is Article 198 of the Argentine criminal code, which stipulates several situations for the establishment of the crime of piracy [7]. In another example, the regulation of piracy in China is mainly focused on the crime of robbery under Article 263, intentional injury under Article 234, intentional homicide under Article 232, and hijacking of ships under Article 122 of the Chinese Criminal Law [8]. It can be seen from the above examples that there are two different legislative modes for the regulation of piracy in different countries. One is centralized regulation, that is, it is stipulated as the crime of piracy; the other is decentralized regulation, which stipulates that different charges are constituted. However, exploring the threat degree of different variables to crew and ships in practice is very important for the choice of legislative model. The existing researches have not carried out studies this problem from the above perspectives.

In order to achieve the above objectives, the motivation of this article is to discuss the legislative model to regulate piracy based on the analysis of the relevant variables which affect the degree of infringement of pirates' legal interests. The specific method is to use statistical software to study the relevant variables affecting the degree of piracy legal interest infringement. It is concluded that different variables can affect the degree of piracy legal interest infringement to varying degrees. On this basis, this paper summarizes the legislative models of piracy in different countries, and offers suggestions on the improvement of the legal regulation path of piracy. Major contribution of this paper is to explore the basic reasons affecting the legislative trend with the support of the data in practice, but not a simple logical analysis. The best way to explore the above contents is to collect practical data, through analysis with statistical software, classify the harm degree of the result of piracy cases in practice, that is, the degree of infringement of legal interests, from low to high, and explore the factors affecting the degree of harm result. Section 2 is the literature review, Section 3 is the data and methods of this article, Section 4 describes the results of the data, Section 5 is the discussion and conclusion, and Section 6 gives the limitations and plans of the paper.

2. Literature Review

It is possible due to the joint efforts of the international community to combat piracy, the number of piracy cases has seen decrease in recent years. For example, the data of the past decade studied in this article shows that the piracy cases in 2012 is 297, which has dropped to 132 piracy cases in 2021, posing a fluctuated decreasing trend, which is the result of the joint fight against piracy by the international community. Similarly, the number of pirate-related articles has also decreased in recent years. The years of rampant piracy witness the increase number of articles on piracy cases, whereas the number of piracy literature decreases in the year of reduced piracy cases. In recent years, including the previous researches on piracy, the research orientation mainly focuses on the legal regulation and measures of piracy, description of piracy, and so on.

2.1. Piracy Legal Regulation and Measures. In the legal regulation and measures of piracy, for example, some scholars have studied the reasons why Indonesia does not join the Asian regional cooperation agreement on combating piracy and armed robbery against ships [9]; some scholars hold the belief that countries should revise their domestic definition of piracy [10]; exploring the definition of piracy in the United Nations Convention on the law of the sea [11], sorting out the evolution of the concept of piracy [4], analyzing and describing the judgment of piracy cases of a certain county [12], outlining the different initiatives taken by the international community to combat piracy in Somalia [13]. Some scholars point out that insufficient international laws to solve the problem of territorial piracy, coupled with the lack of effective law enforcement in the special political, social, and economic conditions in some countries, resulting in a surge in piracy in their territorial waters [14]; some scholars have explored the purposes of piracy crime [15, 16]; some scholars have also explored the legislative model of piracy [17], etc. Among them, the exploration of legislative model is mainly divided into two views, one proposes the crime of piracy should be established to regulate piracy, and the other is that decentralized regulation should be adopted to evaluate different behaviors, in order to carry out combined punishment for several crimes. Scholars of the first viewpoint discuss from the following aspects: the transformation and application international conventions in domestic laws, the performance of international obligations without adding the crime of piracy cannot be achieved [18]; the failure of domestic criminal law to regulate the crime of piracy in some countries and the suspect cannot be trialed [19]; and if piracy is evaluated as the crime of robbery, countries with crimes such as kidnapping do not have universal jurisdiction [20], fight crime and protecting national maritime interests [21], and the objective of piracy crime is different from other crimes [22]. For the second view, some people believe that if the criminal law of a country has the sufficiency to investigate the piracy crimes as an

international obligation, there is no need to establish the crime of piracy for regulation [23].

The above discussion on the legal regulation of piracy crime has the following deficiencies: for example, the lack of effective law enforcement is not the problem of legal regulation, which is a separate issue from the legal provisions; in the exploration of the legislative model, international law only stipulates that member countries should regulate piracy in criminal law, not forcing countries to stipulate the crime of piracy. Therefore, the argument that international obligations cannot be fulfilled without adding the crime of piracy is untenable. In addition, if there is no piracy crime, the comprehensive evaluation of piracy can be realized and the trial of suspect still can be achieved. Moreover, the application of universal jurisdiction is not based on the correspondence of charges. It is not necessary to use the same crime to realize the protection of national marine security. Being different from other crimes, piracy involves the problem of single legal interest and compound legal interest, which stands for advantages and disadvantages of each, but the compound legal interest is not necessarily superior to the compound legal interest. In addition to the above deficiencies, the abovementioned scholars have adopted the method of logical analysis for the research arguments on the legal regulation of the crime of piracy, and it can be called as a pity to explore what kind of legislative model to be adopted from practice.

2.2. Pirate Description. In the description of piracy, for example, some scholars believe that countries with strong institutions and democratic regimes are less likely to commit piracy in the Gulf of Guinea than countries with weak institutions or without democratic regimes [24]. Some scholars explore the reasons affecting the development of piracy and emphasize that we should pay attention to the source of piracy rather than eliminate it [25]. Based on the emphasis on the causes of piracy, some scholars have summarized and combed the adverse consequences of piracy [26]. Some scholars have made evaluation of the impact of terrorism and piracy on marine-related economic activities in the Niger Delta of Nigeria [27]. Some scholars' research results showed that the impact of piracy on maritime transportation in the Indian Ocean is weakening through the statistical analysis of ship tracking data in five years [28]. Some scholars explore the evolution of counterpiracy measures [29]. Some scholars determine the nature and extent of the global piracy threat based on the literature review of formal and informal publishing sources [30]. Some scholars use quantitative and qualitative research methods to draw the conclusion that seafarers are familiar with piracy, and they know that piracy usually occurs in Somalian territory waters and other threatening areas, and the international community plays a role in working together to help seafarers protect their lives in these difficult times [31]. Some scholars explain the causes of piracy [32], or explain that piracy has undergone substantial changes compared with before, such as upgraded weapons [33], describe the phenomenon of piracy in Somalia [34], analyze the development and change of piracy in the world [35] and description of piracy in Nigeria

[36], analyze the reasons behind the piracy phenomenon, and believe that the widespread poverty, economic difficulties and sociopolitical instability in the countries where pirates live are the major driving factors [37]. Some scholars have concluded that the Navy will pose a threat to pirates [38]. So far, some scholars have also used a statistical modelling perspective to explore the phenomenon of the causes of piracy, for example, the study shows factors such as military capability, population size, length of coastline, and volume of trade are statistically associated with piracy, but the predictive effect of state vulnerability is by far the strongest [39].

In the above literature, the author uses different research methods to explore the phenomenon of piracy and the causes behind it from different angles, but the article does not further study how to regulate the causes, especially the legal regulation. Moreover, most scholars only use the method of logical analysis but do not combine logical analysis with empirical analysis. Only a few scholars use statistical methods to explore the reasons behind piracy. However, on the one hand, scholars who use the data of the international maritime administration information sharing platform do not use the data of recent ten years, which results in small data base span and small sample size selection, which may lead to unclear results. On the other hand, scholars who use empirical analysis have not explored how to use reasons to regulate piracy, which is a missing element in the study.

In previous studies, although the articles related to law have explored the purpose of crime, legislative model, piracy, and reasons, they have not explored the specific conditions in practice which could lead to the increase of the infringement degree of legal interests and the decrease of the infringement degree of legal interests. These conditions will essentially affect the legislative trend and the orientation of crime prevention. In the previous literature, no one used statistical methods to study the degree of piracy legal interest infringement from piracy data and related variables. Therefore, this paper will explore from this approach.

3. Data and Methods

(i) From the international maritime administration, piracy cases in the decade 2012-2021, a total of 2112 cases are obtained, which are divided into nine variables: the sea area, pirates boarding status, the situation of the infringed ship, the type of the infringed ship, the nationality of the infringed ship, the weapon carrying situation of pirates, the number of pirates, the handling method, and the degree of legal interest infringement

(ii) As for the coding of case variables, the sea area of occurrence adopts the classification method in the annual report of the international maritime bureau, which is divided into nine categories: Southeast Asia (including Malacca) = 0, Southeast Asia (excluding Malacca) = 1, East Asia = 2, Indian subcontinent = 3, America = 4, Africa (excluding Gulf of Aden/ Red Sea/Somalia) = 5, rest of the world = 6, Africa (including Gulf of Aden/Red Sea/Somalia) = 7,
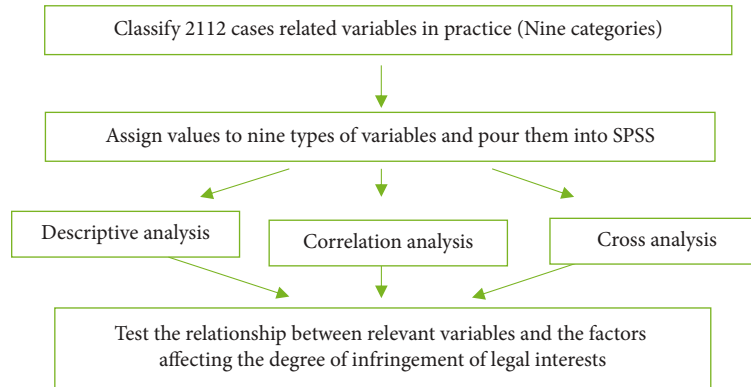
FIGURE 1: The specific work chart.

and far east = 8. Whether pirates board the ship is divided into two categories: yes = 1 and no = 0. The status of the infringed ship is divided into two categories: dynamic = 1 and static = 2, in which static includes static anchored and berthed. The types of infringed ships are oil ships = 1, cargo ships = 2, and functional ships = 3: oil ships include LPG ships, oil tanker products, oil tankers, etc.; cargo ships include containers, bulk cargo, etc.; and functional ships include landing craft, fishing boats, maritime support ships, etc. The registry of the infringed ship is divided into two categories: developed country = 1 and developing country = 2. The weapon carrying status can be divided into three categories: gun = 1, knife = 2, and others = 3 (including crowbars); when carrying both guns and knives, it is categorized into the group of guns. The treatment methods include timely alarm = 0, safety group intervention = 1, timely detection and pursuit = 2, immediate intervention of the authorities = 3, intervention of the authorities after the event = 4, discovery after the event = 5, and others = 6. Others include ship reinforcement, speed-up, etc. The degree of infringement of legal interests includes five categories: potential damage offense = 0, attempted infringement of property = 1, accomplished infringement of property = 2, complete violation of human health = 3, and complete violation of property and human health = 4. Potential damage offense includes the situation of escaping without boarding and doing nothing after boarding; attempted infringement of property includes escape after boarding; accomplished infringement of property includes theft of property, goods, personal belongings of crew members, damage to equipment on board, etc.; accomplished violation of human health includes the kidnapping, threat, injury and killing of the crew; and accomplished violation of property and human health includes the situation of infringement on both property and human health

(iii) Descriptive analysis, the correlation analysis, and cross analysis are conducted on the above variables

with the application of statistical software (SPSS), gaining the test results of the relationship between relevant variables and the factors affecting the degree of legal interest infringement

The specific work flow chart is as follows (see Figure 1).

4. Results

4.1. Descriptive Analysis. In the decade from 2012 to 2021, the sample size of piracy cases was 2112. Among them, Southeast Asia (excluding Malacca) has the largest number of piracy cases, accounting for 41.9% of global cases. The number of pirates on board was 1765, accounting for 83.57% of the category whether boarded. Among the types of ships infringed, 1812 oil and cargo ships with high cargo value account for 85.8%. 71.35% of the infringed ships are registered in developing countries. Knives account for 76.8% of the weapons carried. Among 2112 samples, the number of pirates is 48 at most, 1 at least, and the mode is 4. In the handling mode, timely alarm is the treatment mode adopted by most ships. In the degree of infringement of legal interests, the accomplished infringement of property accounts for 39.77%, followed by dangerous crime and attempted infringement of property, which account for almost the same proportion (see Table 1–2 for details).

4.2. Correlation Analysis. The correlation analysis is used to study the correlation between the degree and year of legal interest infringement, the sea area, whether boarded, month, ship status, ship type, the nationality of the infringed ship, the number of pirates, weapons carrying situation, and handling methods. The Spearman correlation coefficient is used to express the strength of the correlation. Specific analysis shows the following.

The correlation coefficient between the degree of infringement of legal interests and the year is -0.046, showing a significant level of 0.05, which demonstrates a significant negative correlation between the degree of infringement of legal interests and the year. The correlation coefficient between the degree of infringement of legal interests and months is 0.044, reflecting a significant level of 0.05, which shows that there is a significant positive

TABLE 1: Descriptive analysis results.

Name	Sample size	Minimum value	Maximum value	Average value	Standard deviation	Median
Number of pirates	2112	1.000	48.000	4.619	2.971	4.000

TABLE 2: Descriptive analysis results.

Category	Option	Frequency	Percentage (%)
	Southeast Asia (including Malacca)	10	0.47
	Southeast Asia (excluding Malacca)V	885	41.90
	East Asia	66	3.13
	Indian subcontinent	169	8.00
Occurrence sea area	America	223	10.56
	Africa (excluding Gulf of Aden/Red Sea/Somalia)	604	28.60
	Rest of the world	9	0.43
	Africa (including Gulf of Aden/Red Sea/Somalia)	116	5.49
	Far east	30	1.42
Whether boarded	No	347	16.43
	Yes	1765	83.57
Status of infringed ship	Dynamic	783	37.07
	Static state	1329	62.93
	Oil ship	876	41.48
Type of vessel infringed	Cargo ship	936	44.32
	Functional ship	300	14.20
The registry of the infringed ship	Developed country	605	28.65
	Developing country	1507	71.35
	Gun	419	19.84
Carrying weapons	Knife	1622	76.80
	Other	71	3.36
	Timely alarm	1345	63.68
	Security group intervention	117	5.54
	Find and pursue in time	1	0.05
Handling method	The authorities stepped in immediately	93	4.40
	The authorities intervened afterwards	102	4.83
	Later discovery	265	12.55
	Other	189	8.95
	Potential damage offense	415	19.65
	Attempted infringement of property	418	19.79
Degree of infringement of legal interests	Accomplished infringement of property	840	39.77
	Complete violation of human health	105	4.97
	Complete violation of property and human health	334	15.81
Total		2112	100.0

correlation between the degree of infringement of legal interests and months. The correlation coefficient between the degree of infringement of legal interests and the number of pirates is 0.062, displaying a significant level of 0.01, which reveals that there is a significant positive correlation between the degree of infringement of legal interests and the number of pirates. The correlation coefficient between the degree of infringement of legal interests and the carrying of weapons is -0.022, close to 0, and the p value is $0.320 > 0.05$, which shows that there is no correlation between the degree of infringement of legal interests and the carrying of weapons. In addition, there is 0.01 level significance between the degree of legal interest infringement and the sea area, 0.01 level significance between the degree of legal interest infringement and whether boarded the ship, 0.01 level significance between the degree of legal interest infringement and the state of the ship, 0.01 level significance between the degree of legal interest infringement and the type of ship, 0.05 level significance between the degree of legal interest infringement

Table 3: Correlation analysis results.

Spearman correlation analysis results		
		Degree of infringement of legal interests
Year	Correlation coefficient	-0.046*
	p	0.034
Occurrence sea area	Correlation coefficient	-0.150**
	p	≤0.01
Whether boarded	Correlation coefficient	0.574**
	p	≤0.01
Month	Correlation coefficient	0.044*
	p	0.045
Status of infringed ship	Correlation coefficient	0.080**
	p	≤0.01
Type of vessel infringed	Correlation coefficient	0.156**
	p	≤0.01
The registry of the infringed ship	Correlation coefficient	0.054*
	p	0.014
Number of pirates	Correlation coefficient	0.062**
	p	0.005
Carrying weapons	Correlation coefficient	-0.022
	p	0.320
Handling method	Correlation coefficient	0.148**
	p	≤0.01

*$p \leq 0.05$, **$p \leq 0.01$.

and the type of registry of the infringed ship, and 0.01 level significance between the degree of infringement of legal interests and the handling methods, indicating that there is a significant correlation between the degree of infringement of legal interests and the above variables (see Table 3 for details).

4.3. Chi-Square Test. Chi-square test (cross-analysis) is used to study the differences the 9 items in different degrees of infringement of legal interests in different years, sea area, whether boarded, month, ship status, ship type, registry of the ship infringed, carrying weapons, and handling methods. There are significant differences in the degree of infringement of legal interests under these 9 items ($p \leq 0.05$). The specific results are as follows.

In terms of years, the degree of infringement of legal interests in years showed a significant level of 0.01 (chi = 150.627, $p \leq 0.01$). Through difference of the percentage comparison, it can be seen that the proportion of dangerous crimes in 2012 is the highest, 29.73%, which is significantly higher than the average level of dangerous crimes in other years (19.65%); the proportion of attempted property infringement in 2020 and 2021 are the highest, 29.74% and 26.52%, respectively, which are significantly higher than the average level of attempted property infringement in other years (19.79%); the highest proportion of property infringement and personal accomplishment occurs

in 2012, 22.97%, significantly higher than the average level of 15.81%.

From the perspective of the sea area, the degree of infringement of legal interests in the sea area shows a significant level of 0.01 (chi = 503.660, $p \leq 0.01$). Through difference of the percentage comparison, it can be seen that Africa, including the Gulf of Aden/Red Sea/Somalia and other regions in the world, has the highest proportion of dangerous crimes, 77.59% and 66.67, respectively, which are significantly higher than the average level of dangerous crimes in other sea areas (19.65%); the proportion of attempted property violations in Southeast Asia excluding Malacca is the highest, 25.76%, which is significantly higher than the average level of attempted property violations in other sea areas (19.79%); East Asia and the Indian subcontinent have the highest proportion of property violations, 72.73% and 68.05%, respectively, which are significantly higher than the average level of property violations in other sea areas (39.77%); Southeast Asia, including Malacca, has the highest proportion of personal violations of property, 40.00%, which is significantly higher than the average level of personal violations of property in other sea areas (15.81%).

In terms of whether boarded the ship, the degree of infringement of legal interests shows a significant level of 0.01 (chi = 1388.402, $p \leq 0.01$). Through difference of the percentage comparison, it can be seen that the proportion of dangerous crime without boarding (92.22%) is significantly higher than that of dangerous crime without boarding

(5.38%); the proportion of attempted property infringement, accomplished property infringement, and accomplished personal property infringement on board is significantly higher than that of attempted property infringement, accomplished property infringement. and accomplished personal property infringement on board.

In terms of months, the degree of infringement of legal interests in April shows a significant level of 0.01 (chi = 81.377, $p \leq 0.01$). Through the difference of percentage comparison, it can be seen that the proportion of dangerous crimes in April was 27.80%, which is significantly higher than the average level of dangerous crimes in other months of 19.65%; the proportion of attempted property infringement in October is 26.53%, which is significantly higher than the average level of 19.79% in other months; in February, 45.55% of the cases in February is accomplished, which is significantly higher than the average level of 39.77% in other months; 45.11% of attempted property infringement, 15.81% of accomplished property infringement, and accomplished personal property infringement occur in September, which are higher than the average of 39.77% and 15.81% in other months, respectively.

From the perspective of ship status, the ship status shows a significant level of 0.01 for the degree of infringement of legal interests (chi = 279.504, $p \leq 0.01$). Through the difference of percentage comparison, the proportion of dynamic dangerous crime and personal accomplishment of infringing property is significantly higher than that of static dangerous crime and accomplished personal property infringement; the proportion of static attempted and accomplished property infringement is significantly higher than that of dynamic attempted and accomplished property infringement.

From the perspective of ship types, the degree of infringement of legal interests by ship types is significant at the level of 0.01 (chi = 90.693, $p \leq 0.01$). Through the difference of percentage comparison, the proportion of personal infringement of property by functional ships is 23.67%, which is significantly higher than the average level of 15.81% by other ship types.

From the perspective of the type of the infringed ship, the type of the infringed ship shows a significant level of 0.01 for the degree of infringement of legal interests (chi = 27.161, $p \leq 0.01$). Through the difference of percentage comparison, the proportion of attempted infringement of property in developed countries is 24.13%, which is significantly higher than 18.05% in developing countries.

From the perspective of weapon carrying, the degree of infringement of legal interests by weapon carrying shows a significant level of 0.01 (chi = 248.112, $p \leq 0.01$). Through the difference of percentage comparison, the proportion of dangerous crimes with guns is 32.22%, which is significantly higher than the average level of dangerous crimes with other weapons of 19.65%. 44.88% of the cases carrying knives completes their property violations, which is significantly higher than the average level of 39.77% of those which carrying other weapons. 30.07% of the cases carrying guns had completes personal assault on property, which is significantly higher than the average level of 15.81% of those which carrying other weapons. 25.35% of the cases which complete

infringement of personal property with other weapons, which is significantly higher than the average level of 15.81% of the cases of accomplished infringement of personal property with knives and guns.

From the perspective of treatment methods, the handling methods shows a significant level of 0.01 for the degree of infringement of legal interests (chi = 942.500, $p \leq 0.01$). Through the difference of percentage comparison, the proportion of dangerous crimes in the safety group is 90.60%, which is significantly higher than the average level of dangerous crimes in other handling methods of 19.65%. The proportion of attempted infringement of property in timely alarm is 28.03%, which is significantly higher than the average level of 19.79%. 100.00% of attempted violations of property are detected and handled in a timely manner. The percentage of attempted infringement of property found after the incident is 95.09%, which is significantly higher than the average of 39.77% for attempted infringement of properties in other handling methods. After the intervention of the authorities, the proportion of accomplished personal property infringement is 35.29%, which is significantly higher than the average level of 15.81%. 32.26% of the cases with authorities involved result in accomplished personal property infringement, which is significantly higher than the average level of 15.81% in other handling methods (see Table 4 for details).

5. Discussion and Conclusion

According to the correlation analysis, we can conclude that the closer the year is, the lower the degree of infringement of legal interests, which can be reflected as the results of combating piracy by various countries and the international community. In a year, the degree of infringement of legal interests increases as the order of the months, indicating that the action against piracy in winter should be strengthened. The more pirates there are, the higher the degree of infringement of legal interests; hence, we should be vigilant against organized crime. Unexpectedly, from the correlation analysis, there is no correlation between the degree of infringement of legal interests and the hazard level of carrying weapons. This conclusion may be due to the replacement of the missing value by mode, which makes the final result inaccurate.

Chi-square test shows that the proportion of attempted property violations in 2020 and 2021 is the highest, which is significantly higher than the average level of attempted property violations in other years, maybe the result of countermeasures by countries. Compared with other regions in the world, Southeast Asia, including Malacca, has the highest proportion of accomplished violations of property and people, that is, its degree of legal interests is the most harmful. Attention of countries and the global community should be aroused in order to reduce the degree of infringement of piracy legal interests or even eliminate piracy in the region. In the variable of whether boarded, the degree of infringement of legal interests without boarding is less than that of boarding, which shows that it is useful to train crew members for the handling of piracy, getting rid of pirate

TABLE 4: Chi-square test results.

Variable	Name	Degree of infringement of legal interests (%)					Total	χ^2	p
		Potential damage offense	Attempted infringement of property	Accomplished infringement of property	Accomplished infringement of human health	Accomplished infringement of property and human health			
Year	2012	88 (29.73)	18 (6.08)	111 (37.50)	11 (3.72)	68 (22.97)	296		
	2013	48 (18.18)	52 (19.70)	111 (42.05)	12 (4.55)	41 (15.53)	264		
	2014	40 (16.33)	60 (24.49)	92 (37.55)	4 (1.63)	49 (20.00)	245		
	2015	33 (13.41)	62 (25.20)	107 (43.50)	13 (5.28)	31 (12.60)	246		
	2016	35 (18.32)	29 (15.18)	84 (43.98)	7 (3.66)	36 (18.85)	191		
	2017	35 (19.44)	33 (18.33)	68 (37.78)	16 (8.89)	28 (15.56)	180	150.627	≤0.01**
	2018	48 (23.88)	37 (18.41)	76 (37.81)	18 (8.96)	22 (10.95)	201		
	2019	29 (17.90)	34 (20.99)	53 (32.72)	19 (11.73)	27 (16.67)	162		
	2020	38 (19.49)	58 (29.74)	82 (42.05)	0 (0.00)	17 (8.72)	195		
	2021	21 (15.91)	35 (26.52)	56 (42.42)	5 (3.79)	15 (11.36)	132		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Occurrence sea area	Southeast Asia (including Malacca)	0 (0.00)	1 (10.00)	4 (40.00)	1 (10.00)	4 (40.00)	10		
	Southeast Asia (excluding Malacca)	99 (11.19)	228 (25.76)	362 (40.90)	36 (4.07)	160 (18.08)	885		
	East Asia	4 (6.06)	12v(18.18)	48 (72.73)	0 (0.00)	2 (3.03)	66	503.660	≤0.01**
	Indian subcontinent	12 (7.10)	25 (14.79)	115(68.05)	2 (1.18)	15 (8.88)	169		
	America	36 (16.14)	45 (20.18)	110(49.33)	3 (1.35)	29 (13.00)	223		
	Africa (excluding Gulf of Aden/Red Sea/Somalia)	165 (27.32)	100 (16.56)	178(29.47)	58 (9.60)	103 (17.05)	604		
	Rest of the world	6 (66.67)	0 (0.00)	1(11.11)	1 (11.11)	1 (11.11)	9		
	Africa (including Gulf of Aden/Red Sea/Somalia)	90 (77.59)	1 (0.86)	7 (6.03)	4 (3.45)	14 (12.07)	116		
	Far east	3 (10.00)	6 (20.00)	15 (50.00)	0 (0.00)	6 (20.00)	30		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Whether to board or not	No	320 (92.22)	0 (0.00)	19 (5.48)	7 (2.02)	1 (0.29)	347		
	Yes	95 (5.38)	418 (23.68)	821 (46.52)	98 (5.55)	333 (18.87)	1765	1388.402	≤0.01**
Total		415(19.65)	418(19.79)	840(39.77)	105(4.97)	334(15.81)	2112		
Month	1	47 (23.98)	33 (16.84)	81 (41.33)	11 (5.61)	24 (12.24)	196		
	2	45 (23.56)	25 (13.09)	87 (45.55)	7 (3.66)	27 (14.14)	191		
	3	43 (22.87)	35 (18.62)	64 (34.04)	12 (6.38)	34 (18.09)	188	81.377	≤0.01**
	4	57 (27.80)	42 (20.49)	65 (31.71)	14 (6.83)	27 (13.17)	205		
	5	50 (22.94)	48 (22.02)	85 (38.99)	5 (2.29)	30 (13.76)	218		

TABLE 4: Continued.

Variable	Name	Degree of infringement of legal interests (%)					Total	χ^2	p
		Potential damage offense	Attempted infringement of property	Accomplished infringement of property	Accomplished infringement of human health	Accomplished infringement of property and human health			
	6	20 (13.33)	26 (17.33)	66 (44.00)	7 (4.67)	31 (20.67)	150		
	7	22 (13.92)	37 (23.42)	67 (42.41)	5 (3.16)	27 (17.09)	158		
	8	24 (17.27)	30 (21.58)	50 (35.97)	7 (5.04)	28 (20.14)	139		
	9	12 (9.02)	23 (17.29)	60 (45.11)	7 (5.26)	31 (23.31)	133		
	10	28 (14.29)	52 (26.53)	82 (41.84)	5 (2.55)	29 (14.80)	196		
	11	32 (17.78)	33 (18.33)	72 (40.00)	14 (7.78)	29 (16.11)	180		
	12	35 (22.15)	34 (21.52)	61 (38.61)	11 (6.96)	17 (10.76)	158		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Status of infringed ship	Dynamic	261 (33.33)	115 (14.69)	178 (22.73)	69 (8.81)	160 (20.43)	783	279.504	≤0.01**
	Static state	154 (11.59)	303 (22.80)	662 (49.81)	36 (2.71)	174 (13.09)	1329		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Type of vessel infringed	Oil ship	214 (24.43)	194 (22.15)	313 (35.73)	27 (3.08)	128 (14.61)	876	90.693	≤0.01**
	Cargo ship	171 (18.27)	184 (19.66)	404 (43.16)	42 (4.49)	135 (14.42)	936		
	Functional ship	30 (10.00)	40 (13.33)	123 (41.00)	36 (12.00)	71 (23.67)	300		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
The registry of the infringed ship	Developed country	112 (18.51)	146 (24.13)	256 (42.31)	14 (2.31)	77 (12.73)	605	27.161	≤0.01**
	Developing country	303 (20.11)	272 (18.05)	584 (38.75)	91 (6.04)	257 (17.05)	1507		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Weapons carrying	Gun	135 (32.22)	31 (7.40)	95 (22.67)	32 (7.64)	126 (30.07)	419	248.112	≤0.01**
	Knife	270 (16.65)	375 (23.12)	728 (44.88)	59 (3.64)	190 (11.71)	1622		
	Other	10 (14.08)	12 (16.90)	17 (23.94)	14 (19.72)	18 (25.35)	71		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		
Treatment method	Timely alarm	247 (18.36)	377 (28.03)	460 (34.20)	52 (3.87)	209 (15.54)	1345	942.500	≤0.01**
	Security group intervention	106 (90.60)	1 (0.85)	7 (5.98)	3 (2.56)	0 (0.00)	117		
	Find and pursue in time	0 (0.00)	0 (0.00)	1 (100.00)	0 (0.00)	0 (0.00)	1		
	The authorities stepped in immediately	13 (13.98)	14 (15.05)	20 (21.51)	16 (17.20)	30 (32.26)	93		
	The authorities intervened afterwards	2 (1.96)	15 (14.71)	37 (36.27)	12 (11.76)	36 (35.29)	102		
	Later discovery	2 (0.75)	4 (1.51)	252 (95.09)	1 (0.38)	6 (2.26)	265		
	Other	45 (23.81)	7 (3.70)	63 (33.33)	21 (11.11)	53 (28.04)	189		
Total		415 (19.65)	418 (19.79)	840 (39.77)	105 (4.97)	334 (15.81)	2112		

*$p \leq 0.05$, **$p \leq 0.01$.

ships in time during navigation, and taking corresponding measures for pirate ships for the protection of property and lives. In addition, among the variables of month, September has the highest degree of infringement of legal interests. We should focus on strengthening the patrol of piracy in September to reduce the degree of infringement of legal interests of piracy. Combined with the analysis of the high degree of infringement of legal interests on dynamic navigation ships, the protection focus should be given to dynamic ships in September. According to the variables of ship type, the degree of legal interests infringed by functional ships is higher. According to the data, the ships involved by the onboard safety team in piracy cases are mostly oil tankers and cargo ships, perhaps because functional ships are rarely equipped with onboard safety teams. Compared with developing countries, the ships of developed countries suffer a higher degree of infringement of the legal interests of piracy, or it is related to the strength and attention of developed countries. The degree of infringement of the legal interests of carrying firearms is the highest compared with other weapons, indicating that it is necessary to strictly control the use of firearms and ammunition, and carrying knives can play an important role in looting property. The escape of pirates and the timely warning of crew members play a positive role in the protection of property on board, with the attempted infringement of property will be significantly higher than the average level of attempted infringement of property.

It can be seen from the above that those variables can have an impact on the degree of infringement of legal interests in piracy cases. In this paper, infringement of legal interests can be divided into infringement of people and property from the perspective of object, accomplished and attempted from the perspective of criminal form, and the cross-combination of the four can be divided into many kinds of charges. For example, theft, robbery, and robbery against property and crimes of intentional injury, intentional homicide, kidnapping, etc. As a result, there are dozens of combinations of accomplished and attempted crimes. Piracy is a complex body, and its specific form may violate a variety of crimes.

In international treaties, the *Geneva Convention on the High Seas*, the *United Nations Convention on the Law of the Sea*, and *the Convention for the Suppression of Unlawful Acts against the Safety of Maritime Navigation* all stipulate piracy as a criminal act. In the process of transforming the crime of piracy into domestic law, there are two legislative models for the crime of piracy. One is to directly stipulate the crime of piracy, such as the United States, Canada, the Philippines, Argentina, etc. [40]; the other is to stipulate different crimes according to different acts of piracy and then evaluate piracy by means of combined punishment for several crimes, such as China. The author believes that the crime of piracy does not need to be stipulated as a crime of piracy in the process of transformation of domestic law but can be stipulated as different crimes according to different types of behavior, in the light to realize the full evaluation of piracy. As mentioned above, any variable will have an impact on a certain behavior of pirates, such as property

infringement and personal infringement, and the act has the state of accomplished or attempted crime. By defining the acts of piracy as different crimes, we can accurately convict and sentence pirates according to different specific acts. Especially in countries in Southeast Asia (including Malacca), where piracy infringes on a high degree of legal interests, the legislative model of separate evaluation of piracy should be adopted. In addition, national legislation should be strengthened to reduce the degree of piracy.

Based on the analyses above, it can be inferred that this article makes up for the lack of research methods on the degree of infringement of legal interests of piracy, which is a supplement to previous researches and provides a new idea of research for the choice of legislative models of various countries. What is more, compared with the previous studies, the data of the last ten years is used to analyze the degree of infringement of legal interests of piracy, which makes up for the lack of data samples in previous studies, and the results are more credible.

6. Limitations and Future Plans of the Article

The limitation of this paper lies in that some practical data such as the number of pirates and the situation of pirates holding weapons are missing, which is filled in the way of mode in the process of statistical data processing. This technical processing method may affect the authenticity of the results to a certain extent. Based on the choice of legislative mode in this article, future studies will explore the variables which mainly affect the degree of infringement of legal interests and take this as the basis for the strategy making of investing human and material resources in the prevention of piracy in practice. For example, assuming that piracy from 8:00 pm to 12:00 pm is highly harmful, patrols should be strengthened during this time period.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Tianzi Yu and Tiantong Yu contributed to the work equally and should be regarded as co-first authors.

Acknowledgments

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