Visual Metrological Analysis of the Research on "Stakeholder Economic Crimes" from the Perspective of Big Data

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Abstract

As my country enters a new era, my country's economic crime activities are generally in a high-incidence situation. Stakeholder economic crimes are particularly concerned because of their characteristics of huge economic risks. However, due to the limitations of past technology and horizons, the research on stakeholder economic crimes often presents a state of high repetition. From the perspective of big data, using citespace software to visualize and analyze the subject papers of the CNKI database "stakeholder economic crimes" can better summarize the current research results in the field of stakeholder economic crimes in my country, and promote the level of research on stakeholder economic crimes. The effective promotion.

Keywords

Stakeholder Economic Crime; Citespace; Quantitative Analysis; Visualization.

1. The Concept and Research Status of "Stakeholder Economic Crime"

1.1. The Concept of "Stakeholder Economic Crime"

As a special type of crime concept, "stakeholder economic crime" was first proposed in 2006 by Gao Feng, then deputy director of the Economic Crime Investigation Bureau. Gao Feng uses the number of victims as a yardstick for judging whether it is a "stakeholder economic crime", and defines a "stakeholder economic crime" as "economic crime involving many unspecified victim groups." [1] According to the definition, "stakeholder economic crime" The extension of "stakeholder economic crime" should include crimes of illegal fund-raising, organization, leading pyramid schemes, and certain securities crimes that accompany stakeholders. However, the extension of "stakeholder economic crime" was not clearly determined by law at that time. As of November 2017, my country promulgated a judicial interpretation, clearly stipulating that "stakeholder economic crime cases" refer to "economic crime cases that are based on the same legal facts, have a large number of people who have suffered damages, and may affect the stability of social order", and express it in clear text. The form specifies the specific crimes that fall into the category of "stakeholder economic crime" in detail. It can be seen that the stakeholder economic crime is not a statutory specific crime, but a general term for a certain type of economic crime that is introduced after the analysis of economic crime.

1.2. The Research Status of "Stakeholder-type Economic Crimes"

At present, affected by new domestic and foreign situations and macro-uncertainty factors, especially as the emerging Internet financial fields such as online lending, virtual currency, financial mutual assistance, and P2P have become a high-incidence area for stakeholder economic crimes, stakeholder economic crimes It has become a hot spot in the field of economic crimes.

After searching the CNKI database, we have obtained the annual distribution of the number of related documents issued from 2006 to 2021 (see Figure 1). The research on "stakeholder economic crime" can be divided into three stages:

The first stage, 2006-2013. At this stage, the academic circle has little research on "stakeholder economic crime", and it is still in the accumulation stage. The typical feature of this stage is that the amount of relevant literature is small, but it can show a steady growth. The period of this stage is 7 years, accounting for 58.3% of the president's timekeeper, and the volume of postings accounts for about 40% of the total postings. The "Discussion on Stakeholder Economic Crimes" published in 2007 is a more systematic and comprehensive and earlier article on the study of "stakeholder economic crime" at this stage.
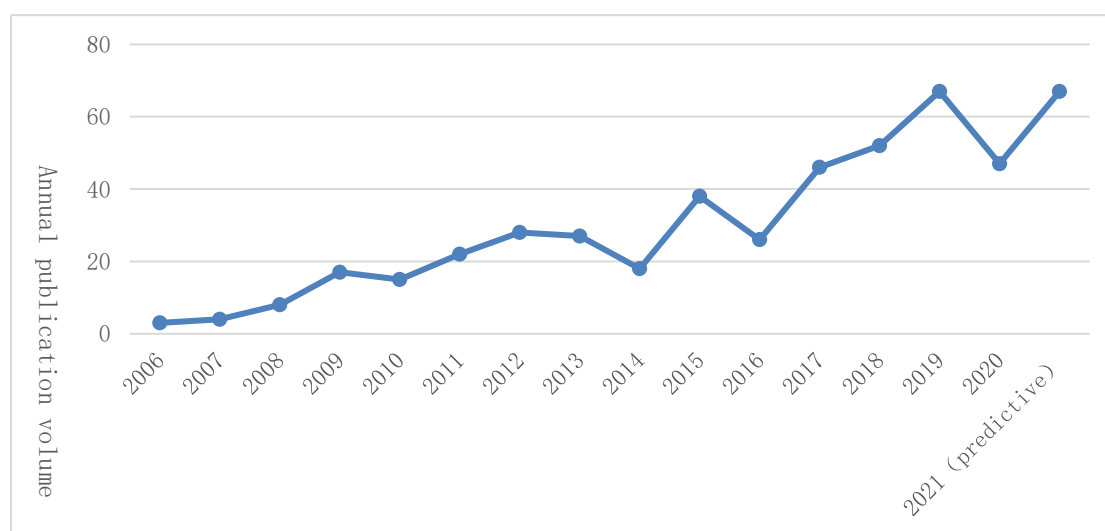

Figure 1. The annual distribution of the number of documents issued from 2006 to 2021

The second stage, 2014-2016. The number of related documents published at this stage fluctuates greatly. It can be seen that the number of posts issued in 2014 has declined compared with 2013, and the increase has doubled by 2015, which reflects the fact that my country's economic system was in a period of reform and transformation at the time, and the macroeconomic instability was brewing. The new situation of "stakeholder economic crime".

The third stage, 2016-present. The volume of publications in this stage has shown rapid growth. Taking 2016 as the watershed, scholars have become more enthusiastic about the research on stakeholder economic crimes. The increase in the number of "stakeholder economic crimes" is, from a certain perspective, that my country's economic system reform has entered a deep-water period, with the continuous development and elimination of emerging economic and financial platforms, and "stakeholder economic crimes" imposing violent actions on social life. A profound reflection of the impact. It is foreseeable that "stakeholder economic crimes" should still be the focus and focus of research in the field of economic crimes in the following years.

2. Big Data Quantitative Analysis Method for "Stakeholder Economic Crime" Research

As mentioned above, through statistics and drawing the annual distribution map of the amount of publications related to "stakeholder economic crime", it is based on the concept of big data visualization measurement analysis. According to Figure 1, it can be concluded that the research on "stakeholder economic crime" from 2006 to 2021 is divided into three phases, and it is found that the change in the popularity of the research on "stakeholder economic crime" in

the academic circle actually reflects the stakeholders. Type economic crime has a huge impact and profound impact on social life. In addition to drawing a simple line chart, if you need to conduct further quantitative analysis on the research results of "stakeholder economic crime", you can choose to use other technologies and tools.

2.1. Overview of Analysis Methods

For a large number of "Stakeholder-type economic crimes" research literature, due to the identity of the research theme, you can generally choose to use Citespace to sort out the literature citation context, and display the "involvement" through the co-occurrence of keywords and the presentation of scientific knowledge graphs. The knowledge production path of "multiple economic crimes" reveals the research hotspots in related fields.

2.2. Data Sources

As a new information technology, the important significance of big data is not only to quickly realize the analysis of existing data, but also to achieve the purpose of discovering new knowledge, creating new value, and enhancing new capabilities through processing and processing of existing data. [2] In order to fully realize the characteristics of big data and analyze and summarize the current research results in the field of public-stakeholder economic crimes in my country in a comprehensive and systematic manner, the author uses the relevant documents included in the CNKI database as the basis, and takes the "Stakeholder-type economic crimes" as the basis. For keywords, "2006-2021" is the time interval, and all journals in the library are used as the source, and other conditions are not restricted for searching. 176 invalid records such as reports were removed, and finally 336 valid literature samples were obtained.

3. Big Data Visualization Measurement Analysis of "Stakeholder Economic Crime" Research

3.1. Overview of Major Scholars and Their Cooperation Networks

Katz [3] defines scientific cooperation as "scholars working together for the common purpose of producing new scientific knowledge". Quantitative analysis of research scholars and their cooperation networks in the field can provide guidance for the drainage of academic resources and provide references for cross-scholar cooperation.

Citespace can provide three levels of scientific cooperation network analysis: Co-Author, Co-institution, and Co-country/territory based on the co-occurrence of the authors of the literature. The following takes Co-Author's micro-scholar cooperation network as an example to visualize co-occurrence cooperation in the field of "stakeholder economic crime".

3.2. Big Data Visualization Analysis of Major Scholars' Research Directions and Their Cooperation Networks

Taking 2006-2021 as the time interval, the author selected several scholars who have made more research on "stakeholder economic crime", and enumerated their research directions, as shown in Table 1.

According to Table 1, among the scholars with a high volume of publications, most of the research fields are "criminal law" and "public security". There are also a small number of scholars who focus on "public security" and "criminal law" as their main research directions, while at the same time they are involved in "finance", "procedural law and judicial system", "jurisprudence, legal history" and other professional fields. Based on this, the author believes that scholars who conduct research in the field of "stakeholder economic crime" have obvious similarities and convergences in their research directions, and they are mainly concentrated in the fields of "criminal law" and "public security". In addition, there are a small number of

scholars who have both finance and jurisprudence backgrounds, and are able to conduct research on "stakeholder economic crimes" from different professional perspectives.

Table 1. Distribution of main research directions of literature scholars (partial)

Name	research direction
Xiao Wenbo	Criminal Law; Public Security
Xiong Weihui	Criminal Law; Public Security
Ren Yi	Public Security; Criminal Law
Tian Guangwei	Finance; Public Security; Criminal Law
Bao Haiyong	Public Security; Criminal Law
Wang Xiaodong	Public Security; Criminal Law; Procedural Law and Judicial System
Chen Yanqing	Public Security; Criminal Law; Jurisprudence, Legal History
…	…

The author believes that the field of "stakeholder economic crime" will produce a lot of convergence in research directions. On the one hand, the concept of "stakeholder economic crime" was first proposed by the Ministry of Public Security in 2006. The research field is still new and the research history is short. , The research results are still immature and are still in the stage of "knowledge accumulation"; on the other hand, under the new situation, stakeholder economic crimes often rely on illegal Internet financial platforms with P2P lending and private equity funds as the main form of financing , Or under the guise of e-commerce and other online financial fundraising fraud. Therefore, "stakeholder economic crime" is an economic crime with extremely complicated cases. To study it, it is necessary to have a sufficiently deep understanding of new criminal methods and criminal law theory; apply the theory of "stakeholder economic crime" to practice. Relevant scholars are also required to have rich practical experience and solid practical skills.

Through Citespace, the author chose "scholar name" as the node type of the view, and finally got Figure 2 and Network: N=58, E=36 (Density=0.0218) and other data indicators. Among them, N represents the connection line of the node, E represents the number of associated connections, and Density represents the network density. The role of these indicators is to accurately reflect the status of collaboration between institutions or scholars. In these analyzed data, there are a total of 58 information nodes, 36 associated links, and a cooperative network density of 0.0218.

Generally speaking, in the research field of "stakeholder economic crime", there is relatively little cooperation among scholars, and it is relatively common for the research literature to be written by only one person; although it is currently also in the field of "stakeholder economic crime". There have been some cooperative teams of scholars, but the form of cooperation is still dominated by small groups, and the number of members is mostly between 2-3 people. It is worth noting that there have been cases where individual scholars and institutional research groups have reached joint cooperation.

Based on the above situation, the author believes that due to the late formation of the concept of "stakeholder economic crime", the development of academic research on "stakeholder economic crime" is not sufficient. Most of the "stakeholder economic crimes" research groups are still concentrated in the public security team and the legal academia, with relatively scattered research strength, and a relatively obvious form of research isolation. However, from a long-term perspective, although the collaboration between different scholars in the field of "stakeholder economic crime" is relatively weak, and most of them appear to be relatively independent researches, with the increase in the popularity of "stakeholder economic crime"

With the deepening of research, the advantages of teamwork will be gradually released. Collaboration between scholars and even between individual scholars and institutions will become a major trend.
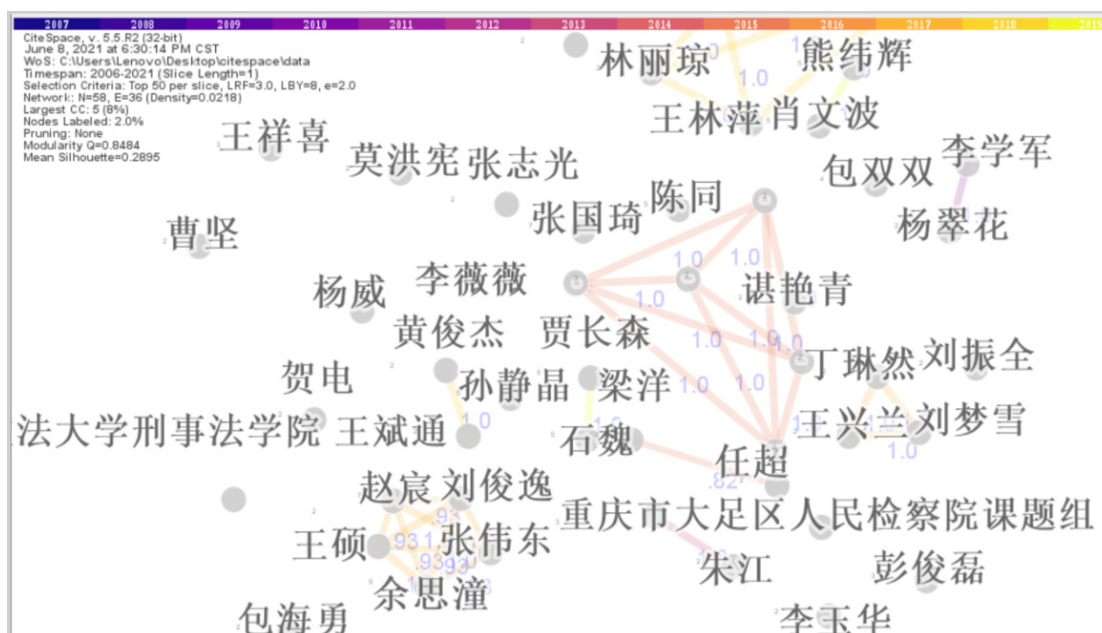

Figure 2. Schematic diagram of cooperation network among scholars (partial)

3.3. An Overview of the Research Hotspots of "Stakeholder Economic Crime"

In scientometric research, word frequency dictionaries can be established according to subject areas, so as to make a quantitative analysis of the creative activities of scientists[4] .The study of word frequency co-occurrence mode can be traced back to Callon's co-word analysis method in the 1980s. According to Whittaker's co-word analysis hypothesis, some premises need to be met to achieve co-word analysis[5]:

1. Scholars carefully choose terms that appear in their papers

2. The relationship between different expressions of terms needs to be paid attention to

3. If enough scholars approve a certain relationship, then tacitly assume that this relationship has a certain meaning

4. The key words of literature papers are listed by scholars after consideration and are trustworthy indicators. When indexing keywords, scholars will be affected by the results of other scholars and use the same or similar keywords in their papers to index their own papers.

The basic principle of co-word analysis is to count the number of times they appear in the same set of documents for a group of words, and measure the close relationship between them through this number of co-occurrences[6].Because the co-word analysis mode is intuitive, it can directly analyze the subject of the research field through the results of co-word analysis.

3.4. Big Data Visualization Analysis for the Research Hotspots of "Stakeholder Economic Crime"

1. Research hotspots in the field of "stakeholder economic crime"

Keywords can focus on the theme of the literature, and the co-occurrence frequency and centrality value of related literature keywords in the same field provide quantitative guidance for hot research in this field.

The centrality of a keyword is an important indicator for measuring the degree of co-occurrence between the keyword and other keywords and the influence of the network. The higher the

betweenness centrality of the node, the stronger its media function in the co-occurrence knowledge graph[7]. According to the above theory, the value of frequency and centrality play a role in jointly measuring the importance of the keyword in the co-occurrence network.

Table 2. High-frequency keywords and centrality in the field of "stakeholder economic crime" (partial)

Frequency	Centrality	Keywords	Frequency	Centrality	Keywords
190	0.72	Stakeholder economic crime	11	0.19	The victim
39	0.23	Stakeholder	10	0.10	Cause
32	0.09	Economic Crime	8	0.13	Judiciary
23	0.27	Illegal fundraising	6	0.01	Illegal absorption of public deposits
20	0.16	public safety agency	5	0.01	Fundraising fraud
15	0.16	case	5	0.05	Property involved
14	0.09	Economic Investigation Department	4	0.08	Detect
12	0.06	victim	...		Keywords

The higher the centrality value, the more important the keyword node. Generally, nodes with an intermediary centrality exceeding 0.1 are called "key nodes". Table 2 intercepts 15 representative keywords with high frequency and centrality in the obtained keyword knowledge graph. In addition, in terms of the frequency of keywords, there are also words such as "stakeholder type", "economic crime", "illegal fundraising", "public security organs", "cases", "economic investigation departments", "victims" and "causes". High centrality keywords.

Based on the keyword frequency and centrality data obtained above, the author draws the following conclusions:

Key words such as "stakeholder economic crime" ("stakeholder type", "economic crime"), "illegal fundraising", "public security organs", "economic investigation departments", "victims" ("victims"), and "causes" are in "stakeholders" The research field of "economic crime" has outstanding co-occurrence influence, which is a hot and concentrated point of research in this field.

2. Cluster analysis of the subject keywords of "stakeholder economic crime"

Spectral clustering has good adaptability to co-citation network clustering based on connection relationship. With the aid of clustering analysis methods, the sample space of any shape can be clustered and converge to the global optimal solution. For the keyword co-occurrence knowledge graph obtained by Citespace through co-word analysis, spectral clustering algorithms such as Latent Semantic Indexing (LSI), log-likelihood ratio (LLR), and mutual information (MI) can often be used. This paper takes the LLR spectral clustering algorithm as an example, takes the subject keywords of "stakeholder economic crime" as the tag source, and performs clustering analysis based on the co-occurrence of keywords.

(1) Overview of LLR spectral clustering algorithm

Log-likelihood ratio is abbreviated as LLR, which is an exponential family estimation function in the logarithmic form of the likelihood function, that is, "log-likelihood ratio". As a common type of algorithm for data statistics, LLR is usually used as a significance test of the binomial distribution.In this case, the statistical value of the LLR algorithm usually does not lie in being operated in the importance frequency test, but in the heuristic ranking of related items. Although the LLR often changes due to different applicable mathematical models, the output results will change; however, considering that the item sorting imposed by the LLR algorithm

has strong robustness to count fluctuations [8], the ability to resist random interference items is strong, The LLR spectral clustering algorithm is still widely used to distinguish feature equivalence situations with strong co-occurrence relations.

(2) Cluster analysis of topic keywords and their clusters

Using the subject keywords of "stakeholder economic crime" as the source of labeling, and using the LLR spectral clustering algorithm to perform the subject keyword clustering analysis, we can finally obtain 7 keyword groups in the field of "stakeholder economic crime" and provide Silhouette , Modularity Q and other important indicators of the network signature.

Silhouette and Modularity Q are two important metrics about the overall structure of the network. For CiteSpace cluster analysis, the larger the Silhouette value, the stronger the network homogeneity. It is generally believed that when the average Silhouette value is above 0.5, the clustering result is reasonable, and when the Silhouette value is greater than 0.7, the clustering reliability is high [9].

As shown in Table 3, the largest silhouette of the eight subject keyword clusters obtained is 0.973, the smallest is 0.752, and the average Silhouette value is 0.897, indicating that the subject keyword clustering analysis result is reasonable.

Table 3. "Stakeholder-based economic crime" topic keyword clustering table (partial)

Cluster ID	Size	Silhouette	Top Terms
0	14	0.931	(log-likelihood ratio, p-level)
1	12	0.819	Financial management (7.29, 0.01); research (7.29, 0.01); investment (7.29, 0.01); evidence review (7.29, 0.01); public security organs (4.35, 0.05)...
2	11	0.867	Judicial agency (11.08, 0.001); crime prevention (7.830.01); public security bureau (7.83, 0.01); intelligence guided investigation (4.32, 0.05); financial prosecution (4.32, 0.05)...
3	10	0.752	Economic crime (10.37, 0.005); prevention and control (9.64, 0.005); countermeasures (9.64, 0.005); disposal (9.64, 0.005); investigation (9.64, 0.005)...
4	10	0.973	Political and legal organs (7.49, 0.01); victims (7.49, 0.01); risk prevention and control (7.49, 0.01); General Secretary Xi Jinping (7.49, 0.01); public security organs (4.13, 0.05)...
5	5	0.938	Stakeholder financial crimes (12.14, 0.001); victims (11.52, 0.001); the era of big data (8.06, 0.005); investigation mechanism (8.06, 0.005); investment channels (8.06, 0.005)...
6	4	0.944	Public security agency (11.32, 0.001); crime of illegally absorbing public deposits (10.98, 0.001); crime of illegal fund-raising (10.72, 0.005); crime of fund-raising fraud (7.29, 0.01); network pyramid scheme (7.29, 0.01)...
7	4	0.953	Prevention and resolution (15.15, 1.0E-4); tough battle (14.9, 0.001); typical cases (9.88, 0.005); bottom line thinking (4.91, 0.05)...

4. Summary and Discussion

As our country enters a new era, with the rapid development of my country's socialist market economy, tremendous changes in the economic system, and various complex factors at home and abroad, "stakeholder economic crime" is an important concept of economic crime in our country, and its criminal activities The overall incidence is high. Especially with the emergence of the emerging Internet finance field, "stakeholder economic crime" has once become a hot spot in the field of economic crime research. The changes in the "three stages" of "stakeholder

economic crime" research are a vivid reflection of the profound impact of "stakeholder economic crime" on the country's economic operations and social life. "Various economic crimes" and professional economic crimes are intertwined and coexisted, superimposed on qualitative changes, and the total number of crimes continues to run at a high level.

At the same time, in order to further analyze the research results of "stakeholder economic crime", the author uses Citespace tools to process and visualize the data, and obtain the schematic diagram of the cooperation network between scholars (part) and the high level in the field of "stakeholder economic crime". Scientific knowledge graphs and visualization charts such as frequency keywords and centrality (partial) are conducive to fully mining big data analysis data, discovering the characteristics of new knowledge, and summarizing the current academic research results on "stakeholder economic crime".

Regarding the research on "stakeholder economic crimes", the author found that scholars in this field currently focus on "criminal law" and "public security" and other research directions, and the research directions have obvious convergence. Some scholars have both financial professional backgrounds and can put forward opinions on the research of "stakeholder economic crime" from different perspectives. At the same time, according to the obtained knowledge map of the cooperation network among scholars, the author found that in the field of "stakeholder economic crime", it is most common for the literature to be written by a single scholar, and there are still relatively few contacts and cooperation between scholars. Although some cooperative teams of scholars have also appeared in this research field, the form of cooperation is still mainly in small groups, and there have also been cases in which individual scholars and institutions have reached joint cooperation.

In view of the insufficient development of the current research field of "stakeholder economic crime", the research groups are similar but the research strength is relatively scattered, the author believes that although the current "stakeholder economic crime" research has an obvious form of isolation, it is considered that The field is still in the accumulation stage. It is believed that with the continuous deepening of research, the channels for cross-academic and cross-scholar information exchange can be continuously unblocked, and cooperation between scholars can become a major trend.

Aiming at the research hotspots and cluster analysis of "stakeholder economic crime", on the premise that the keywords in the literature have both validity and reliability, comprehensively consider the obtained keyword frequency and centrality data, and filter out the "involved" keywords. 9 keywords with high frequency ranking and high centrality, such as "various economic crimes". Because some keywords have semantic repetition or unclear connotations, they need to be cleaned and combined appropriately to improve the reliability and authenticity of the conclusions.

Spectral clustering has good adaptability to co-citation networks based on connection relations. In the spectral clustering algorithm, the LLR spectral clustering algorithm is more robust and can provide more accurate and stable results. Therefore, the author takes the LLR algorithm as an example, and uses the subject keywords of "stakeholder economic crime" as the tag source. Obtained 8 "stakeholder economic crime" keyword groups and important indicators such as Silhouette and Modularity Q. In the subject keyword clusters, the Silhouette value is the largest 0.973, the smallest is 0.752, and the average is 0.897. It satisfies the requirement that the average clustering result is above 0.5, which proves that the document keyword feature clusters obtained by the LLR algorithm have strong Relationship.

From the perspective of big data, the author uses citespace to visually measure "stakeholder economic crimes" and draw certain conclusions. However, because the concept of "stakeholder economic crime" was only proposed in 2006, the concept is novel, and more than ten years of development is not enough to enable academics to conduct very in-depth and detailed research

on this newly opened professional field. At present, "stakeholder economic crime" "Crime" research is still in the stage of "knowledge accumulation". Therefore, due to time constraints, the current literature samples on "stakeholder economic crimes" are far from reaching the point where they are sufficiently substantial and comprehensively summarized, and the author is not enough to ensure that the results and conclusions obtained in this article are completely consistent with the facts. , There is no deviation, only for the purpose of inviting jade.

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