

The motivation of integrating multi-layer governance into holistic governance Taking the implementation of the forest chief system as an example - An empirical test based on the theory of multiple streams

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Abstract: The forest chief system is an important institutional innovation in forest governance during the deepening of the reform of the collective forest tenure system. It reconstructs the system of inter-departmental collaboration. However, the academic community has paid insufficient attention to the formation and promotion mechanism of the forest chief system. Based on sample data from the implementation of the forest chief system at the county level in Anhui Province from 2010 to 2020, this paper deconstructs the implementation process of the forest chief system using the multiple streams theory under the pressures of hierarchical experimentation and peer pressure, and conducts an empirical analysis using event history analysis. The study finds that the policy stream represented by per capita forestry expenditure and the proportion of forestry output value in GDP, as well as the political stream represented by the work experience and tenure of county leaders, are key factors driving the implementation of the forest chief system. However, unlike related studies, the results of this paper indicate that due to the complexity of forest governance, the problem stream represented by per capita forest area and the frequency of forestry-related words significantly inhibits the implementation of the forest chief system. In addition, under China's unique context, hierarchical experimentation as a form of institutional innovation holds a special position, and the pressures from higher-level authorities and peers are important factors in promoting the implementation of the forest chief system.

Keywords: Forest Chief System; Multiple Streams Theory; Event History Analysis; Multi-level Governance; Holistic Governance

1. Introduction

Forests play a crucial role in achieving carbon neutrality, protecting biodiversity, and supporting the livelihoods of forest farmers in mountainous areas (Solanki et al., 2019). The mainstream literature on government natural resource and environmental governance generally acknowledges that the governance of natural resources and the environment falls under multiple departments, necessitating coordination among these departments to balance their interests (Boffa et al., 2016). Consequently, within the framework of multi-level governance, the "fragmentation" of governance power is often regarded as one of the reasons for inefficiency in the government's resource and environmental governance. To reconcile the conflict between forestry development and protection, the government has attempted to adopt a series of systems or laws. For instance, the revisions and enactments of the Forest Law and the Decision of the Central Committee of the Communist Party of China and the State Council on Several Issues Concerning the Protection of Forests and the Development of Forestry demonstrate the importance of forestry

development and protection.

The evolution of China's forestry authorities has undergone a transition from redundancy to non-redundancy to inadequate capacity. After the founding of the People's Republic of China, the forestry sector flourished, but as China's forestry function shifted from production to ecology, the sector ceased generating economic benefits. Consequently, funding for the sector became entirely dependent on fiscal allocations, leading to a decline in its political status. At the local level, the "legs" of the forestry sector diminished as numerous local forestry bureaus merged into natural resources bureaus. While this addressed the issue of bureaucratic redundancy, it also created a dilemma of inadequate capacity for development and protection. Responding to the need for ecological civilization construction, forestry authorities underwent mergers and reorganizations based on their functions, forming the National Forestry and Grassland Administration, which incorporated forestry into the broader framework of natural resources, further diminishing its status. This decline in status has led to insufficient political momentum, increasing the costs of inter-departmental coordination and widening the functional gaps within the forestry sector, ultimately hindering the efficient resolution of critical issues in forestry development and management (Lin et al., 2023). Concurrently, in recent years, new challenges have emerged in the protection and development of forest resources, including "diluted concepts, vague responsibilities, fragmented powers, generalized measures, and weakened functions" (Chen, 2019; Xu & Hedy, 2019). The widening gap between the increasing demand for forestry development and management and the lagging forestry governance capabilities has created a situation akin to an "undersized horse pulling a heavy cart," making forestry governance particularly challenging.

However, the institutional reforms and refinement of functional divisions within government departments have led to more frequent policy conflicts between departments and increasingly difficult cross-departmental coordination (Zhang & Zhao, 2022). This is characterized by a fragmented management mindset, unclear functional positioning of sub-systems, insufficient policy coordination, a single participant entity, and a lack of equal consultation mechanisms. In response, local governments have begun to seek holistic solutions. The rapid development of digital information has enabled the government to integrate departmental functions based on information sharing, thereby improving the "fragmentation" of public management (Yu et al., 2024; Chen, 2022). Consequently, the theory of holistic governance has gained widespread acclaim from academia and industry, with a significant portion of literature examining the transformation of government towards holistic governance (Liu & Shi, 2024; Qi & Wang, 2022). This theory transcends the singular goal of economic efficiency, returning to the value pursuit of addressing social issues, emphasizing the government's pursuit of solving public problems and focusing on policy integration. Nevertheless, scholars primarily view holistic governance as a mandatory reform imposed by higher-level governments. According to the theory of multi-level governance, the implementation of holistic governance by lower-level governments may suffer from insufficient awareness of change due to limitations in resources, information, and technology (Zeng & Pan Yi, 2021; Guo, 2021).

In the context of an authoritarian government, the Forest Chief System seeks cooperation among departments as a solution to bureaucratic redundancy. In response to the changes in forestry authorities and the growing demand for forestry governance, some local reforms of the Forest Chief System have emerged. However, the question of why the Forest Chief System is implemented remains inadequately answered, especially for long-cycle ecological products like forests, where there is a lack of effective evidence under multi-level governance. According to conventional theories, the more severe the ecological and environmental problems in a region, the more urgent the impetus for implementing the Forest Chief System. However, under the implementation of the Forest Chief System,

the more complex the issues, the more tasks local government leaders have to manage, which may paradoxically reduce their willingness to promote it. In multi-level governance, local government leaders often find themselves in a passive position of "doing more work and doing it well," where forest protection, governance, and development are at risk of being addressed in a "one-size-fits-all" manner, focusing solely on protection and preventing fires. Additionally, if local governments can obtain more funding and generate high forestry output values, they are more likely to attract the attention of local government leaders and be more inclined to implement the Forest Chief System. This is a manifestation of the political and GDP tournament, implying that ecological governance must endow ecological systems with the ability to generate economic value. Furthermore, local government leaders with work experience in environmental protection or forestry departments may be motivated to promote the Forest Chief System, leveraging their connections with "old departments and subordinates" to reduce resistance to its implementation.

Under the framework of multi-level governance, why are lower-level local governments willing to implement holistic governance? There is relatively little academic research on this topic. To address this gap, this paper poses a research question to examine spontaneous policy innovations by local governments.

To answer this research question, this paper draws on the multiple streams framework, incorporating external shocks such as hierarchical experimentation and peer pressure, to provide a theoretical framework explaining how environmental changes influence government policy implementation. Using a dataset from 99 counties in Anhui Province, China, spanning nearly a decade from 2010 to 2020, this paper examines the decisive factors influencing the implementation of the Forest Chief System at the county level.

The contributions of this paper are threefold. First, previous studies on holistic governance reforms have largely been qualitative in nature, focusing primarily on theoretical discussions and government practices at the macro level. This paper, based on the introduction and implementation of the Forest Chief System at the regional level, adopts a quantitative approach to study holistic governance reforms. Second, this paper empirically explores for the first time the reasons behind the emergence of holistic forest governance. While previous literature on holistic governance has mostly concentrated on the agricultural sector, with limited attention to forestry production, this paper uses the Forest Chief System as an entry point to investigate the transformation of holistic governance by governments in forestry development and protection. Finally, while most studies using the multiple streams framework have focused on explaining why policies are implemented, this paper further explores the causes of local behavior within the context of multi-level governance. Previous research often used the multiple streams framework to explain why a particular level of government (national or local) implements a specific policy. This paper is one of the few to specifically address this issue within a multi-level governance model.

2. Theoretical Analysis and Research Hypothesis

The forestry chief system is a policy aimed at protecting and developing ecological resources such as forest resources, with the core objective of consolidating the responsibilities of local party and government leaders, in order to achieve the improvement of the ecological environment and the protection of forestry resources. How did this policy come into existence? To explore the underlying causes, this article refers to the research of Jiang (2019) and constructs the theoretical analysis framework of this study based on Kingdon's (1984, 1995) Multiple Streams Framework theory. Kingdon's theory argues that the successful identification of public issues is a prerequisite, and that problem streams, policy streams, and political streams are the key streams that influence policy agenda setting. When the "policy window" opens, coupled with the role of policy entrepreneurs, the likelihood of this public issue

being placed on the policy agenda will greatly increase (Kingdon, 1995).

When applying the Multiple Streams Framework theory to the formation of policies and the establishment of policy agendas in China, it is necessary to take into account the issue of universal applicability (Wang et al., 2018). The forestry chief system is a typical embodiment of China's public policies, and its emergence is a comprehensive effect of all elements of the political system and external influencing factors. Additionally, China is an authoritarian country, and the policy attitudes of the central government can influence the innovative adoption behavior of local governments (He et al., 2024). The promotion of policies can also be influenced by peer pressure (Fan et al., 2022). Therefore, analyzing the forestry chief system from the perspectives of the Multiple Streams Framework theory, hierarchical experimentation, and peer pressure can effectively reveal the underlying mechanisms behind its emergence. To this end, the theoretical framework constructed in this article is shown in the following figure:

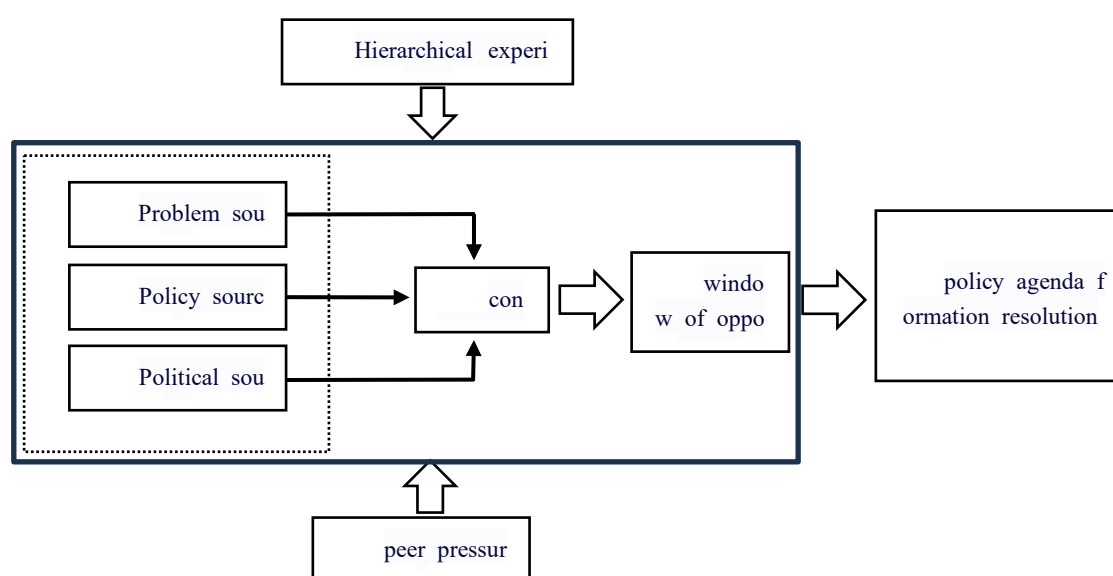


Figure 1: A Multiple Streams Model of Implementing the Forestry Chief System under Hierarchical Experimentation and Peer Pressure

2.1 The problem stream that emerges in the context of the forestry chief system

In the process of formulating public policies, the key to making an issue a problem that the government needs to address lies in indicators (Kingdon, 1993). Indicators can help policymakers perceive changes and assess the severity of challenges (Kingdon, 1993; Guo, 2022). When exploring the implementation of the forestry chief system in counties in Anhui Province, making the implementation of this system an urgent need relies on the relevant indicators in these counties. According to existing studies on multiple streams of issues, from the public's perspective, there is often a positive correlation between resource endowments, the government's attention, and policy implementation (Xiong et al., 2017; Cheng, 2021). However, whether this applies to all levels of policy implementation still needs further discussion based on actual conditions. Specifically, analyzing the driving factors for the implementation of the county-level forestry chief system from the perspective of problem streams, the abundance of forest resources in a county suggests that the region has relatively rich forestry resources (Yang et al., 2017). A high frequency of forestry-related terms indicates that forestry issues have also become a focus of public and policymakers' attention, confirming the complexity of forestry issues in the region, which are more likely to expose the diversity and complexity of forestry management. Meanwhile, a high frequency of forestry-related terms

in a county also indicates that the region has relatively comprehensive policies and management measures for forestry governance. To meet new forestry governance requirements, the county will tend to revise the existing policies. In the process of transforming existing forestry governance policies and measures into the forestry chief system, there will be resistance, which mainly stems from two aspects: first, existing policies are already relatively complete, forming a relatively stable forestry governance framework and interest pattern. Any policy shift may touch upon existing interests, thus triggering a certain degree of resistance and concern (Guo Yang et al., 2020); second, as an emerging forestry governance model, the forestry chief system's concepts, mechanisms, and implementation methods are relatively novel compared to existing policies, requiring some time to adapt and accept (Liu et al., 2022). Furthermore, forestry often involves multiple stakeholders, and the conflict and coordination of interests among these stakeholders increase the complexity of forestry governance and management difficulties (Qi, 2023). Therefore, in terms of collaborative and integrated governance, due to the complexity of the issues and the involvement of many stakeholders, it is difficult to establish an efficient governance coordination mechanism.

Therefore, the per capita forest area and the frequency of forestry-related words in various counties of Anhui Province constitute the source of the issue of the forest chief policy system being put on the policy agenda in Anhui Province. In general, the source of the issue constituted by per capita forest area and forestry-related word frequency does not promote the implementation of the forest chief system due to its own scale and issue popularity, but will inhibit the implementation of the forest chief system to a certain extent. Based on this, this paper proposes Hypothesis 1:

Hypothesis 1: The issue flow represented by per capita forest area and forestry-related word frequency will have a negative impact on the implementation of the county forest chief system.

2.2 The policy stream that emerges from the forest chief system

Policy streams refer to various policy solutions, strategies, or suggestions that may be proposed by government departments, research institutions, interest groups, and so on. Policy streams are described as the "primal soup" of problem-solving strategies, which can be mobilized in the policy system to address issues (Kingdon, 1995). They directly influence the government's perception and attitude towards forest resource management and protection. The implementation and communication of policies in the policy field are closely related, providing strong external support for policy implementation to a certain extent. From the perspective of policy streams, the most prominent contribution of forestry to the county economy is reflected in the proportion of forestry output value to GDP. A high proportion indicates that the forestry industry plays an important role in the county's economy. In this case, the government is more likely to attach importance to the development of forestry and adopt more active and effective forestry management policies to further enhance the forestry output value and benefits. Additionally, a high proportion of output value also means that the forestry industry has strong self-development ability and market potential (Ye et al., 2022), which helps the forest chief system play a greater role in promoting the upgrading and transformation of the forestry industry. Meanwhile, per capita expenditure on forestry reflects the government's investment and attention to forestry (Liu et al., 2024). When per capita expenditure on forestry is higher, it indicates that the government has invested more resources and energy in forest resource protection, forestry technological innovation, forestry talent cultivation, and other aspects. These investments provide a good material basis and policy support for the implementation of the forest chief system, contributing to better results in improving forestry management and promoting sustainable forestry development. Therefore, county governments are more inclined to implement the forest chief system. In studying the driving factors of the implementation of the forest chief system,

this paper summarizes per capita expenditure on forestry and the proportion of forestry output value to GDP as policy streams. Based on this, Hypothesis 2 of this study is proposed:

Hypothesis 2: The policy streams represented by per capita expenditure on forestry and the proportion of forestry output value to GDP will have a positive impact on the implementation of the county-level forest chief system.

2.3 The Political stream that emerges from the forest chief system

Political streams refer to the political background and environment for policy-making, including political leaders, political interests, political dynamics, and so on (Kingdon, 1995). Political streams determine which issues and policy options policy-makers focus on and when to take action (Kingdon, 1995). In China, policy innovation by local governments largely depends on the capabilities of local government leaders (William et al., 2009; Eaton et al., 2014; Zhu et al., 2015). In fact, during the gestation of the forest chief system, the county government has a significant impact on its implementation. Firstly, the abilities and personal work experience of county government leaders are related to whether the forest chief system can be introduced and whether the policy can be fully implemented. County government leaders with relevant work experience in related fields will have a deeper understanding of issues such as forestry resources and ecological environmental protection, and will be more sensitive to problems and challenges in forest resource management and ecological environmental protection. They will have a better understanding of the importance and implementation needs of relevant policies, making it more likely to promote the implementation of relevant policies. Secondly, the length of the term of county leaders will also affect the implementation of the forest chief system. The forest chief system is a long-term policy that requires long-term implementation. The length of the term of county leaders will affect whether a policy is implemented and the degree of implementation. Long-term tenure can accumulate more work experience, enabling leaders to better cope with complex situations and challenges, and more flexibly utilize measures and resources to promote policy implementation. Meanwhile, the length of tenure will also affect the stability of the county's political ecology, thereby affecting the sustainability of a policy's implementation. Based on this, Hypothesis 3 of this study is proposed:

Hypothesis 3: The political streams formed by the introduction of the forest chief system are mainly composed of the personal work experience and tenure of political leaders.

2.4 Implementation of Forest Chief System under Hierarchical Experiments

Under the system with Chinese characteristics, the higher-level government holds authority in the vertical relationship between governments to ensure effective control and leadership over local governments. The higher-level government directly influences the local government's perception and implementation of policies, and the coercive force from the higher-level government drives the local government to adopt and execute innovations (Walker, 2006). Local governments are strictly controlled in a highly centralized and hierarchical political system, and the promotion of local officials to higher positions depends on performance evaluations conducted by the higher-level government (Yu et al., 2021). The higher-level government even enforces policy choices in line with its wishes through incentives and punishments to achieve control over local officials (Mei et al., 2014). Therefore, the policy choice behavior of county-level governments is influenced by the policy choice behavior of city-level governments. In the process of implementing the Forest Chief System, the city-level government's promotion of the Forest Chief System or the issuance of related policies and systems not only enhances the legitimacy of the Forest Chief System but also exerts pressure on county-level governments. Based on the traditional administrative contracting system,

city-level governments use their authority and resource advantages to promote the implementation of the Forest Chief System in counties and evaluate its actual situation by quantifying indicators and establishing a performance evaluation system. Therefore, Hypothesis 4 of this study is proposed:

Hypothesis 4: The hierarchical experiment represented by whether the city-level Forest Chief System is implemented will have a positive impact on the implementation of the county-level Forest Chief System.

2.5 Implementation of Forest Chief System under Peer Pressure

Policy activities between governments often involve horizontal competition mechanisms, which essentially refer to the competition for performance among governments (Wang et al., 2013). Based on the theory of political tournaments, local governments at the same level have high similarities. They all face performance evaluations from higher-level governments, and the results of these evaluations are linked to promotion opportunities. Therefore, there is fierce competition among county-level governments. When a city adopts policy innovations and achieves corresponding achievements, it puts pressure on another city (Zhu et al., 2018), thus prompting other counties to introduce similar policies. The implementation of the Forest Chief System in counties is also influenced by political tournaments. Due to the need for assessment and promotion, county-level governments will learn from the policy measures of neighboring counties to maintain their advantages or avoid disadvantages. When county-level governments face similar issues as other counties, leaders and officials will observe policy innovations in other counties and learn advanced governance experiences to reduce and control the risks of policy innovation (Wang et al., 2021). Based on this, Hypothesis 5 of this study is proposed:

Hypothesis 5: Peer pressure represented by whether all adjacent counties have implemented the Forest Chief System will have a positive impact on the implementation of the Forest Chief System in counties.

3. Research Design

3.1 Research Area

This paper takes the counties in Anhui Province as the research units. Anhui Province, located in the central part of China, plays an important role in ecological location and is a key province of collective forest areas in southern China. As the first province in China to implement the forestry chief system across the province, Anhui Province was approved to become a national forestry chief system reform demonstration zone in 2019. The practical exploration of the forestry chief system in Anhui Province has become a focus of academic attention. Therefore, this paper conducts a practical study on the policy introduction of the forestry chief system in various counties of Anhui Province. The emergence of the forestry chief system in Anhui Province can be traced back to 2017. Considering the issue of county-level administrative division adjustment, this paper selects 99 counties in Anhui Province from 2010 to 2020 as the research objects. The research area is shown in Figure 2.

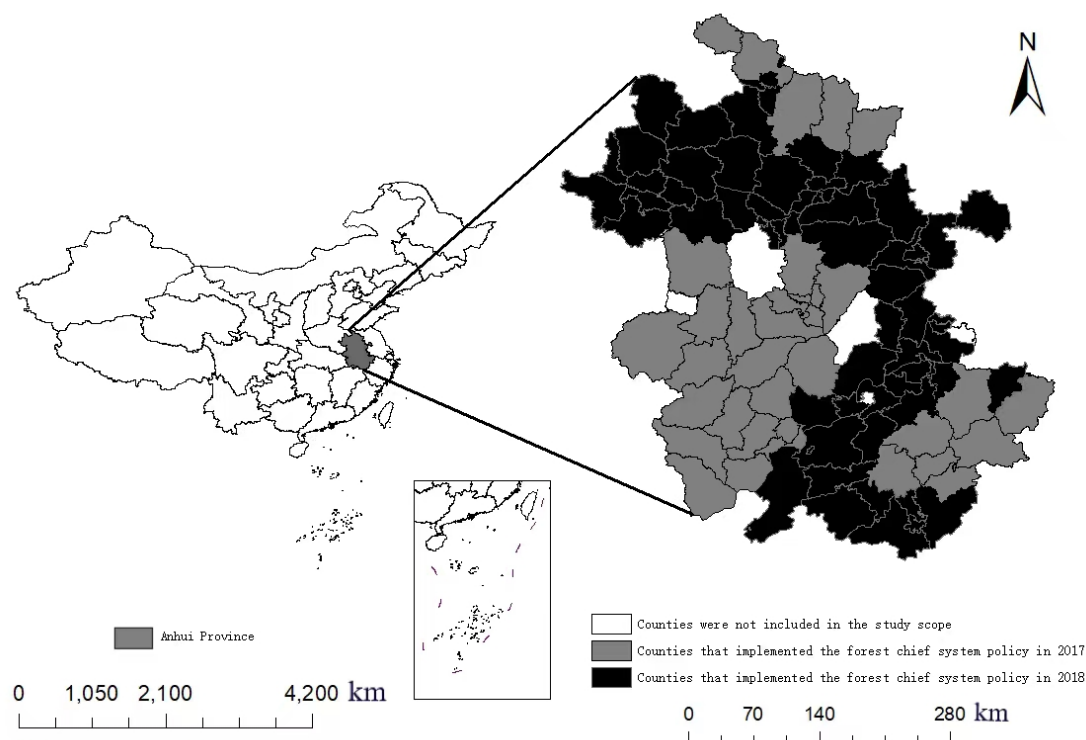


Figure 2

3.2 Data Sources

Based on the discussion of the influencing factors of the implementation of the forestry chief system, the data used in this paper, such as forest area, expenditure on forestry undertakings, and regional gross domestic product, are derived from the statistical yearbooks of prefecture-level cities and counties in Anhui Province. The data on the implementation of the forestry chief system and related forest-related word frequencies are mainly obtained by retrieving and organizing the documents related to the implementation of the forestry chief system released by the websites of prefecture-level cities and county-level governments. The incentive data of officials in various counties are mainly from the official websites of local governments, collecting and organizing relevant information such as the tenure of county party secretaries and related work experience. Other data required for the article mainly come from the China City Statistical Yearbook, China County Statistical Yearbook, and county statistical bulletins.

3.3 Variable Description

3.3.1 Dependent Variable

Implementation of the Forestry Chief System. Whether the Forestry Chief System has been implemented can be directly used to measure whether the Forestry Chief System has been implemented in a county. This variable is a dummy variable, assigned a value of 0 for years when the Forestry Chief System has not been implemented, and a value of 1 for the year of implementation and subsequent years.

4.3.2 Core Independent Variables

In this paper, independent variables are selected based on the three streams of the multiple streams theory, as well as hierarchical experimentation and peer pressure. The variables selected correspond to these three streams, hierarchical experimentation, and peer pressure. Among them, the problem stream combines theoretical analysis and existing research results (Kingdon, 1993), using the frequency of forestry-related words (SLC) and the per capita forest area (RSM) as indicators. The policy stream refers to existing research (Dolan et al., 2019), selecting per capita expenditure on forestry undertakings (RLZ) and the proportion of forestry output value in GDP (LCZ) as indicators. The political stream refers to the research of Tian et al. (2019), selecting whether the county or district

secretary has served in forestry and environmental protection-related departments (SHB) and the length of service of the county or district secretary (SRS) as indicators. At the same time, considering the possible influence of hierarchical experimentation and peer pressure on the implementation of the Forestry Chief System, referring to the relevant research of Liu et al. (2021) in the academic community, the municipal Forestry Chief System is intuitively included in the hierarchical experimentation, and whether all neighboring counties have implemented the Forestry Chief System is included in peer pressure.

3.3.3 Control Variables

Considering that other relevant factors may affect the implementation of the Forestry Chief System in counties, referring to relevant research, the implementation of innovative policies in a region is usually related to economic development level, population structure, innovation capability, etc. Therefore, this paper includes the proportion of rural population, per capita GDP, and Ln patent grants in the consideration. Table 1 lists the types, meanings, and statistical information of each variable.

Table 1: Types, Meanings, and Statistical Information of Variables

Variable Type	Code	Variable Name	Variable Meaning	Mean	Std.Dev
Dependent variables	LZZ	Whether to implement the forest chief system	Whether the county implements the forest chief system at time t is assigned a value of 1 and a value of 0 if not	0.253	0.435
	SLC	Frequency of forest-related words	The number of words related to forestry in county-level documents and statistical bulletins	11.501	6.114
	RSM	Forest area per capita	The area of forest cover in the county	0.111	0.220
	RLZ	Per Capita Forestry Expenditure	The county's investment expenditure on forestry	0.083	0.079
	LCZ	Forestry output value as a proportion of GDP	The ratio of forestry production value to county GDP	0.016	0.020
independent variables	SHB	The position of the secretary of the county and district party committee	Whether the secretary of the county party committee has relevant experience in the forestry and environmental protection department is assigned a value of 1 and a value of 0	0.080	0.271
	SRS	Duration of tenure of the secretary of the county or district party committee	The length of the term of office of the secretary of the county or district party committee	3.027	1.384
	SLZ	Municipal forest chief system	Whether the prefecture-level city where the county is located implements the forest chief system is assigned a value of 1 and a value of 0 if not	0.091	0.288

control variables	peer pressure	XLZ	Whether the adjacent counties have implemented the forest chief system	Whether the relevant neighboring counties of the county have implemented the forest chief system is assigned a value of 1 and a value of 0 if not	0.222	0.416
		NCR	Proportion of rural population	The annual rural population of the county	0.635	0.278
		RJG	GDP per capita	The annual per capita GDP of the county	3.994	3.211
		ZLS	LN Patents Granted	The number of patents granted by the county in a year, and the variable is logarithmically processed	5.507	1.097

3.4 Research Methodology and Measurement Model

Event History Analysis (EHA) is a widely used research method in the field of social sciences (Berry, 1990; Yang et al., 2024). The core of this method lies in tracking the behavior or events of individuals or collectives at specific time points, and analyzing the causes, processes, and outcomes of these behaviors or events (Barton et al., 1996). It provides a series of theoretical and empirical tools for studying the key driving factors that affect state changes over time (Allison, 2014). Based on the mainstream models of EHA, this paper utilizes the Kaplan-Meier survival function and Nelson-Aalen hazard function to estimate the distribution characteristics of the implementation of the forest chief system in counties of Anhui Province, and employs the proportional hazards regression model (Cox model) for regression analysis. The specific research model is as follows:

$$S(t) = \prod_{i:t_i \leq t} (1 - \frac{d_i}{n_i}) \quad (1)$$

Where $S(t)$ represents the cumulative survival probability of counties that have not yet implemented the forest chief system, t denotes the observation time points, $n(t)$ indicates the number of county individuals that implemented the forest chief system at time t , and $N(t)$ represents the number of county individuals that have not implemented the forest chief system at time t .

$$\hat{H}(t) = \sum_{t_i \leq t} \frac{d_i}{n_i} \quad (2)$$

Where represents the estimated cumulative hazard function, t is the observation time points, $n(t)$ is the number of county individuals that implemented the forest chief system at time t , and $N(t)$ represents the number of counties that have not implemented the forest chief system at time t .

$$h(t, x) = h_0(t) \exp(\beta_1 \times SLC + \beta_2 \times RSM + \beta_3 \times RLZ + \beta_4 \times LCZ + \beta_5 \times SHB + \beta_6 \times SRS + \beta_7 \times SLZ + \beta_8 \times XLZ + \beta_9 \times NCR + \beta_{10} \times RJG + \beta_{11} \times ZLS) \quad (3)$$

Where $h(t)$ represents the hazard function of the implementation of the forest chief system in counties, and is the baseline hazard function (i.e., the hazard function value when all core independent variables are 0). $\beta_1, \beta_2, \dots, \beta_k$ are the model parameters, representing the influence of core independent variables on the hazard, while the independent variables include the municipal forest chief system (SLZ), per capita forest area (RSM), per capita forestry expenditure (RLZ), etc.

4. Empirical Results and Analysis

This study utilizes STATA 17.0 software to perform survival function and risk estimation on the implementation of the Forestry Chief System in counties during the research period, and conducts a regression analysis on the influencing factors of the implementation of the Forestry Chief System in counties based on the Cox regression model.

It should be noted that there exists an endogeneity issue between the dependent variable and independent variables in the same period. Whether the Forestry Chief System is implemented in the current period will affect some performance indicators in the forestry sector during this period, such as the potential improvement in forest area and quality, changes in the number of policy documents, and an increase in forestry output value. Using this variable as an explanatory variable would lead to endogeneity issues. Generally speaking, the implementation of the Forestry Chief System in the current period will not affect the forestry status of the previous period, while the status of the previous period is the reason for the implementation of the Forestry Chief System in the current period. Therefore, this study performs a one-period lag treatment on the forestry-related word frequency, per capita forest area, per capita expenditure on forestry undertakings, the proportion of forestry output value in GDP, the municipal Forestry Chief System, and whether neighboring counties have fully implemented the Forestry Chief System among the core independent variables.

4.1 Kaplan-Meier, Nelson-Aalen, and Smoothed Hazard Estimation for the Overall Sample

Kaplan-Meier's product-limit method is an effective means to describe the occurrence of survival outcomes (Kaplan et al., 1958). Based on the Kaplan-Meier product-limit formula, this study provides an overall estimation of the implementation of the Forestry Chief System in 99 counties in Anhui Province. Figure 3(a) shows the survival function of the implementation of the Forestry Chief System in 99 counties in Anhui Province. The horizontal axis measures the analysis time in months, with the observation starting point set at 0, indicating the duration of the non-implementation of the Forestry Chief System policy in each county in Anhui Province under the observed time. The vertical axis represents the proportion of counties in Anhui Province that have not implemented the Forestry Chief System. As the observation time extends, the survival function curve in the figure shows a downward trend, indicating the survival probability of the non-implementation of the Forestry Chief System in counties in Anhui Province. It can be observed from the trend of the survival function curve that the curve is relatively steep from around the 16th to 20th month, indicating a significant downward trend. This suggests that during this period, counties in Anhui Province were relatively active in promoting the Forestry Chief System.

The Nelson-Aalen survival analysis function is a statistical method used to evaluate time-dependent events, commonly used in observational studies and survival analysis (Nelson, 1969; Aalen, 1978). It is a non-parametric estimation method similar to the Kaplan-Meier product-limit method. Figure 3(b) depicts the hazard function of the implementation of the Forestry Chief System in counties in Anhui Province. It can be seen that before the pilot of the Forestry Chief System in Anhui Province, the risk of implementing the Forestry Chief System in counties was zero. As time progressed, Anhui Province conducted pilot projects of the Forestry Chief System, and the risk of implementing the Forestry Chief System in counties increased until all counties in Anhui Province implemented the Forestry Chief System.

Figure 3(c) describes the risk of implementing the Forestry Chief System in counties in Anhui Province as a function of duration based on smoothed hazard function estimation. It can be observed that as time progresses, the risk of implementing the Forestry Chief System in counties generally exhibits a trend of first increasing and then decreasing. The peak risk of implementing the Forestry Chief System in counties occurs around the 23rd month of observation. This is consistent with the actual comprehensive promotion of the Forestry Chief System in Anhui Province in 2018.

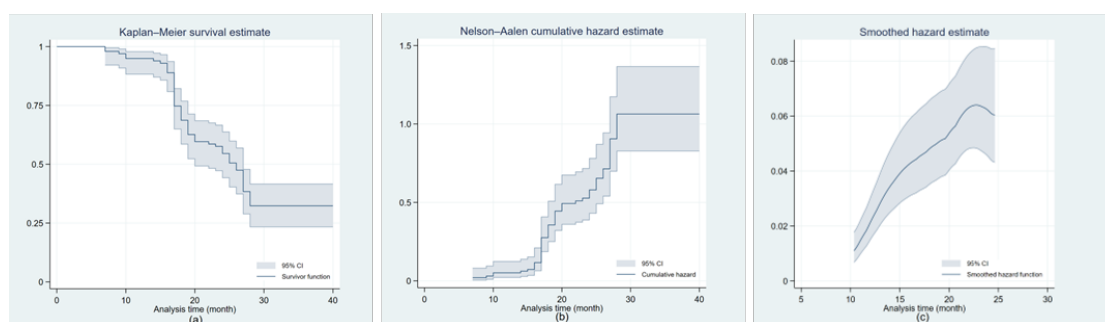


Figure 3

4.2 Cox Regression Model Analysis for the Implementation of Forest Chief System

Before conducting a Cox regression model analysis, it is necessary to test it to meet the proportional hazards assumption. The proportional hazards assumption is a fundamental prerequisite for the Cox proportional hazards model. If the assumption holds, it means that the effects of various independent variables on the risk of event occurrence are time-invariant, i.e., their hazard ratios remain constant throughout the entire observation period. To test this assumption, this paper employs the Schoenfeld residual method. As shown in Table 2, the P-values of all independent variables are greater than 0.05, and the P-value of the "Global test" is also greater than 0.05, indicating that the above assumption holds, and thus the Cox proportional hazards model can be applied in this paper.

In the analysis of the impact of the implementation of the forest chief system, variables corresponding to the three streams of origin, hierarchical experimentation, and peer pressure are included as core independent variables in the analysis of the impact of the implementation of the forest chief system. Table 3 presents the regression results of each core independent variable on the implementation of the forest chief system.

In Model 1, this paper regresses the core independent variables on the implementation of the forest chief system without considering other potential control variables that may affect its implementation. In Model 1, variables corresponding to the three streams of origin, hierarchical experimentation, and peer pressure have significant effects on the implementation of the forest chief system. Based on Model 1, this paper includes other factors that may affect the implementation of the forest chief system as control variables in the regression model. The results, as shown in Model 2, are consistent with the effects of the independent variables on the implementation of the forest chief system in Model 1.

First, this paper regresses the core independent variables corresponding to the problem stream, i.e., the frequency of forest-related words (L.SLC) and per capita forest area (L.RSM), on the implementation of the forest chief system. The frequency of forest-related words (L.SLC) has an inhibitory effect on the implementation of the county-level forest chief system in both Model 1 and Model 2, and both pass the significance test at the 1% level. Per capita forest area (L.RSM) has a negative impact on the implementation of the county-level forest chief system, passing significance tests at different levels, while the inhibitory effect of per capita forest area (L.RSM) on the implementation of the county-level forest chief system in Model 2 is weaker than that in Model 1. Overall, the independent variables corresponding to the problem stream have a significant inhibitory effect on the implementation of the county-level forest chief system, which is consistent with Research Hypothesis 1.

Second, this paper performs regression analysis on the implementation of the forest chief system based on the independent variables selected from the policy stream, i.e., per capita forestry expenditure (L.RLZ) and the proportion of forestry output value in GDP (L.LCZ). The results show that in both Model 1 and Model 2, per capita forestry expenditure (L.RLZ) and the proportion of forestry output value in GDP (L.LCZ) have significant positive effects on the implementation of the county-level forest chief system, and the regression results of Model 2 pass the significance test at the 10% level. Further observation reveals that the regression coefficient of per capita forestry

expenditure (L.RLZ) in Model 2 is greater than that in Model 1, indicating that after controlling relevant variables, its impact on the implementation of the county-level forest chief system is greater. However, after incorporating relevant control variables, the regression coefficient of per capita forestry expenditure (L.RLZ) becomes significantly smaller, and its significance becomes weaker. This change may be due to the decrease in the explanatory power of the proportion of forestry output value in GDP (L.LCZ) on the implementation of the county-level forest chief system after introducing relevant variables. After incorporating other control variables, the research on the implementation of the county-level forest chief system tends to be more scientific. Therefore, the policy stream represented by per capita forestry expenditure and the proportion of forestry output value in GDP has a significant positive impact on the county-level forest chief system, verifying Research Hypothesis 2.

Once again, a regression analysis was conducted on the implementation of the county forest chief system, represented by whether the county or district secretary had served in forestry and environmental protection-related departments and the length of time they served in this position. The results showed that in Models 1 and 2, whether the county or district secretary had served in forestry and environmental protection-related departments (SHB) and the length of time they served (SRS) both had a significant positive impact on the implementation of the forest chief system. Further observation revealed that in Model 2, the regression coefficient of whether the county or district secretary had served in forestry and environmental protection-related departments (SHB) increased and the significance strengthened compared to Model 1, indicating that after better controlling for the economic and social development level of the county, whether the county or district secretary had served in forestry and environmental protection-related departments (SHB) played an important role in the implementation of the forest chief system. The regression coefficient of the length of time the county or district secretary served (SRS) decreased and the significance weakened from Model 1 to Model 2. This suggests that the impact of the length of time the county or district secretary served (SRS) on forestry policies weakened compared to Model 1, mainly because these related variables may also be important factors affecting forestry policies, thus diluting the role of the personal characteristics of the county or district secretary. Therefore, the independent variables corresponding to the political stream have a significant positive impact on the implementation of the county forest chief system, verifying Hypothesis 3 of the study.

Additionally, in this study, the implementation of the municipal forest chief system (L.SLZ) was considered as a factor under the hierarchical experiment. The regression results showed that the implementation of the municipal forest chief system (L.SLZ) had a significant positive impact on the implementation of the county forest chief system, and both Models 1 and 2 passed the 1% significance level test. After including control variables based on Model 1, the regression coefficient of the municipal forest chief system (L.SLZ) increased, indicating that after considering other factors that may affect the implementation of the county forest chief system, the impact of the municipal forest chief system (L.SLZ) under the hierarchical experiment on the implementation of the county forest chief system was more accurate and reasonable. At the same time, the introduction of the forest chief system by the higher-level government can significantly promote the implementation of the forest chief system by lower-level county governments. Therefore, Hypothesis 4 of the study was verified.

Finally, considering that the implementation of policies may be influenced by peer pressure, this study included whether adjacent counties implemented the forest chief system (XLZ) in the regression analysis. The results of Models 1 and 2 both showed that under peer pressure, whether adjacent counties implemented the forest chief system (XLZ) had a significant positive impact on the implementation of the forest chief system in the local county. One possible explanation is that the implementation of the forest chief system in adjacent counties can produce a "spillover effect," and due to the role of "political competition," it will promote the current county to strengthen its emphasis and investment in forestry, thus making it more willing to implement the forest chief system. Therefore, Hypothesis 5 of the study was verified.

Table 2: Proportional Hazards Hypothesis Testing

	rho	chi2	df	Prob>chi2
L.SLC	0.053	0.250	1	0.617
L.RSM	0.238	2.240	1	0.134
L.RLZ	-0.196	3.560	1	0.059
L.LCZ	0.010	0.010	1	0.939
SHB	0.208	3.220	1	0.073
SRS	-0.118	1.020	1	0.312
L.SLZ	-0.085	0.470	1	0.492
L.XLZ	0.220	3.370	1	0.066
NCR	0.042	0.120	1	0.733
RJG	0.175	2.090	1	0.149
LnZLS	-0.065	0.280	1	0.598
Global test		11.270	11	0.421

Note: Robust variance-covariance matrix used.

Table 3: Results of Cox Regression Model Analysis

variable	LLZ	
	Model 1	Model 2
L.SLC	-0.089** * (0.026)	-0.079*** (0.028)
L.RSM	-1.235** (0.531)	-1.042* (0.556)
L.RLZ	2.569* (1.429)	2.936* (1.755)
L.LCZ	15.733** * (3.658)	9.439* (5.38)
SHB	0.885** (0.425)	1.176*** (0.312)
SRS	0.237*** (0.091)	0.177* (0.102)
L.SLZ	1.272*** (0.266)	1.659*** (0.276)
L.XLZ	0.729** (0.301)	0.979** (0.38)
NCR		-2.081*** (0.72)
RJG		-0.058 (0.048)
LnZLS		-0.113 (0.166)
Log pseudolikelihood	-251.577	-247.149

Note: *, **, *** indicate significant at the levels of 10%, 5%, and 1%, respectively. The values in parentheses are robust standard errors.

4.3 Moderating Effect

To further explore the moderating effect of hierarchical experiments and peer pressure on the influence of various core independent variables on the implementation of the forest chief system, this paper conducts regression analysis by adding the interaction terms between the implementation of the municipal forest chief system and the three streams of influence in adjacent counties.

4.3.1 Moderating Effect of Multiple Streams of Influence under Hierarchical Experiments

Table 4 verifies the moderating effect of hierarchical experiments on the three streams of influence and the implementation of the forest chief system. The regression results show that the model passes the F-test overall, and the F-test is relatively significant. All explanatory variables (including interaction terms and other variables) in Models 1 to 6 jointly have a significant impact on the implementation of the forest chief system. Specifically, under hierarchical experiments, the problem stream has an inhibitory effect on the implementation of the forest chief system. The interaction term between the forest-related word frequency and the implementation of the municipal forest chief system (L.SLC×SJL) passes the significance test at the 5% level, while the interaction term between the per capita forest area and the implementation of the municipal forest chief system (L.RSM×SJL) does not pass the significance test. The interaction terms between the per capita expenditure on forestry undertakings and the proportion of forestry output value in GDP (L.RLZ×SJL) and the implementation of the municipal forest chief system (L.LCZ×SJL) in the policy stream have a positive impact on the implementation of the forest chief system, but they do not pass the significance test. Regions with higher per capita expenditure on forestry undertakings and a higher proportion of forestry output value in GDP may have already formed an industrial structure and economic development model that relies on forest resources. The implementation of the forest chief system may have economic and social impacts on these regions, leading to local governments resisting or treating the implementation of the forest chief system negatively, which may ultimately weaken the moderating effect of per capita expenditure on forestry undertakings and the proportion of forestry output value in GDP on the implementation effect of the municipal forest chief system. The interaction term between the environmental protection work experience of the county or district party secretary and the implementation of the municipal forest chief system (SHB×SJL) and the interaction term between the term length and the implementation of the municipal forest chief system (SRS×SJL) in the political stream both pass the significance test at the 10% level.

Table 4 Analysis Results of the Moderating Effect of Multiple Streams of Influence under Hierarchical Experiments

variable	LZZ					
	(1)	(2)	(3)	(4)	(5)	(6)
L.SLC×SJL	-0.026** (0.008)					
L.RSM×SJL		-0.285 (0.170)				
L.RLZ×SJL			0.212 (0.699)			
L.LCZ×SJL				1.426 (2.533)		
SHB×SJL					0.403** (0.142)	
SRS×SJL						0.086* (0.037)
L.SLC	-0.002 (0.001)	-0.006** * (0.001)	- 0.005*** (0.002)	- 0.005*** (0.001)	- 0.006*** (0.001)	- 0.005*** (0.001)
L.RSM	-3.089** (1.089)	-3.524** * (1.030)	-2.951* (1.146)	-2.927* (1.157)	-2.905* (1.113)	-2.88* (1.131)
L.RLZ	0.593** (0.212)	0.703*** (0.204)	0.634** (0.212)	0.670** (0.205)	0.577** (0.187)	0.618** (0.192)
L.LCZ	1.359 (0.729)	0.944 (0.633)	1.049 (0.587)	0.996 (0.528)	0.773 (0.543)	0.948 (0.580)
SHB	0.068* (0.037)	0.068* (0.037)	0.072* (0.037)	0.073* (0.037)	0.013 (0.037)	0.066* (0.037)

	(0.034)	(0.325)	(0.033)	(0.033)	(0.023)	(0.031)
SRS	0.015** (0.005)	0.017** (0.005)	0.016** (0.005)	0.016** (0.005)	0.015** (0.005)	0.007* (0.003)
SLZ	0.638*** (0.140)	0.280*** (0.069)	0.229** (0.084)	0.225** (0.077)	0.203** (0.064)	-0.060 (0.139)
XLZ	0.821*** (0.036)	0.808*** (0.035)	0.815*** (0.038)	0.813*** (0.035)	0.817*** (0.034)	0.820*** (0.035)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.076 (0.129)	0.152 (0.128)	0.076 (0.141)	0.074 (0.140)	0.076 (0.137)	0.086 (0.135)
F test	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Regional fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	990	990	990	990	990	990

Note: *, **, *** indicate significant at the levels of 10%, 5%, and 1%, respectively. The values in parentheses are robust standard errors.

4.3.2 The Effect of Multiple Streams under Peer Pressure

Table 5 presents the regression results of the impact of peer pressure on the implementation of the forest chief system in terms of the three major streams. The results show that the overall F-test of the model is significant, indicating that the comprehensive impact of relevant variables on the implementation of the forest chief system is relatively significant. Peer pressure has a negative impact on the implementation of the forest chief system in terms of the frequency of forest-related words in the problem stream, but it did not pass the significance level test. However, the positive impact of the interaction term between L. per capita forest area and whether neighboring counties implement the forest chief system on the implementation of the forest chief system passed the significance test at the 10% level. In the impact of the interaction between policy streams and peer pressure on the implementation of the forest chief system, the interaction term between L. per capita forestry expenditure and whether neighboring counties implement the forest chief system, as well as the interaction term between the proportion of forestry output value in GDP and whether neighboring counties implement the forest chief system, both have a positive impact on the implementation of the forest chief system, but both did not pass the significance test. In the impact of the interaction between political streams and peer pressure on the implementation of the forest chief system, the interaction term between the environmental protection work experience of the county party secretary and whether neighboring counties implement the forest chief system, as well as the interaction term between the term length and whether neighboring counties implement the forest chief system, both have an inhibitory effect on the implementation of the forest chief system, but did not pass the significance test.

Table 5 Analysis Results of Multiple Streams under Peer Pressure

variable	LZZ					
	(1)	(2)	(3)	(4)	(5)	(6)
L.SLC×XLZ	-0.005 (0.004)					
L.RSM×XLZ		0.125* (0.048)				
L.RLZ×XLZ			0.004 (0.255)			
L.LCZ×XLZ				0.487 (0.606)		
SHB×XLZ					-0.092 (0.072)	
SRS×XLZ						-0.009 (0.016)
L.SLC	-0.005* * (0.112)	-0.005* ** (0.001)	-0.005* ** (0.001)	-0.005* ** (0.001)	-0.005* ** (0.001)	-0.005* ** (0.001)
L.RSM	-2.731* (1.086)	-2.789* (1.224)	-2.954* (1.147)	-2.920* (1.153)	-2.935* (1.164)	-2.985* (1.152)
L.RLZ	0.684** (0.209)	0.636** (0.203)	0.670* (0.284)	0.678* * (0.206)	0.658* * (0.205)	0.660** (0.214)
L.LCZ	1.007 (0.565)	1.131 (0.594)	1.061 (0.597)	0.763 (0.788)	1.001 (0.555)	1.082 (0.594)
SHB	0.078* (0.034)	0.077* (0.034)	0.073* (0.033)	0.074* (0.033)	0.119 (0.068)	0.074* (0.033)
SRS	0.016** (0.005)	0.016** (0.005)	0.016** (0.005)	0.016* * (0.005)	0.016* * (0.005)	0.018** * (0.005)
SLZ	0.247** * (0.060)	0.249** * (0.060)	0.248** * (0.060)	0.247* ** (0.060)	0.245* ** (0.060)	0.247** * (0.067)
XLZ	0.876** * (0.041)	0.799** * (0.036)	0.813** * (0.043)	0.805* ** (0.039)	0.823* ** (0.036)	0.844** * (0.139)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.063 (0.137)	0.042 (0.148)	0.076 (0.141)	0.078 (0.140)	0.078 (0.141)	0.073 (0.139)
F test	0.000** *	0.000** *	0.000** *	0.000* **	0.000* **	0.000** *
Regional fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	990	990	990	990	990	990
Observations	990	990	990	990	990	990

*Note: *, **, *** indicate significant at the levels of 10%, 5%, and 1%, respectively. The values in parentheses are robust standard errors.*

4.4 Heterogeneity Test

To explore the heterogeneity of factors influencing the implementation of the county-level forest chief system, this paper divides Anhui Province into northern, central, and southern regions based on geographical location, into areas with rich and non-rich forest resources based on forest resource endowment, and into regions with high, medium, and low economic development levels for regression analysis. The results are shown in Table 6.

4.4.1 Regional Heterogeneity

Regarding the heterogeneity of regions, there are significant differences in the impact of the problem stream on the implementation of the forest chief system in northern, central, and southern Anhui, especially between northern and central Anhui. This interesting difference may be attributed to the relatively small population and forest resources in northern Anhui. Within the same province, areas with low forest resource endowment will make every forest area particularly important. The government may be more inclined to implement more forestry-related policies to protect and promote the sustainable utilization of forest resources, thus having a positive impact on the implementation of the forest chief system. From the perspective of policy stream, the per capita expenditure on forestry undertakings in central Anhui passed the significance test, while other regions did not. In addition, there is a significant difference in the proportion of forestry output value to GDP between central Anhui and northern and southern Anhui. One possible explanation is that local governments tend to pay more attention to economic development, increase the output value of related forest products, and the expenditure on forestry undertakings related to ecological aspects is mainly to serve economic development, funded by the corresponding environmental protection investment brought by regional economic development. In the political stream, whether the county or district party secretary has worked in the environmental protection department has no significant impact on the implementation of the forest chief system in southern Anhui, while different levels of significance tests have been passed in northern and central Anhui. The reason for this difference lies in the rich forestry resources in southern Anhui, which means that forestry undertakings in this region may be more complex. In the process of implementing the forest chief system, more factors need to be considered comprehensively, such as forest resource protection, ecological protection, industrial development, etc. These aspects may lead to the insignificant impact of the working background of county or district party secretaries on the implementation of the forest chief system. In contrast, the forestry resources in northern and central Anhui are relatively scarce, so there may be fewer factors to consider in implementing the forest chief system, which also leads to the significant impact of the working background of county or district party secretaries on the implementation of the forest chief system.

4.4.2 Heterogeneity of Resource Endowment

From the perspective of the heterogeneity of forest resource endowment in Anhui Province, there is a significant difference in the impact of the frequency of forestry-related words in the problem stream on the implementation of the forest chief system between areas with rich and non-rich forest resources. The frequency of forestry-related words in areas with non-rich forest resources has a positive impact on the implementation of the forest chief system. However, the impact of whether the county or district party secretary has worked in the environmental protection department in the political stream on the implementation of the forest chief system is significantly stronger in areas with non-rich forest resources than in areas with rich forest resources. The reason for this difference may be that in areas with relatively few forest resources, forestry undertakings and forestry reforms tend to be more simplified. The number of forestry-related policy documents will directly concern the attention paid to regional forestry undertakings. Leaders, for the need of ecological civilization construction, will be more inclined to implement the forest chief system.

From the perspective of per capita expenditure on forestry undertakings in the policy stream, areas with rich forest

resources have a significant positive impact on the implementation of the forest chief system, while areas with non-rich forest resources have no significant impact. One possible explanation is that in areas with rich forest resources, the government usually attaches great importance to the development of forestry industry and the protection of forest resources. Therefore, it will increase investment in forestry undertakings through policy stream, providing necessary financial and technical support for the implementation of the forest chief system, including forestry infrastructure construction, forest tending, forest fire prevention, and forestry technology promotion. Conversely, in areas with non-rich forest resources, the government's expenditure on forestry undertakings is relatively small, which may lead to insufficient financial, technical, and personnel support for the implementation of the forest chief system, thus affecting the implementation of the policy.

4.4.3 Heterogeneity of Economic Development Level

To further examine the heterogeneity of relevant factors in the implementation of the forest chief system across regions with different economic development levels, the per capita GDP of counties in Anhui Province was sorted and classified into three different levels, as shown in the results. In the policy problem origin, the impact of regions with different economic development levels on the implementation of the forest chief system is relatively apparent, mainly manifesting in the positive influence of per capita forest area in regions with high economic development levels on the implementation of the forest chief system, and the positive influence of the frequency of forestry-related words in regions with moderate economic development levels on the implementation of the forest chief system. The reasons for this are twofold. Firstly, in regions with high economic development levels, a higher per capita forest area indicates rich forest resources and a more stable ecosystem, providing a good natural foundation for the implementation of the forest chief system. At the same time, ecological services are crucial to economic development and residents' quality of life, so both the government and residents have a strong motivation to protect forests and tend to promote the implementation of the forest chief system. Secondly, as the economy develops, residents' awareness of ecological protection in regions with moderate economic development levels is also increasing. Recognizing the important role of forestry in economic development and ecological protection, the government will take measures to support forestry development, including formulating policies conducive to forestry development and increasing investment in forestry.

In the policy source, per capita expenditure on forestry undertakings has a significant positive impact on the implementation of the forest chief system in regions with low economic development levels, but not in regions with high and moderate economic development levels. The proportion of forestry output value in GDP has a negative impact on the implementation of the forest chief system in regions with moderate economic development levels, which is more apparent compared to regions with high and low economic development levels. The reasons for these two differences may be that regions with low economic development levels have limited financial resources and insufficient government investment in forestry undertakings. Therefore, the impact of per capita expenditure on forestry undertakings on the implementation of the forest chief system is more significant. In regions with moderate economic development levels, the economic development model may be more dependent on resource consumption and environmental destruction, with a higher proportion of forestry output value in GDP. This can lead to a certain degree of contradiction between forestry output value and forest ecological protection, and counties may tend to develop the economy.

Table 6 Results of Heterogeneity Analysis

variable	LZZ							
	Regional heterogeneity			heterogeneity of resource endowment		heterogeneity of economic development level		
	Northe	Centr	Southe	Forest	Forest	High	Medium	Low Economic
	rn Anhui	al Anhui	rn Anhui	Non-Rich Area	Rich Area	Economic	Economic	Development

						Development Level	Development Level	Level
L.SLC	0.003 (0.002)	-0.003 (0.002)	-0.001 (0.002)	0.001 (0.002)	-0.000 (0.002)	-0.002 (0.002)	0.000 (0.002)	-0.003 (0.002)
L.RSM	6.885 (13.460)	-0.000 (0.102)	0.018 (0.062)	-4.888 (5.141)	-0.014 (0.046)	0.039 (0.082)	-0.007 (0.616)	-0.139 (0.091)
L.RLZ	0.024 (0.230)	1.595*** (0.413)	0.154 (0.148)	0.266 (0.187)	0.361* (0.153)	0.146 (0.132)	0.054 (0.231)	1.704*** (0.414)
L.LCZ	0.377 (0.687)	-0.550 (0.914)	0.669 (0.577)	0.587 (0.659)	0.067 (0.487)	2.033* (0.962)	-0.002 (0.619)	0.760 (0.723)
SHB	0.110* (0.048)	0.138** (0.045)	0.070 (0.051)	0.118** (0.041)	0.090* (0.036)	0.095* (0.042)	0.093 (0.055)	0.097* (0.045)
SRS	0.039*** (0.010)	0.030** (0.010)	0.030* ** (0.009)	0.040*** (0.008)	0.026*** (0.007)	0.036*** (0.009)	0.019* (0.009)	0.034*** (0.009)
SLZ	0.672*** (0.040)	0.715*** (0.047)	0.792* ** (0.041)	0.686*** (0.036)	0.799*** (0.034)	0.806*** (0.040)	0.603*** (0.045)	0.662*** (0.045)
XLZ	0.701*** (0.040)	0.769*** (0.414)	0.805* ** (0.037)	0.724*** (0.033)	0.834*** (0.031)	0.813*** (0.038)	0.604*** (0.045)	0.689*** (0.043)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.354** (0.016)	-0.007 (0.107)	-0.201 (0.131)	-0.207* (0.085)	-0.030 (0.109)	-0.242* (0.101)	-0.290** (0.102)	-0.104 (0.154)
Observations	340	320	330	490	500	330	330	330

Note: *, **, *** indicate significant at the levels of 10%, 5%, and 1%, respectively. The values in parentheses are robust standard errors.

4.5 Robustness Test

To ensure the robustness of the results, this paper adopts the method of replacing variables to test the robustness of the regression model. Specifically, the index "forest-related word frequency" in the problem stream is replaced with "forest-related word frequency on government websites," and the index "per capita expenditure on forestry undertakings" in the political stream is substituted with "whether there is a forestry bureau in the county." At the same time, in the political stream, the characteristic of leaders, "whether the county/district party secretary has served in forestry and environmental protection-related departments," is replaced with "whether the municipal party secretary has served in forestry and environmental protection-related departments," and "the tenure of the county/district party secretary" is substituted with "the tenure of the municipal party secretary." The results show that the forest-related word frequency on government websites, the presence of a forestry bureau in the county, whether the municipal party secretary has served in forestry and environmental protection-related departments, and the tenure of the municipal party secretary have all passed the significance test, and their impacts on the implementation of the forestry chief system remain consistent with those before the variable substitution. The results of the robustness test support the regression results of the baseline model, indicating that the analysis results of this study have strong robustness.

5. Discussion

Most existing studies on the forestry chief system focus on evaluating the effectiveness of policy implementation and exploring improvement strategies. This paper, however, explores the dynamic mechanism of the implementation of the forestry chief system based on Kingdon's three-stream theory of policy agenda-setting, hierarchical experimentation, and peer pressure.

This paper investigates the influencing factors of the implementation of the forestry chief system in counties in Anhui Province. Through regression analysis of variables, it is found that among the problem streams affecting the implementation of the forestry chief system, the forest-related word frequency (L) and per capita forest area (L) have significant inhibitory effects on the implementation. This finding differs from some related academic studies. For example, Cao et al. (2023) found that local government attention can significantly reduce carbon emissions from an environmental policy perspective. Xiong et al. (2017) revealed that water resource endowment is a core variable affecting the implementation of the river chief system and proposed a resource-led path for the diffusion of the river chief policy. Song (2020) found that cities with higher total water resources tend to adopt the river chief policy for a shorter duration, indicating a greater likelihood of adopting the policy under other constant conditions. Huang et al. (2021) discovered that regional resource factors have a negative impact on urban resilience in China. A possible explanation for the difference in this study is that a higher forest-related word frequency and per capita forest area in a county indicate a relatively sound local forestry management system and framework, which may already regulate and manage forestry development through other means. Therefore, the urgency and necessity of implementing the forestry chief system are relatively reduced.

In the study of the impact of variables related to the policy stream on the implementation of the forestry chief system in counties, it is found that per capita expenditure on forestry undertakings and the proportion of forestry output value in GDP have positive effects on the implementation. This finding corresponds to some existing academic research. For example, Wang (2022) included the proportion of the tertiary industry as a factor affecting the diffusion of low-carbon city policies and found that it has a significant positive impact on low-carbon city pilots through empirical analysis. In this study, GDP is used as a control variable to more specifically highlight the impact of the proportion of forestry output value in GDP on the forestry chief system.

Regarding the impact of variables in the political stream on the implementation of the forestry chief system in counties, the study found that whether the county/district party secretary has served in forestry and environmental protection departments and the tenure of the county/district party secretary both have significant positive effects on the implementation. There is ample evidence in academic research on the influence of leaders' personal characteristics on policy diffusion. For example, Liu et al. (2021) found that leaders with work experience in environmental protection and related departments promote regional applications for low-carbon city status. Wen et al. (2023) empirically verified that local leaders' tenure characteristics are positively correlated with policy innovation diffusion, suggesting that local leaders may maintain strong policy innovation intentions at the end of their term to seek re-election and promotion. These findings are similar to those of this study.

Under the influence of hierarchical experimentation and peer pressure, the implementation of the forestry chief system by higher-level governments and neighboring counties will promote the implementation of the system in the local region. Fundamentally, this is an inevitable outcome based on the vertical administrative pressure and horizontal political competition among governments. When higher-level governments issue relevant policy appeals, local governments will make corresponding strategic responses (Zhu et al., 2018a). The forestry chief system shares similarities in implementation logic with its counterpart, the river chief system. In the case of the river chief system, its implementation is influenced by directives from higher-level governments, and due to the need for "competition" among horizontal governments, local governments tend to be more inclined to implement the river chief system

(Zeng, 2023).

Regarding the impact of the interaction between the municipal forestry chief system and other variables on the implementation of the forestry chief system, as well as the interaction between whether neighboring counties have implemented the forestry chief system and other variables on its implementation. The results found that the interaction term ($L.SLC \times SJL$) between the frequency of forestry-related words in the problem stream and the implementation of the municipal forestry chief system has a significant impact on the implementation of the forestry chief system. A potential reason is that in areas with a high frequency of forestry-related words, there may be more stakeholders involved in the formulation and implementation of forestry policies. The implementation of the municipal forestry chief system may intensify the game between stakeholders, thus increasing the difficulty and cost of implementing the forestry chief system (Xu, 2022; Guo et al., 2020). Meanwhile, despite the implementation of the municipal forestry chief system, the per capita forest area is unlikely to undergo significant changes in a short period, and whether county-level governments decide to implement the forestry chief system will also be based on comprehensive considerations in other aspects (Lou et al., 2021).

The interaction terms between the county party secretaries' environmental protection work experience and the implementation of the municipal forestry chief system ($SHB \times SJL$) in the policy stream, as well as the interaction term between the length of tenure and the implementation of the municipal forestry chief system ($SRS \times SJL$), both have significant impacts on the implementation of the forestry chief system. This indicates that the influence of county leaders' environmental protection work experience and length of tenure on the implementation of the forestry chief system will increase with the promotion of the municipal forestry chief system. This finding is similar to the research results of Yang et al. (2021). A possible explanation is that the promotion of the municipal forestry chief system brings greater pressure and motivation to county leaders to implement the policy. County leaders with environmental protection work experience and longer tenure have stronger environmental awareness and more time and opportunities to accumulate environmental knowledge and experience, making them more capable of handling pressure from higher-level governments and assuming the responsibility of implementing the forestry chief system.

The interaction term between per capita forest area and whether neighboring counties have implemented the forestry chief system has a significant positive impact on the implementation of the forestry chief system. The per capita forest area can promote the implementation of the county-level forestry chief system, possibly because the forestry chief system is a significant institutional innovation in the forestry field. When neighboring counties implement the forestry chief system, local governments may consider the review of similar governments, their own resource endowments, and horizontal competition among similar governments. Counties with higher resource endowments tend to be more inclined to implement the forestry chief system (Zhang et al., 2021; Zhang et al., 2022).

6. Conclusion

The forestry chief system has been implemented nationwide, and the benefits brought by its implementation have promoted the continuous improvement of the policy. However, a review of the relevant literature on the forestry chief system reveals that few studies can reveal the logic behind its implementation. Based on the implementation of the forestry chief system, this study utilizes panel data from 99 counties in Anhui Province from 2010 to 2020, integrates Kingdon's multiple streams theory with the distinct hierarchical experimentation and peer pressure, and constructs an analytical framework to jointly explore the influencing factors of the implementation of the forestry chief system at the county level. The study found that:

The frequency of forestry-related words and per capita forest area in the problem stream have an inhibitory effect on the implementation of the forestry chief system. Due to the volume and heat of the problem stream itself, forestry is a complex systematic project, and even a lot of attention to forestry and related policies may not

necessarily promote the implementation of the forestry chief system.

The per capita expenditure on forestry undertakings and the proportion of forestry output value in GDP in the policy stream have a positive impact on the implementation of the county-level forestry chief system. The per capita expenditure on forestry undertakings and the proportion of forestry output value in GDP provide a good social foundation and economic premise for the implementation of the county-level forestry chief system. Policy makers and implementers may be more willing to take stronger measures in forestry protection.

The fact that whether the county or district party secretary has worked in forestry and environmental protection-related departments and their length of service in the political stream will promote the implementation of the county-level forestry chief system. County or district party secretaries who have worked in forestry and environmental protection-related departments possess certain professional knowledge and experience, which helps them make scientific policy decisions and promote the work during the implementation of the forestry chief system. Meanwhile, a longer tenure allows for more attention to the forestry chief system and more opportunities for cooperation with relevant departments, ultimately promoting its implementation.

The implementation of the municipal-level forestry chief system under hierarchical experimentation will promote the implementation of the county-level forestry chief system. As China is a typical authoritarian country, the upper-level government has the authority to intervene in local policy practices through protection, guidance, and coordination. For counties, the high-level promotion of the upper-level government will enhance the political momentum of the forestry chief system, thus driving its implementation in counties.

Whether neighboring counties have fully implemented the forestry chief system under peer pressure will also have a positive impact on the implementation of the county-level forestry chief system. Peer pressure can promote the implementation of the forestry chief system in other regions through various channels. This diffusion of the forestry chief system may be based on motivations such as learning, recognition, and responding to challenges, leading to the exchange and sharing of policy experiences and systems.

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