The Characteristics of Chinese Artificial Intelligence Policies for Innovations in Industry:
Policy Distribution and Inclination

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Abstract
Globally, many countries have elevated artificial intelligence (AI) to the level of a national strategy. It is widely recognized that AI plays a pivotal role in contributing to sustainable national economic development, industrial upgrading, technological progress, and innovation. The purpose of this research is to identify different phases of China's AI policy issuing evolutions and reveal the characteristics of its issuing distributions and inclinations for innovations in industries. We employed a bibliometrics-based research framework to characterize the development and evolution of China's AI policy across its main regions. The framework integrates bibliometric methods for identifying core policy elements and tracking their evolution, as established by other researchers. It also utilizes quantitative network analysis to investigate the characteristics of AI policy distribution, and co-word analysis to identify the AI policy inclination features. The data for this study were primarily sourced from the PKULAW database, encompassing AI-related policies from 2017 to the present. First, China's AI policies and their four stages of evolution were collected and summarized, providing the primary interpretation of iterative trends. Second, the core objectives in each policy at each stage were analyzed to elucidate policy inclinations. The visualized results reveal four iterative stages corresponding to the years 2017, 2018-2019, 2020-2021, and 2022, each presenting distinct policy orientations in the realm of innovation. These findings are expected to stimulate further discussions among scholars and practitioners in the AI and innovation domains who have a keen interest in China's AI policy.

Keywords: Artificial Intelligence (AI), Policy Distribution, Policy Inclination, China's Innovation Industry

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1. Introduction

It has been recognized that AI impacts different types of supply chains, product design management, healthcare, e-commerce business, education, law, etc. (Li, 2020; Verma, Sharma, Deb, & Maitra, 2021). In this context, researchers have begun to pay attention to AI-related research, leading to an explosive growth in related articles from 2017 to 2022. In recent articles, with the release of reports, plans, and policy documents, an increasing number of countries worldwide are focusing on this area. More than 30 countries have released national AI policy strategies so far (Schiff, 2022). For example, China has released 982 plans, laws, and policy documents to promote AI development in various areas (www. pkulaw.com, 2023), and the 117th U.S. Congress introduced 130 AI-related policy documents in 2021(AI Index Report, 2022), up from just one in 2015. Besides China and the US, other countries have introduced AI policies with AI strategies, such as the European Union and the United Kingdom (Qu and Kim, 2022). These policy documents and reports provide informative content on the development and future directions of AI research. By exploring these strategies and trends of a country's AI development, we can compare different strategies that focus on different regions and examine the relationship between such dimensions and pillars, thereby establishing a basis for policy evaluation and improvement (Yang & Huang, 2022).

While current AI policy research has been increasingly compared to before, research on China's AI policy for innovations in the industry is limited. This is especially true for studies focusing on policy orientations and scenarios related to China's AI development directions. This research aims to analyze the characteristics and trends of AI-related policies for innovations in industries, with a focus on policy distribution and inclinations. The remainder of this paper is organized as follows. Section 2 presents current AI policies and evaluates China's AI policies. Section 3 outlines the research methods, including data screening and the division of research periods. Section 4 provides the data analysis and discussion for each phase. Finally, in Section 5, we conclude our research, discuss policy implications, and outline limitations for future research agendas.

2. Literature Review

2.1 AI Policies

Recent research on AI policies can be categorized into three main dimensions. (1) Topic analysis across countries. Some scholars have employed structural topic modeling techniques and qualitative analysis to identify the topics addressed by national AI policies and their relative importance across countries. For instance, Saheb and Saheb, (2023) integrated the results of a topic modeling analysis of 30 national AI policies with a textual analysis of the policies. Guenduez and Mettler (2023) examined the policy narratives in AI policies of 33 countries by combining the novel technique of structural topic modeling and qualitative narrative analysis. Van Berkel et al. (2020) identified national AI policy documents across 25 countries and highlighted differences between them. (2) Evolution of AI policy in specific regions. Some researchers have focused on the evolution of AI policy within a particular country or region over the past decades. For example, Yang and Huang (2022) characterized the development and evolution of China's AI policy. Liu et al. (2022) analyzed the characteristics of the innovation policy mix using data on 116 China's AI policy programs from 2009 to 2021. (3) AI industry innovation and policy design. Some scholars have focused on identifying laws related to AI industry innovation and designing policies to support innovation and global leadership. For instance, Arenal et al. (2020) developed an Asymmetry

Triple Helix framework to assess the status and prospects of China's AI innovation ecosystem.

2.2 The Evaluations of China's AI Policies

However, among previous research on AI policies, few studies have analyzed the characteristics of AI innovation policies for industries in China at regional levels. Research related to China's AI policies has mainly focused on the following domains: (1) the analysis of Chinese AI strategic areas (Allen, n.d.; Roberts et al., 2021; Schiff, 2022); (2) the specific application areas of AI through policy analysis (Knox, 2020; Sun & Medaglia, 2019; D Valle-Cruz, Ruvalcaba-Gomez, Sandoval-Almazan, & Criado, 2019); (3) policy effect evaluations (Liu et al., 2021; Valle-Cruz et al., 2020); (4) national policy comparative analysis (Hine & Floridi, 2022).

However, the above summary of existing studies reveals the main characteristics and limitations as follows. Firstly, these studies tend to primarily rely on qualitative analysis of relevant policies, with a focus mainly on some of China's national AI policies. They often exclude regional policy implementations. Secondly, in many cases within this research, there may be a lack of comprehensive AI policy comparisons, textual analysis, and network analysis of distribution characteristics based on regional policies. Thirdly, due to the absence of a comprehensive analysis of policy documents, these studies might overlook external attributes or fail to account for how policies are internalized by regional governments. Fourthly, the understanding of AI policy often remains tacit, and there is a lack of a process for transforming this tacit knowledge into explicit knowledge through data and mapping analysis (Nonaka, 1998). Lastly, these policy analyses tend to overlook the unique status of specific fields and may not use co-word analysis to extract the most significant aspects.

Therefore, to address the research gap, we conducted a bibliometric analysis to examine the evolutionary trends of China's AI policies from 2017 to 2022 and the roles of core government agencies in policy-making. Our focus was on analyzing 69 national and 310 regional AI-related policy documents.

3. Methodology

To compare the connections within these policies in terms of characteristics and trends, some scholars often use the bibliometric methods that focus on the reference relationships among policy documents (Cheng, Zheng, Xiong, & Lin, 2022; Yang & Huang, 2022; Zhang & Guan, 2022), as well as policy collaboration networks and citation networks (Huang, Chen, & Yi, 2021; O'Leary & Vij, 2012). This research primarily employs quantitative mapping to explore the external attributes of policy documents, utilizing bibliometric methods and network analysis to create an understandable model for policy document analysis. It addresses the following two research questions: 1) What are the characteristics of policy distribution? 2) What are the characteristics of policy inclination for innovation in industries? The key steps of the research steps are outlined in Figure. 1.
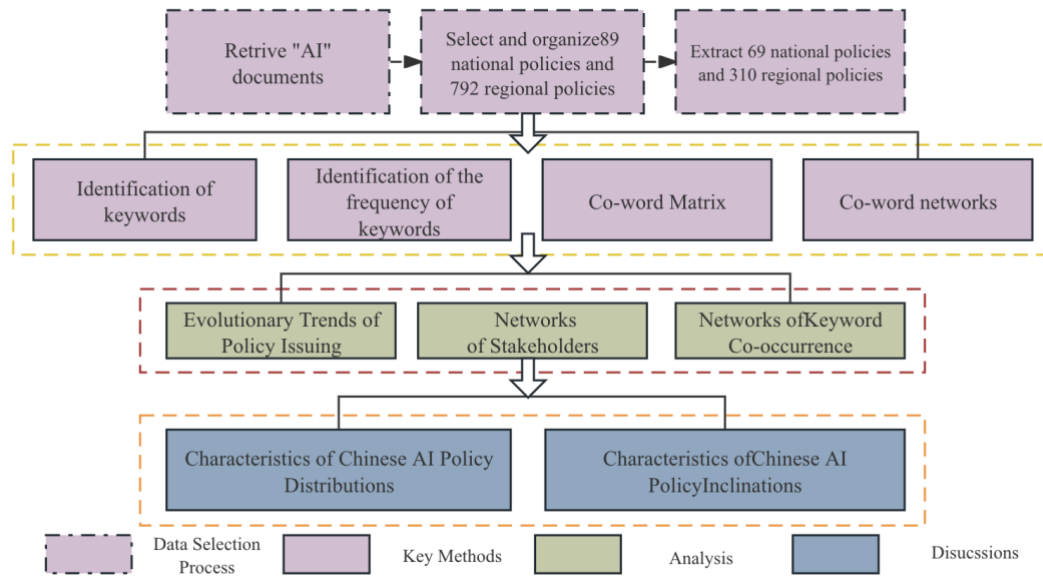
Figure 1. The Framework of Research Process

3.1 Data Collection and Screening

Policy documents were collected from the PKULAW Database (https://www.pkulaw.com). We extracted and identified three policy elements: policy-issuing trends, policy-issuing stakeholders, and policy inclinations. Policy-issuing trends refer to the specific release time for the public; policy-issuing stakeholders are government departments responsible for formulating and releasing the policy; policy inclination refers to policy orientation, specifically, the aspects the policy leans towards and focuses on. Detailed analysis is provided in Section 4.

3.2 Bibliometric Analysis

Bibliometric analysis is a "rigorous method for exploring and analyzing large volumes of scientific data" (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021) to reveal development trends in specific research areas (Tarkowski, 2007). Bibliometric analysis is typically applied in the academic literature domain because early Chinese policy documents used keywords to characterize the core content of the policy (H. Li et al., 2016). However, keywords from the constituent elements of policy documents have been excluded by the government since 2012 (Yao & Zhang, 2018). Therefore, we first established a threshold based on word frequency in the AI policy documents using ROST-CM software. Second, we analyzed the core content of the documents in each phase based on the high-frequency keywords.

3.3 Co-word Analysis

Co-word analysis is used for researching trends, indicating that frequency is proportional to similarity (Chen, Chen, Wu, Xie, & Li, 2016; Hong et al., 2016). Its purpose is to identify co-occurring words and the absence of keywords (Ronda-Pupo & Guerras-Martin, 2012). This research involves three steps for extracting core words from Chinese AI policy documents using the co-word analysis method. First, we retrieved the top 10 keywords with high frequency from existing policies. Second, we merged some similar keywords that might affect the rationality of the results and standardized them. Third, we established a co-word

matrix by calculating the frequency of keywords that appear in the same policy text (Chen et al., 2016; Yao & Zhang, 2018).

3.4 Mapping Network Analysis

Network analysis is a method that involves collecting interconnected units using a graph to map and analyze their relationships within an organization and society (Monaghan et al., 2017; Tichy et al., 1979). In this research, co-word networks are employed to explore shifts in topics related to innovation in industries within Chinese AI policies across different phases. Cooperation networks are also used to reveal relationships among the policy stakeholders. To address the questions regarding policy distribution and inclination characteristics, a joint policy-issuing network was constructed using Gephi.

4. Data Analysis of China's AI Policy Documents

4.1 Data Source

To compile AI-related policies, we searched the PKULAW database starting from 2017 to 2022. We chose this timeframe because there was limited focus on AI-related innovation industries before 2017. Initially, we collected 89 national AI-related policies and 792 regional AI-related policies spanning the years 2017-2022. To narrow our focus on innovation in industries, the policy documents must include "artificial intelligence" in their titles, and the policy-issuing organizations must include provinces, municipalities, and autonomous regions. Then we excluded AI-related policies related to healthcare and medicine, and industrial standards. After applying these criteria, we obtained a final dataset consisting of 69 national policy documents and 310 regional policy documents.

4.2 Policy Issuing Trends

Figure 2 illustrates the timeline of China's AI policy issuance and phases to visualize the policy trends. On the X-axis, we have the policy issuance time, while the Y-axis represents the quantity of policies at each stage. To categorize these stages, we adopted a three-dimensional policy instrument framework inspired by Rothwell and Zegveld (1985). These stages are as follows. (1) The environmental side (2017): this marks the initial phase of AI policy development. (2) The demand side (2018-2019): during this phase, policies focused on stimulating demand for AI technologies. (3) The supply side (2020-2021): policies in this phase aimed to enhance the supply of AI-related resources and infrastructure. (4) The new supply side (2022): this represents the latest phase, which likely includes novel approaches to AI policy. The detailed analysis of China's AI policy issuing time and quantity at different stages are as follows (see Figure. 2).
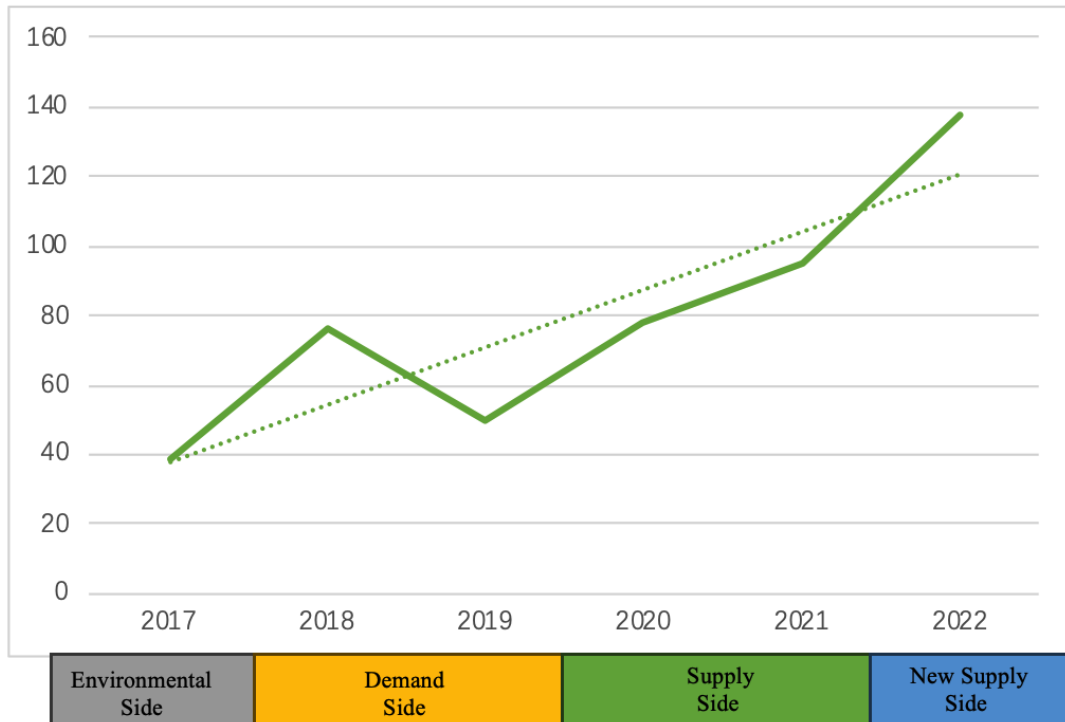
Figure 2. The Trends of China's AI Policy Issuing

In the initial stage, corresponding to 2017, China saw the issuance of three national policies and 36 regional policies related to AI. These policy developments signaled China's strategic commitment to positioning AI as a leading force in a new wave of technological transformations. Following the issuance of these national policies, a total of 33 regional policies were released, constituting a significant majority at 91.67% of the policies issued during this stage. This phase is categorized as the "environmental side" of policy implementation, signifying a crucial step in setting the desired objectives and outcomes, as highlighted by Qu & Kim (2022).

Table 1. The First Stage of China's Policy Quantity: 2017

National	Regional	Total
3	33	36
8.33%	91.67%	100%

The second phase covers the period from 2018 to 2019, during which a greater number of AI-related policies were issued. In comparison to 2017, the number of national policies increased several-fold. 28 national policy documents were being released, and 86 regional AI-related policies were successively issued. The policy approach during this stage was characterized as the "demand side" since AI development policy transitioned into a highly practical phase (Yang & Huang, 2022).

Table 2. The Second Stage of China's Policy Quantity: 2018-2019

National	Regional	Total
28	86	114
24.56%	75.44%	100%

The third phase covers the period from 2020 to 2021. During this time, 28 national policies and 110 regional policies were issued regarding AI innovations in various industries (Table 3). These favorable policies have increasingly encouraged provincial and municipal AI innovation and development efforts in various industries since 2020. In 2020, the MOST issued 6 supportive regional AI pilot zones, enhancing collaborations with universities to promote the integration of disciplines and expedite the training of graduate students in the field of AI. This shift implies that AI policy instruments have transitioned to a "supply side" approach, which includes a focus on "cultivating talents" (Qu & Kim, 2022).

Table 3. The Third Stage of China's Policy Quantity: 2020-2021

National	Regional	Total
28	110	138
20.29%	79.71%	100%

In 2022, China entered a new stage. There was a notable increase in the issuance of regional AI-related policies compared to previous years, accounting for 89.90% of the total (refer to Table 4). This year, the Ministry of Science and Technology (MOST) and six other stakeholders jointly issued the "Guiding Opinions on Accelerating Scene Innovation to Promote High-quality Economic Development with High-level Application of Artificial Intelligence". This signifies that the Chinese government is inclined to invest more in AI adoption for scene innovations, a part of the "supply side" approach. Furthermore, there were 18 competition notices for AI application innovations being released. These policies were expected to attract more AI talents and indirectly strengthen the industrial innovation path of AI.

Table 4. The Fourth Stage of China's Policy Quantity: 2022

National	Regional	Total
10	89	99
10.10%	89.90%	100%

4.3 Policy Distribution

Policy networks are defined as a form of political governance within a society that reflects the evolving relationship between the state and society (Borzel, 1998; Marsh & Smith, 2000; Kenis & Schneider, 1991; Sugimura, Akakura, Yotsushima, & Kawasaki, 2023). In this paper, we adopted a joint policy-issuing network to identify various policy-issuing stakeholders based on their collaborative relationships. Tables 5 and 6 display the core national and regional stakeholders of China's AI policies, respectively. In terms of our analysis process, we first constructed a joint AI policy issuing network matrix, with each node in the network representing a policy entity, and the edges between nodes signifying joint policy relationships. Then, we utilized Gephi software in this study to visualize the policy distribution and obtain the final clustering results. The clusters were divided by different colors, and the size of nodes depended on the clustering coefficient.

Table 5. The Core National Stakeholders of China's AI Policies

Stakeholders	Acronym	Total Issues
Ministry of Science and Technology	MOST	26
Ministry of Industry and Information Technology	MOIIT	9
Ministry of Education	MOE	8
National Radio and Television Administration	NRTA	6
National Development and Reform Commission	NDRC	5
Office of the Central Cyberspace Affairs Commission	OOTCCAC	3
China Machinery Industry Federation	CMIF	2
Standardization Administration	SA	2
Ministry of Human Resources and Social Security	MOHRSS	2
Department of Science and Technology, Ministry of Transport	DOSTMOT	2
Ministry of Human Resources and Social Security General Office	MOHRSSGO	1
Ministry of Civil Affairs	MOCA	1
New Generation AI Governance Expert Committee	NGAGEC	1
Ministry of Transport	MOT	1
China National Intellectual Property Administration	CNIPA	1
Chinese Association for Artificial Intelligence	CAFAI	1
China National Intellectual Property Administration	CNIPA	1
Cyberspace Administration	CA	1
Ministry of Finance	MOF	1
State Administration for Market Regulation	SAFMR	1
National Information Security Standardization Technical Committee	NISSTC	1
National Bureau of Statistics	NBOS	1
State Council	SC	1
China Securities Regulatory Commission	CSRC	1

Table 6. The Core Regional Stakeholders of China's AI Policies

The Regional Stakeholders	Acronym	Total Issues
Guangzhou Municipal Science and Technology Bureau	GMSTB	11
Shanghai Municipal Commission of Economy and Informatization	SMCOEI	8
Wuhan Municipal Science and Technology Bureau	WMSTB	7
Guangzhou Municipal Industry and Information Technology Bureau	GMIITB	6
Hefei Municipal People's Government	HMPG	6
Xiamen Municipal Industry and Information Technology Bureau	XMIITB	6
Hefei Municipal Science and Technology Bureau	HMSTB	5
Department of Economy and Information Technology of Hubei Province	DOEITOHP	5

Jinan Municipal Industry and Information Technology Bureau	JMIITB	5
Tianjin Municipal Industry and Information Technology Bureau	TMIITB	5
Tianjin Municipal Science and Technology Bureau	TJMSTB	5
Chengdu Municipal People's Government	CDMPG	4
Hangzhou Municipal People's Government	HZMPG	4
Department of Industry and Information Technology of Hunan Province	DOIITHNP	4
Jinan Municipal Commission of Economy and Informatization	JNMCOEI	4
Shenzhen Municipal Industry and Information Technology Bureau	SZMIITB	
Changsha Municipal Science and Technology Bureau	CSMSTB	4
Changsha Municipal Science and Technology Bureau	CSMSTB	4
Chengdu Municipal Bureau of Economic and Information Technology	CDMBOEIT	3
Chengdu New Economic Development Commission	CDNEDC	3
The People's Government of Gansu Province	PGOGSP	3
Big Data Development Bureau of Guangxi Zhuang Autonomous Region	BDDBOGXZAR	3
Hefei Municipal Development and Reform Commission	HFMDRC	3
Nanning Municipal Industry and Information Technology Bureau	NNMIITB	3
Shanghai Municipal People's Government	SHMPG	3
Shanghai Xuhui District People's Government	SHXDPG	3
Science, Technology and Innovation Commission of Shenzhen Municipality	STICSM	3
Shenyang Municipal Science and Technology Bureau	SYMSTB	3
Chongqing Municipal Science and Technology Bureau	CQMSTB	3

Phase1: 2017

Figure 3 shows that no national AI policies regarding innovations were jointly issued national policies at this stage. In terms of regional stakeholders, the Shanghai Municipal Commission of Economy and Informatization (SMCOEI) and the Shanghai Municipal Finance Bureau (SHMFB) jointly issued a notice on "Issuing the Implementation Rules for the Special Support of Artificial Intelligence Innovation and Development in Shanghai", which is the first collaborative action to promote the development of the AI technologies for innovation in industries.
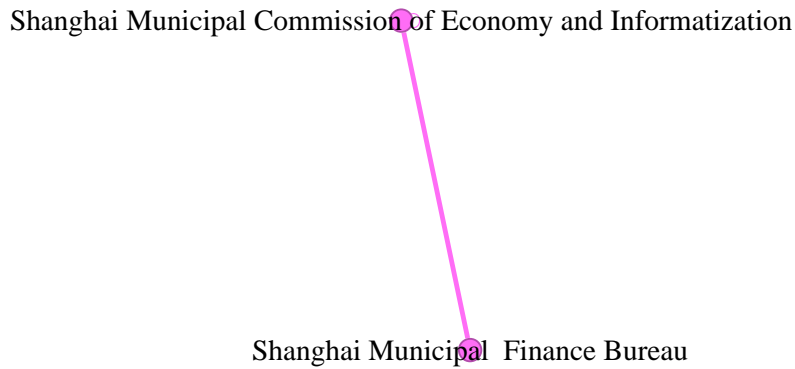
Figure 3. The Issuing Networks of China's AI Policies: 2017

Phase 2018-2019

Figure 4 shows that the number of nodes was increasing, and the connections in the network of cooperation were emerging because the size of nodes has been distinguished, and there are five clusters of joint issues. At this stage, regional joint policy issuing was more connective and systematic among local stakeholders. We can see the five stakeholders from Shanghai jointly formulated "the Implementation Measures for Accelerating the High-quality Development of Artificial Intelligence in Shanghai", to engage talents in the field of AI, breakthrough key core technologies, promote the demonstration application of AI, and accelerate the construction of a national highland for AI development. This demonstrates that the closest collaborative relationship existed in Shanghai's regional governments, and the cooperation between stakeholders was generally strengthened.
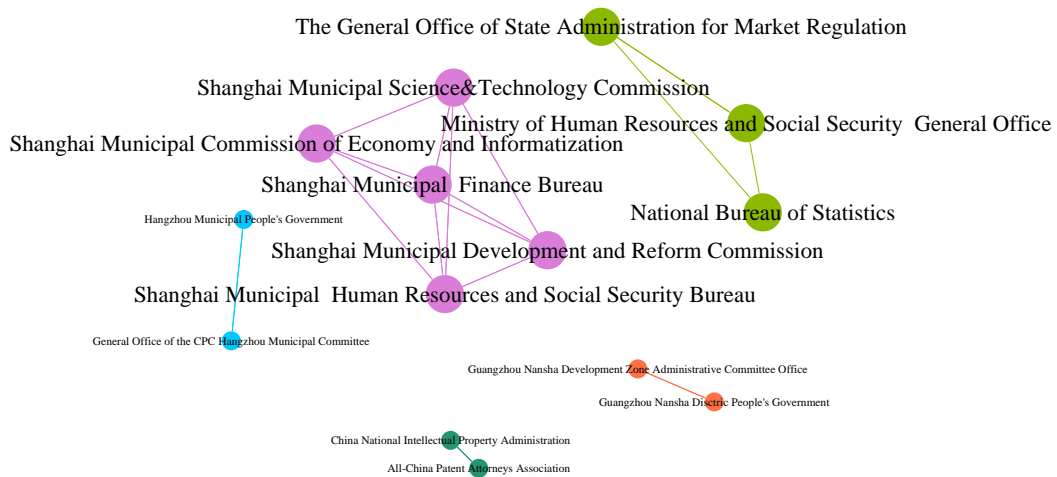

Figure 4. The Issuing Networks of China's AI Policies: 2018-2019

As illustrated in Figure 5, there was a sudden surge in policy networks during this phase. As mentioned earlier, the number of policies experienced significant growth at this stage. Several key national government bodies jointly issued the "Guidelines for the Construction of the

National New Generation Artificial Intelligence Standard System." This initiative aimed to establish an AI standard test and verification platform. Additionally, the MOE, the NDRC, and the MOF released "Several Opinions on the Construction of 'Double First-class' Universities, Promoting Interdisciplinary Integration, and Accelerating Graduate Student Training in the Field of Artificial Intelligence." This policy was designed to foster the development of more AI talents. Furthermore, regions such as Guangxi, Hefei, Anhui, and Shanghai established their own regional joint policy-issuing networks within regional agencies to promote collaborative innovation plans for AI in industries. It is evident that during this phase, AI entered a stage characterized by cross-border integration and independent innovation in the field of AI.
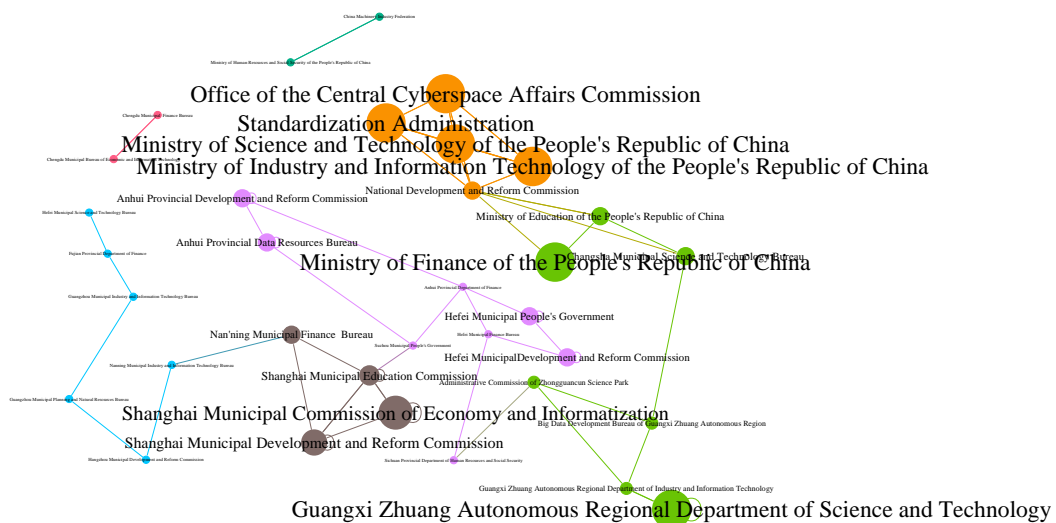

Figure 5. The Issuing Networks of China's AI Policies: 2020-2021

Figure 6 reveals that national joint AI policies were significantly more systematic, and the cooperation among stakeholders had increased. It also indicates that the AI policy field was dominated by a community cluster formed by the MOIIT, and the MOST, NDRC, NRTA, and MOT, which are responsible for the macro-level distribution of AI Policies, such as the "notice of the General Office of the Ministry of Industry and Information Technology and the General Office of the Ministry of Science and Technology on holding the first 'XingZhi Cup' National Artificial Intelligence Innovation Application Competition in 2022". In terms of regional stakeholders, Shandong, Zhengzhou, and Sichuan occupy the highest clustering coefficient with subsequent policies regarding AI competitions. This period represents that policy instruments shifted from an "environmental side" in 2017, to a "demand side" in the 2018-2019 period, to a "supply side" in the 2020-2021 period, and then entered a new "supply side" in 2022, indicating that AI innovation policies entered a stage from focusing on "cultivating AI talents" to "attracting AI talents".
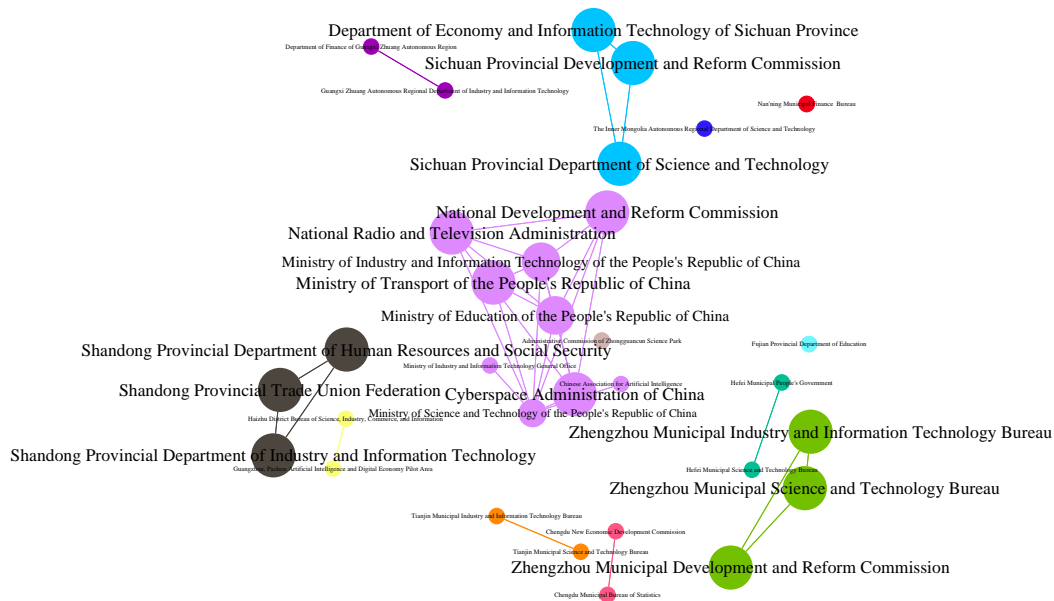
Figure 6. The Issuing Networks of China's AI Policies: 2022

4.4 Policy Inclination

This paper adopted a bibliometric analysis method for keywords with high-frequency screening to study the potential relationships between them, thereby identifying the focus of the AI policies for innovation in industries. The Gephi software was employed to visualize the networks of the most frequently used keywords based on co-word matrices, which "intuitively reflect the relationships among high-frequency keywords" (Yao & Zhang, 2018, p. 88).

Phase 1. 2017

Table 3 shows the top 10 high-frequency keywords in China's AI policies. It reveals that China's AI focuses on developments, innovations, and practical implementations at this stage, such as the keywords "develop", "application", and "build". The "New Generation of Artificial Intelligence Development Plan" was positioned as a medium - and long-term plan for the development of AI at the national level, the first strategic plan for system deployment in the field of AI in China, and also a guiding document for building China's AI first-mover advantage in the future. Subsequently, the government introduced a series of relevant policies, and China's AI entered the initial stage of technology-driven economic development. Figure 7 shows the connections among these words. It was performed by Gephi software, clustering five colors that identify five different inclination characteristics, but here we mainly analyze the two main clusters. The red cluster was headed by the high frequency of keywords "intelligent", "develop", "technology", and "application", which demonstrates that AI policies issued in this stage were related to the plans for an "intelligent" or "smart" technology reform. The purple cluster was led by the high frequency of the keyword "build", "innovate", and "platform", which proves that AI policies planned to focus on more practical

fields in the innovation industry, highlighting the measure of the establishment of AI platforms.

Table 7. Top 10 High-Frequency Keywords in China's AI Policies in 2017

Keywords	Frequency
Intelligent	2310
Develop	1115
Technology	1047
Application	884
Build	766
Innovate	734
Enterprise	606
Platform	556
Service	548
Strengthen	539

Figure 7. Network of the Most Frequently Used Keywords in 2017

Phase 2. 2018-2019

As shown in Table 8, there has been a significant growth in keyword frequency. For example, the frequency of the keyword "intelligent" increased from 2310 in 2017 to 4347 at this stage. Figure 8 visualizes two main clusters with purple and orange colors, being led by "intelligent" and "develop" respectively. At the end of 2017, with the issuing of "The Three-year Action Plan for Promoting the New-Generation Artificial Intelligence Development Plan (2018-2020)" (MOIIT), the policy focus shifted from AI technology to the integration of technology and industry in the second phase. Therefore, we can see that the connective sub-frequency words, such as "core", "key point", and "platforms" were emerging with high frequency during this period. This implies that China's AI policies have inclined to a more practical domain and would enter a more specific field in the next stage.

Table 8. Top 10 High-Frequency Keywords in China's AI Policies during 2018-2019

Keywords	Frequency
Intelligent	4347
Technology	2716
Develop	2211
Application	2104
Enterprise	2080
Innovate	1988
Build	1837
Project	1431
Platform	1399
Field	1358

Figure 8. Network of the Most Frequently Used Keywords during 2018-2019

Phase 3. 2020-2021

Table 9 lists the top 10 high-frequency keywords in China's AI policies during 2020-2021, and Figure 9 illustrates the network of most frequently used keywords. These keyword clusters became increasingly more interactive among policy keywords at this stage. Four connective clusters with four colors are performed. Cluster 1 (green) indicates the most frequently used keywords are "intelligent", "develop", and "build", which stay at the same level of frequency compared to previous stages; however, these keywords were extracted from the one that with "technology" and "application" in cluster 2 (purple). This is in that the keyword "technology" at this stage is inclined to a more specification, such as "scene". Cluster 3 (black) is headed by the keywords "enterprise" and "research and development", which demonstrates that China's AI Policies are inclined to provide great support to the economic entity.

Table 9. Top 10 High-Frequency Keywords in China's AI Policies during 2020-2021

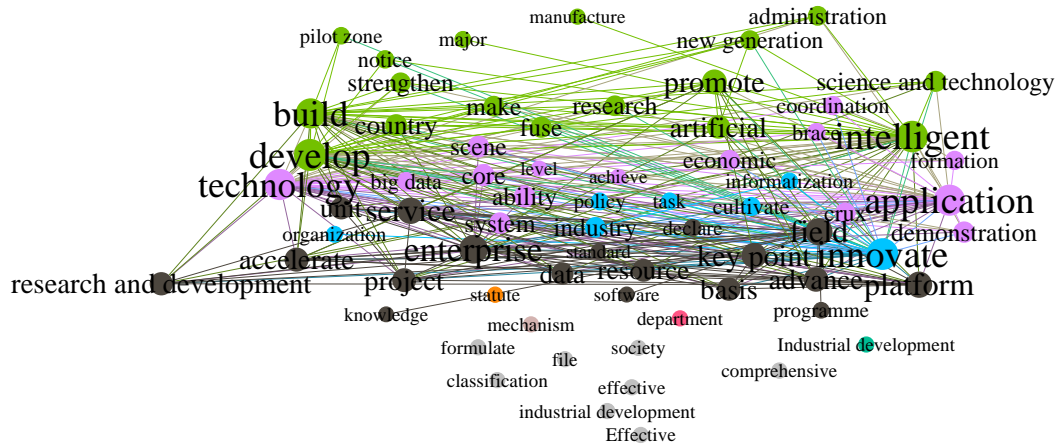| Keywords	Frequency
Intelligent	3145
Technology	2357
Application	1996
Innovate	1952
Enterprise	1799
Build	1769
Develop	1745
Project	1439
Unit	1295
Service	1290

Figure 9. Network of the Most Frequently Used Keywords during 2020-2021

Phase 4. 2022

The frequency of keywords shows an overall increasing trend (Table 10), and the frequency of keywords in a single year 2022 increased compared with the previous stage. Figure 10 illustrates the network among keywords using clusters. There are five clusters at this stage, each cluster has close connections with others. It is clear that the keywords "scenario", "declare" and "competition" appeared, and the corresponding policies also indicate that the country was comprehensively and vigorously promoting multi-dimensional AI construction at this stage. For example, the MOST, MOIIT, and MOE issued "Guiding Opinions on Accelerating Scene Innovation and Promoting High-quality Economic Development with the High-level Application of Artificial Intelligence". This further demonstrates China's AI policies focused on the practical implementation of AI-driven industrial innovation and cross-border integration in 2022.

Table 10. Top 10 High-Frequency Keywords in China's AI Policies in 2022

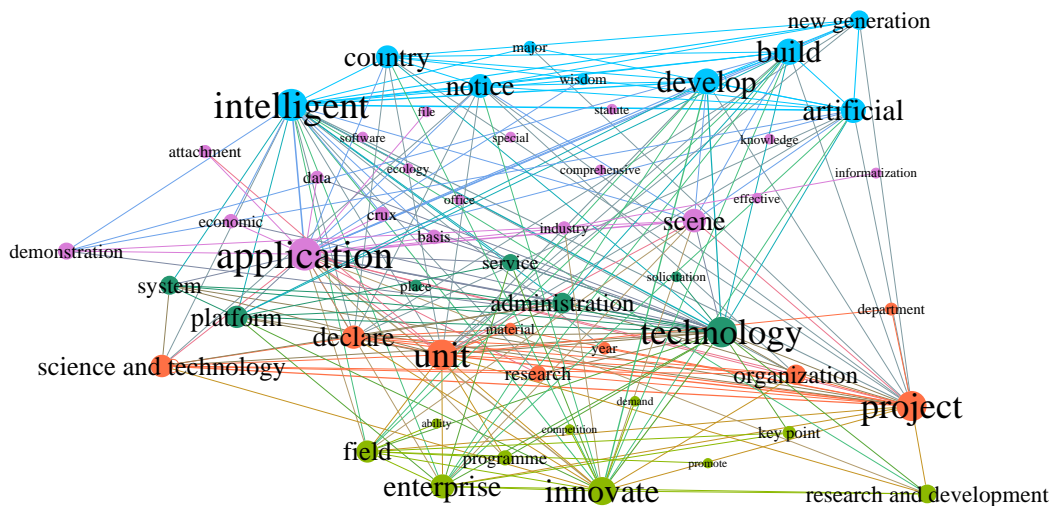| Keywords	Frequency
Intelligent	3998
Application	3145
Project	2357
Declare	1996
Unit	1952
Innovate	1799
Technology	1769
Enterprise	1295
Scene	1439
Develop	1436

Figure 10. Network of the Most Frequently Used Keywords in 2022

5. Discussions in Three Dimensions of China's AI Policy

5.1 Characteristics of China's AI Policy Distribution

From the results of the issuing networks of China's AI policy, the main issuing authorities in the first stage (2017) were primarily regional stakeholders. In the second stage (2018-2019), in addition to regional departments, key issuing departments such as the MOST, the CSRC, and the MOE emerged. In the third stage (2020-2021), the number of documents issued by national stakeholders such as the MOIIT, the NDRC, and the MOST continued to rise. Simultaneously, regions like Guangzhou and Tianjin experienced a sustained increase in the issuance of documents related to AI, surpassing the number of documents issued by other regions by a significant margin. In the fourth stage (2022), the characteristics of the issuing authorities were essentially similar to those observed in the third stage. This indicates a

continuous increase and cooperative connections in the number of authorities issuing AI policies in China. First, it signifies that the formulation of AI policies is orchestrated through multi-stakeholder participation (X. Li, Zhang, Hui, & Lang, 2020; Wilson, Claussen, & Valverde, 2021; Yang & Huang, 2022), involving both central and local authorities, as well as various regional entities. Second, it reflects a shift from policy issuance by a single entity (the MOST) to a diverse range of entities, including educational and other administrative departments. This suggests that the standardization of AI development regulations is expanding more domains and even other industries.

5.2 Characteristics of China's AI Policy Inclination

According to the previous analysis of the results of China's AI policy inclination in 2017, the focus at this stage is to accelerate the development of the AI industry. The NDRC, the MOST, the MOIIT, and the CAOC formulated the "Three-Year Action Implementation Plan for 'Internet Plus' Artificial Intelligence". Regional governments, such as the Chengdu Municipal Committee and Municipal Government, issued notifications to promote the development of the regional AI industry, and the General Office of SHMPG issued a notice on the Implementation Opinions of the City to Promote the Development of a New Generation of Artificial Intelligence. However; these policy documents mainly stayed at the planning stage.

During the period between 2018 and 2019, national and regional stakeholders issued AI policies focusing on practical domains, such as the keywords "build" and "platform". The MOST was the first to issue a policy document regarding the construction of a national pilot zone for innovation in the field of AI. Subsequently, several policies have been promulgated on the establishment of pilot areas. For example, in 2019, the MOST issued "The Guidelines for the Construction of The National Pilot Zone for Innovation and Development of New-Generation Artificial Intelligence", aiming to construct a national new-generation AI innovation and development pilot zones in an orderly manner to give full play to the role of local stakeholders, and to promote the in-depth integration of AI and economic and social development. This implies that the focus of regional AI policies was gradually shifting to a practical phase.

Therefore, with the continuing building of pilot zones, the emergence of the keywords "pilot zone", "cultivate", "fuse", "field", "coordination", and "industrial development" at the third stage indicates policies issued a focus on the deep integration of AI with the real economy. From 2020 to 2021, Chinese regional governments mainly focused on the construction of AI pilot zones and technology industrial development zones, further promoting the clustering development of the AI industry, fostering deeper integration between AI and the real economy, and implementing comprehensive measures. This involved constructing a system based on the themes of "industrial clusters", "intellectual property", and "demonstration projects". Also, China's government continues to support seven regions for the construction of a national pilot zone for AI innovation, and these regional governments successively issued policies regarding the construction of AI pilot zones.

As previously mentioned, the phase in 2022 is a "new supply side" in that AI policies highlight talent recruitment through different innovation competitions. Furthermore, the characteristics in this phase showed that China focused on advancing projects related to the new generation of AI, further refining and constructing AI application scenarios, emphasizing the establishment of AI ecological scenarios, and overall promoting innovation in new generation AI scenarios.

6. Conclusion

This article focused on the current six-year AI policies in China in terms of the issuing trends and the characteristics of distribution and inclination by a bibliometrics method. We collected 69 national and 310 regional AI policy documents and identified their issuing phases, stakeholders' joint networks, and keyword frequency and networks. We finally summarize the characteristics of China's AI policy, and provide some insights for scholars and policy researchers.

In general, the number of AI policies increased multiply from 2017 to 2022, especially after the "New-Generation Artificial Intelligence Development Plan" released by the SC (2017). The growth in the number of AI policies indicates that AI fields have received increasing attention from national and regional dimensions. From these four stages, it can be seen that the development focus varies, and the development focus of each stage is determined based on the achievement of the objectives of the previous stage of AI policies and the current state of social development. For example, the development layout of the AI industry has always been the goal of all four stages. The second stage inherited the comprehensive industrial development planning for AI construction from the first stage, and on that basis, it integrated the real economy, innovation investment, and financing support methods. In the third stage, it integrated big data information infrastructure and developed new-generation AI innovation development pilot zones. In the fourth stage, it developed typical artificial intelligence application scenarios in response to the demand for AI application scenarios.

However, there are some limitations in our study. First, in addition to the bibliometric and network analysis of policy documents, we should adopt qualitative text analysis to characterize national targets and strategies. Second, as the themes of China's AI policies are focused on and reflect policy content, we should collect all the policy themes to analyze the policy keywords. Third, the favorable context of China's AI development indicates that China has gradually entered a high-quality development era. Therefore, in the future, it will be necessary to focus on the research path of high-quality AI development.

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