

Article

What Drives People to Complain about Environmental Issues? An Analysis Based on Panel Data Crossing Provinces of China

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Abstract: Strengthening public participation has often proven essential for achieving environmental sustainability goals. The “Xinfang” system, through complaint visits and letters, offers institutional channels through which the public’s grievances can be addressed, and where court judgments can be challenged by filing complaints about environmental problems to Environmental Protection Bureaus. Operating under the monopoly of the state Party, the “Xinfang” system provides the political opportunity for pro-environmental values and interests to be voiced and heard by governments. Importantly, comprehending the evolution of public complaints over a prolonged period of time sheds light on various determinants of this public participation program. This paper seeks to better understand environmental degradation caused by unbridled economic growth in China and the efforts that civic environmentalism has made to reduce the problem. More specifically, it uses panel data on 31 Chinese provincial/first level administrative units, collected over a decade, from 2003 to 2015, to analyze how socioeconomic status in the general public and the political and policy structures have shaped civic environmentalism. We use two Ordinary Least Squares (OLS) models to explore how these actors have propelled the public to protect their environment from discharged industrial wastewater, industrial waste gas, and solid wastes.

Keywords: Environmental complaints; “Xinfang” system; Civic environmentalism

1. Introduction

Environmental sustainability is complex and contested; hence, precise definitions are impossible [1]. However, from the 1980s, sustainability has been widely used in the context of human sustainability on planet Earth. Within this context, environmental sustainability deals with a healthy environment that is free of pollution. To achieve environmental sustainability, it is imperative that the government interacts with non-government actors, such as the general public, to make efforts in protecting the environment. In this bottom-up approach, environmental sustainability is believed to be achieved through the empowerment of communities [2]. Two key notions for participation accentuate this belief. The first suggests that participation is a means for increasing efficiency; the greater the number of people who are involved in the decision-making process, the greater the likelihood that they will agree with and support the policy choices made [1]. The second views participation as a fundamental right, wherein the main objective is to initiate mobilization for collective action, empowerment and institution building [1].

The public participation system in China is typically restricted by the nation's culture of authoritarianism, and is characteristic of a one-party system [3]. The public's awareness of environmental participation in China is weak, which might be the result of an authoritarian setting and the collective action dilemma. First, as an authoritarian country, there is a long history in China of certain restrictions on public participation in politics. Second, due to externalities and collective actions, most people assume that the cost of participation will outweigh their expected benefits. Traditionally, the Chinese public has been quiet and more willing to rely on the government, rather than taking the initiative to participate in politics. The Chinese regime has also been found to eliminate organizational bases for people to collectively mobilize policy preferences, it has suppressed contentious tactics and activities [4–7].

However, with the growing pressure to clean up the environment, largely due to years of extensive industrialization and rapid urbanization [8–10], policy-makers have started to realize that they are ill-informed of specific pollution problems, due to the asymmetric information between polluting enterprises and the government. As a result, the country has made serious efforts to strengthen public participation in environmental policy-making. China has recently developed a number of participatory and deliberative practices, such as consultative meetings and public hearings, which fit into the socialist tradition of political participation [11]. Moreover, public participation already implicates a rich set of implementation mechanisms that have been applied in China, including public hearings, intergovernmental coordination meetings, advance briefings, surveys, and solicitations of opinion, as well as government hotlines and internet communications. Traditional forms of public involvement can be advantageous for the speed and quality of the implementation of planning decisions, but they are not without pitfalls, especially for environmental policy-making, environmental supervision, and expressions of interest by stakeholders. The literature also shows that many obstacles to public participation in environmental sustainability remain [12–14]. These obstacles include delays by the government in involving the public on project approval decisions, the government's inexperience in understanding its responsibility and options in responding to public opinion [12], political pressures on officials and private individuals stemming from the country's authoritarian political system [13], the public's poor access to information, and low levels of environmental awareness [13,14]. Presumably, in China, there is a constant tension for the government, between the need to encourage participation and to control it [5]. Compared with other forms of public participation, environmental complaints through the "Xinfang" system are an easier form of environmental participation, since the expected benefits from agency action warrant their own investment of time and effort. In the meantime, governmental officials use the complaints through "Xinfang" system for policy implementation and to reduce social instability, and the Chinese Communist Party (CCP) uses it to fulfil its ongoing quest for legitimacy [7]. As a result, environmental complaints through the "Xinfang" system are preferred, both by the general public and the government [5,15].

Political scientists have long considered the higher socioeconomic status [16–19] or the rise of the middle class to be a favorable social condition for public participation in politics or democratization [20]. To understand what drives the public in China to file environmental complaints to the authorities, some scholars follow research on democratic societies, and test the role of provincial socioeconomic conditions [5,16,21] or complainers' political resources [22]. However, while some scholars find a rising environmental consciousness in some Chinese cities with better socioeconomic conditions, like Guangzhou [23], civic environmental complaints are still found only marginally in other cities with higher socioeconomic conditions, for example, Shanghai [17]. Research on Chinese politics may provide some explanations for the failure of better socioeconomic conditions to facilitate public participation: unlike their counterparts in the West, the middle class in China has not been able to act as a catalyst for political liberalization and democratization [24]. This is probably because the middle class must 'rely heavily upon arbitrary political power to survive and prosper' [25], and it has little incentive to change this [26].

As a result, existing research points to a concern: while resources such as time, money, and skills stemming from higher socioeconomic status are important for public participation in democratic countries, would-be complainers in authoritarian and developing countries such as China have additional challenges to overcome. More specifically, how do the complainers know that they are not overstepping politically acceptable lines when they are filing the complaints? Policy Feedback Theory provides a new answer. That is, sociopolitical factors, such as existing policies and political support. This new answer complements socioeconomic factors that are seemingly exogenous to public policy itself, and explains how policies, once created, reshape the politics that in turn affect subsequent policy-making processes, including the involvement of the general public [27]. Under the authoritarian political system, citizens may not engage in political participation to oppose the government, but to show their allegiance to it, to seek righteousness, and to articulate their choices [4,28]. The general public can use the existing political or policy environment as a short-cut form of information, to judge the policy preferences of the government or political elites, and then choose whether to participate in environmental issues or not. For example, if regulators respond to complaints, aggressive plaintiffs may capture most of the available resources [16]. The public can be encouraged to express their preferences and interests if their representatives who are members of the Chinese People's Congress and Chinese People's Political Consultative Conference can provide political support [17]. By contrast, if the government has never put environmental protection into their agenda, participation in environmental issues would be highly discouraged or suppressed. Therefore, we believe that the existing political or policy environment is particularly important for the public in China to make their choices in filing environmental complaints. However, research on the relationship between sociopolitical factors and public participation is much less well-studied.

We aim to identify the factors driving the general public to protect their environment, through filing environmental complaints. More specifically, (1) inspired by the classical Socioeconomic Status (SES) model, we will test how socioeconomic conditions influence the public's choice in filing environmental complaints. Second, (2) we introduce a new theory—Policy Feedback Theory—to complement the dominant SES model, and to test how the existing policy environment—the sociopolitical status—shapes the public's political behaviors in environmental complaints. We are not arguing that the SES model and Policy Feedback Theory are in conflict. Instead, while the SES model assumes that better socioeconomic status increases public participation by providing political resources in terms of time, money, and civic skills, Policy Feedback Theory uncovers an additional reason for political resources. Policies can influence civil engagement by offering actual tangible resources, which is defined as resource effect. Moreover, Policy Feedback Theory suggests that policy can also enhance the general public's capacity and their sense of obligation to participate in politics by conveying the message regarding the governments' policy preferences, which is defined as the interpretative effect [29,30]. In this study, we regard the “Xinfang” system as being conventional participation in China, which is far more different from typical unconventional forms of participation—public vote, citizen-initiated protest, and demonstration—which have been harnessed in most industrial democracies, but are not tolerated by the Chinese incumbent authorities. Previous studies testing the environmental complaints of citizens in environmental schemes often use survey data, which cannot examine changes of environmental complaints over time. We contribute by using aggregate-level 13-year panel data that contains information on 26 provinces and four direct-controlled municipalities each year, and the “Xinfang” system as the outcome of public participation. This dataset allows us to employ discrete time duration effect panel data models, to examine the determinants of environmental complaints. Moreover, by designing our theoretical frame through jointly deploying the SES model and Policy Feedback Theory, our research distinguishes the effects of socioeconomic and sociopolitical status on environmental complaint letters versus visits, and induces theoretical and political implications from this empirical study.

The paper is organized as follows: Section 2 examines the literature on public participation, both from a socioeconomic and a sociopolitical perspective. In Section 3, China's unique “Xinfang” system

is reviewed. In Section 4, we present our methodology used to collect and aggregate the data on civil participation in China. Two fixed-effect regressions for panel data are run separately, to assess the effects of socioeconomic and sociopolitical factors driving public participation. We present the statistical results of factors influencing environmental public participation in Chinese provinces in Section 5. This paper concludes with the policy implications for policymakers, and suggestions for future research in Section 6.

2. Theory and Existing Research

2.1. Socioeconomic Status

Why do citizens participate in environmental protection? A dominant explanation is SES. SES model suggests an answer based on one or more of the components of socioeconomic status: education, income, and occupation. For example, education is, in part, a proxy for social class and economic differences, because people with higher education often have higher skills, resources, and inclinations for political participation [17,18] and they are often economically better off [16,19]. More specifically, people with higher SES are more inclined to participate in politics than people with lower SES, because they (1) have affluent necessary resources: time and money to make contribution [17,18], and (2) they have a relatively high level of background education: citizens with little or low education may lack information on the harmful effects of environmental pollution; on the other hand, illiterate people may have little confidence in their efficacy to influence the authorities [16,19]. The SES–activity connection has been used to explain multiple political behaviors, including voting, direct participation in policy making, and public protests.

While economic and education factors of the “SES” are generally regarded as affecting public participation, the prevailing knowledge in the literature on socioeconomic status is that civic involvement is generally higher in more economically developed areas. The underlying theme throughout these works is that people who are surrounded by more educated and affluent participators feel more social obligation to join clubs, build social capital, and participate in politics [18,31,32]. Likewise, affluent communities often found that residents viewed public participation as a social norm. Huckfeldt described that “the high-status environment encourages participation through the informal transmission of group-based norms which turn participation into a social obligation” [33]. However, other scholars suggest that public participation might be lower for those who live in areas that are more affluent. Unlike people who live in poorer areas, residents from affluent areas face fewer social problems, so they should have fewer social needs requiring governmental action [34]. Jones, Greenberg, and Drew proposed a “needs-awareness” model to demonstrate the relationship between neighborhood affluence and contact. They found that contact decreased from middle-income to more affluent areas, because of the fewer social problems stimulating citizen’s attention to local affairs [35]. Another analysis on economic theory suggesting the income substitution effect and assuming that higher income will produce less social or political interaction, because their higher wages increase the opportunity cost of free time to contact others [36,37].

The relationship between education and civic involvement has general support. Citizens with higher educational backgrounds feel more comfortable with organizing and taking part in meetings, and they are likely to be more effective when they are involved in politics [16]. People with a lower level of education are insensitive to the harm of environmental pollution, and they lack confidence in the suggestion that the government has restricted environmental participation. Citizens with little or no formal education may not understand the harmful effects of pollutants, and they have no confidence in their ability to influence the authorities.

2.2. Sociopolitical Status

Factors implied by the SES Model or the aggregate socioeconomic conditions are seemingly exogenous to policy process itself. To fill this gap, Policy Feedback theory attempts to explain

how sociopolitical factors, such as the existing policies and political support [27,38–42], reshape the political context and influence individual's political behaviors, such as public involvement in the policy-making process. Policy Feedback Theory has its roots in Schattschneider's (1935) famous argument, "new policies create new politics." [43]. Policy Feedback Theory has four major streams of inquiry to explain how existing policies influence four tributaries, including the meaning of citizenship, in future policy processes. Citizenship includes the rights and obligations of the general public as defined by the government, as well as citizens' political attitudes and participation [27]. According to the Policy Feedback Theory, the existing policies, by providing social benefits and conveying norms and messages to the public, affect the extent to which individuals participate in politics [27,40]. More specifically, existing policies can increase public participation by (1) providing educational resources [44] or other resources such as money or time, which reduce the costs of participation [19,37], (2) imposing rules or policies that facilitate enhanced political efficacy, meaning that the general public can feel that government is responsive to people like them, or towards the issue that they care about [27]. Similarly, Paul Pierson (1993) explained that the existing policies affect the behaviors of the general public through two effects [42]: the resource effect means an increase in political participation, by providing the general public or organizations with incentives, such as payments, goods, and services [45–49]; and the interpretive effect means that existing policies serve as a source of information, which can affect people's attitudes and shape their subsequent participation [50–58].

Over the past quarter-century, scholarship of Policy Feedback Theory has been applied to a wide range of policy issues: U.S. social welfare policy [59,60], Medicare and the GI Bill [61,62], educational policies [63], and criminal justice [64]. For example, it was found that senior citizens were one of the most active groups in the electorate, due to the Medicare policy [61]. However, not all policies have positive effects on public participation; some, such as welfare and incarceration, appear to decrease public participation levels [64,65].

3. Environmental Public Participation through the "Xinfang" System

The use of complaint letters and visits through the Xinfang system is a non-litigative approach to resolve disputes in China. In 1957, the Government Administration Council of the Central People's Government promulgated Decisions on Handling People's Letters and People's Visits, which was viewed as the starting point of the "Xinfang" system. Complaint letters and visits were mainly used to resolve a large number of historical issues and restore justice to falsely charged cases [30]. Under the spirit of "serving the people," it aims to encourage people to report issues, and subsequently, the government can investigate and solve the issues [30]. It is viewed as a system that is designed to solidify the relationship between the Communist Party of China (CPC) and the people from a top-bottom approach, and promote public support for the new regime [66].

Complaint letters and visits were originally associated with political matters rather than environmental disputes. In 2005, the State Council published a revised Regulation on Complaint Letters and Visits. Subsequently, the State Environmental Protection Administration revised the 1997 Measures for Environmental Complaint Letters and Visits in 2006 [31]. According to these measures, case-filers can (1) report persons or organizations that violate environmental protection laws or regulations, and that infringe the legitimate environmental rights and interests of citizens; (2) suggest ideas for environmental protection; and (3) make criticisms, suggestions, and requirements for environmental administrative departments and their staff.

China's overpopulation, its unrestrained pro-growth policies, rapid urbanization, and constant industrialization have led to adverse impacts, such as environmental problems and health threats, since China's shift from a centralized economy to a more market-oriented system. In order to solve these massive environmental problems, both the national and provincial governments in China have designed and adopted a series of policy tools, especially in energy conservation, renewable energy, and climate change. Importantly, the country has made serious efforts to strengthen civic participation in environmental policy-making. The general public has also begun to be more involved

in environmental issues, and complaint letters and visits by the public have substantially increased for resolving environmental disputes.

Complaint letters and visits through the “Xinfang” system is a primary form of public participation in China for multiple reasons. First, this approach has lower costs than judicial litigation. Environmental litigation has difficulties in presenting evidence, examinations, and approval, and there are numerous costs and appraisal fees. In contrast, complaint letters and visits do not have requirements for accurate and professional evidence, and there are no fees associated with complaint letters and visits, but instead, case-filers are given a certain amount in subsidies [30]. Moreover, it offers a very flexible procedure of case-filing; thus, the victims of environmental disputes spend less, both in terms of money and time. Second, complaint letters and visits satisfy people’s needs to express their feelings and concerns. People send complaint letters or visit government offices when they are not willing to bear potential negative environmental impacts, during which a decision has been made but has not yet been executed. At this stage, they may choose to complain to resolve disputes, but also, it is possible that they complain because they feel angry and want their voices to be heard. Complaint letters and visits provide channels for them to express their feelings, and this temporarily pacifies their mood and eases the situation. Third, the official offices handling environmental complaints at all levels are generally set up inside the environmental administrative organs, and they are entitled many powers, ranging from monitoring environmental hazards, exerting laws and administrative measures, and taking compulsory measures against ongoing environmental infringements [30]. In other words, the power to directly deal with environmental problems raised from the complaint letters and visits for environmental disputes makes the victims of environmental pollutions feel that their disputes can be resolved sooner than bringing them to the court [30,67,68].

Complaint letters and visits are criticized by many public participation scholars, because they believe that the public is not adequately empowered. The victims of environmental pollution only complain after a policy decision has been made by the government, meaning the public does not participate in the policy process from the beginning. As a result, public input can never be fully considered in the policy-making process. According to Arnstein’s “Ladder of Participation,” this includes manipulation, therapy, informing, consultation, placation, partnership, delegated power, and lastly, citizen control, where the complaint letters and visits can at most be situated at the level of therapy [69]. In many successful cases of public participation in environmental disputes in China, case-filers are commonly well-educated, and have private property that is threatened by environmental pollution, and they have a middle- or upper-level income. This is consistent with research in other countries that argue that environmentalism is often representative of the interests of the middle- and upper social class groups. Therefore, the typical question in public participation research, “empowering who?” again questions the effectiveness of complaint letters and visits in China. Additionally, the main responsible departments use gradual administrative measures, such as mediation and adjudication. This is because of their intention to avoid responsibility in dealing with environmental disputes if any party in the environmental dispute is not satisfied with the administrative punishment, and instead, files a lawsuit [30]. The defections of complaint letters and visits, such as lack of legalization and detailing of operations, are also broadly discussed in judicial research or related research [67,68].

Public awareness of environmental pollution and its associated threats to people’s private interests increasingly facilitates public participation [18]; thus, the public seeks channels to express their opinions and influence on associated policies. Given the limited formal channels of public participation in China, and the advantages of complaint letters and visits through “Xinfang” system, complaint letters and visits provide possibilities for the public to transfer their opinions to policy [70,71]. Consequently, the increasing numbers of complaint letters and visits in environmental disputes, and a broad scope of conflict of environmental issues could bring pressure upon the government for policy changes. If the government does not resolve the disputes, public protests and collective petitions are likely to happen, thus bringing adverse impacts on public trust and the governments’ capacity in

governance [66]. Therefore, political responsiveness could be greater when the issue becomes highly salient, as a result of increasing numbers of complaint letters and visits in environmental disputes.

4. Methods and Data

4.1. Variables

4.1.1. Dependent Variables

The dependent variables are the number of complaint letters (log-transformed) and complaint visits (log-transformed). Street demonstration, public protest, and informal assembly for environmental protection are regarded as accidental events, which are usually haphazard. Therefore, we do not count them as dependent variables.

Figures 1 and 2 exhibit the trend of annual complaint letters and visits for 27 provinces and four direct-controlled municipalities by geographic region in China, from 2003 to 2015. According to the National Bureau of Statistics in China, both the number of citizen's environmental complaint letters and visits fluctuate greatly. There was a sharp decrease in both 2007 and 2011. The decrease in 2007 may have been due to the Olympic Games in 2008, when significant efforts were made by China's national and local governments to realize an environmentally friendly China. The reason for the dip in 2010 was less evident.

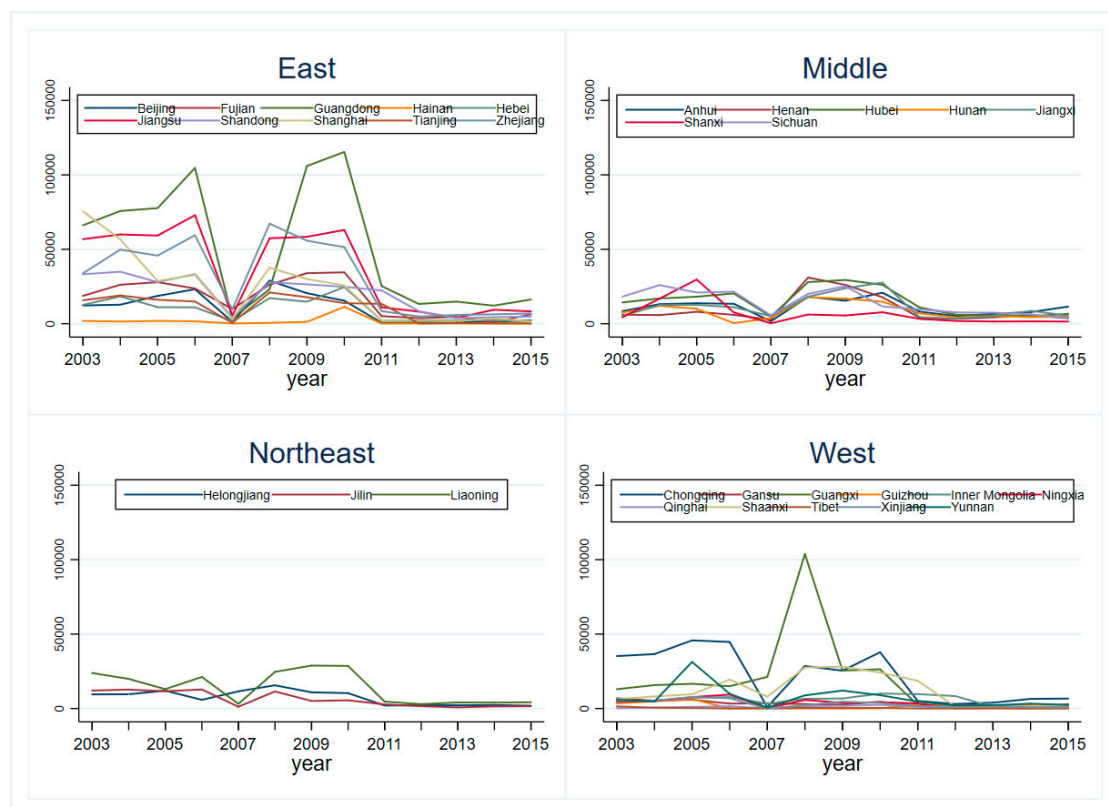


Figure 1. The frequency trend of complaint letters from 2003 to 2015.

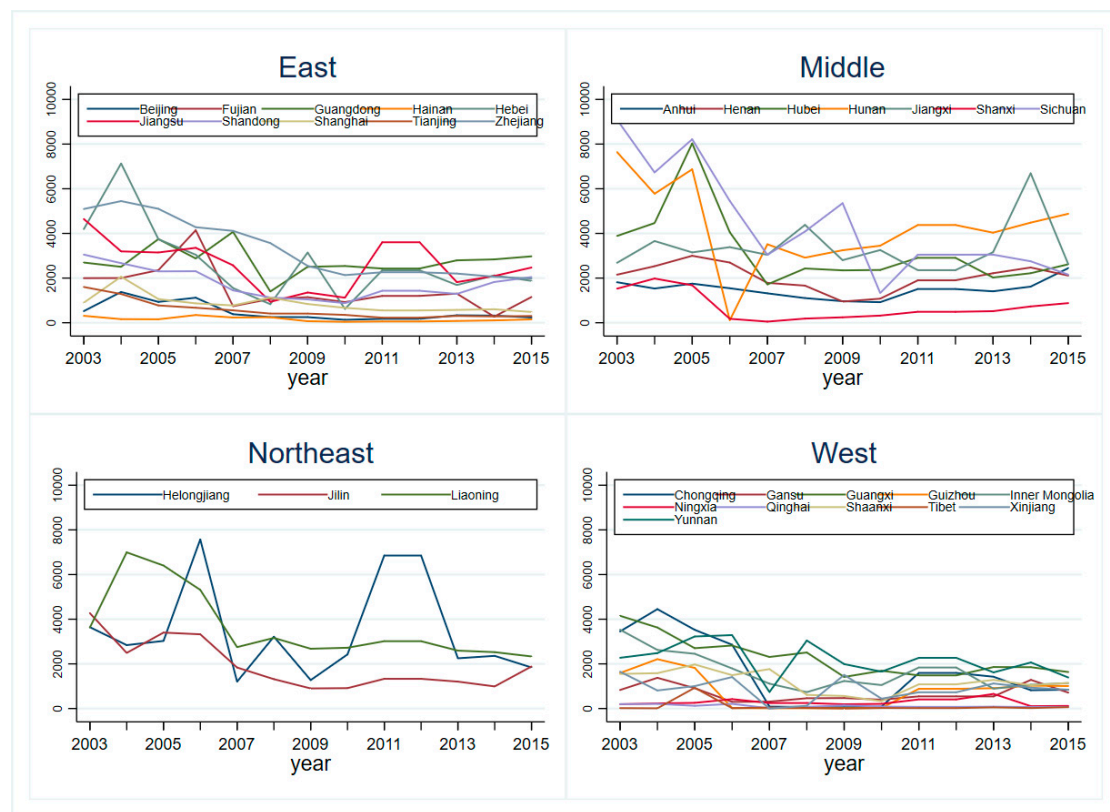


Figure 2. The frequency trend of complaint visits from 2003 to 2015. Different regions also demonstrate varying patterns for both complaint letters and visits. The eastern region of China and the western region of China experienced much fluctuation over time in several provinces, while the northeast region of China and central China experienced relatively slight changes during the same period.

4.1.2. Independent Variables

From the point of view of the SES model and the Policy Feedback Theory, the explanatory variable for this analysis was derived from two aspects: socioeconomic variables and sociopolitical variables.

Socioeconomic variables: We hypothesize that a range of provincial sociopolitical factors will affect public participation in environmental issues. The use of community characteristics, such as economic condition and educational level, to indicate SES or civic capacity is justified by many existing studies [72–74]. Hence, we also used the provincial per-capita GDP and educational level to indicate the socio-economic status of the province.

Our first factor was per capita GDP, which reflected the relative economic development of each province. Nonetheless, the effect of economic performance on public participation remains controversial. Previous research offers two different suggestions about how economic development influences residents' civic activity: First, people in affluent areas are more likely to participate, because they regard participation as a social norm [75]. Second, higher economic areas may have less complaints per capita, because of the fewer social needs [33,34]. It is important to note that the “Xinfang” system, through environmental letters and visits, is distinguished from other forms of public participation, such as public hearing or direct participation in policy making processes, by its nature as a grievance system. The “Xinfang” system reflects the public dissatisfaction about their environment or the existing mode of resolution of environmental issues in other forms of public participation. In another word, environmental complaints could be viewed as a negative signal from the general public when evaluating governmental performance in environmental issues. We expected that higher economic areas would have less complaints per capita. The data for the per-capita GDP were collected from the China Statistic Yearbook.

Second, educational level is also related to public participation. Citizens with little education may have little confidence in their ability to influence the authorities; meanwhile, they may not understand the costs and harmful effects of environmental pollution. We anticipate that, all else being equal, a province with a higher educational level is associated with a higher level of complaint letters and visits. The data for educational level were collected from the China Statistic Yearbook.

Sociopolitical variables: We anticipated that existing policies may influence public participation by bestowing resources, imposing coercive rules, and conveying norms and messages. We used two different policies to measure the existing policy environment: (1) existing environmental policies/regulations indicating the extent to which the provincial government supports environmental protection; (2) the number of environmental policy proposals put forward by representatives of the Province People's Congress indicate the extent to which the elected representatives support environmental protection.

In China, governmental and public awareness about environmental pollution and its associated health hazards has been growing for quite some time now. In 2000, environmental protection and sustainable development was integrated with socio-economic goals in strategies for building a 'moderately prosperous' society [76,77]. In 2004, a Medium and Long Term Energy Development Plan for 2004–2020 was approved by the State Council. In the following year, National the People's Congress (NPC) adopted the Renewable Energy Law, aiming to set out duties for renewable energy development and utilization. Moreover, while climate change has never been a priority issue in China, the Chinese government started to acknowledge the importance of addressing climate change in recent years. For example, in 2007, the National Energy Commission (NDRC) issued China's first global warming policy initiative—the National Climate Change Program [77]. In response to the national government, since 2007, many provinces have developed mitigation and adaptation plans or climate change research programs, including Xinjiang, Hubei, Fujian, Beijing, Liaoning, Shandong and Jiangxi, Guangdong, Qinghai, Sichuan, etc. [77].

In addressing environmental public participation, the national and provincial government of China implemented multiple laws and regulations over recent years. Since 2002, a body of legislation in China has created legal requirements for public participation that officials are obliged to uphold, including the solicitation of public comment in the environmental impact assessment (EIA) process [7]. In 2007, Measures on Open Environmental Information (for Trial Implementation) was released by the State Environmental Protection Administration (SEPA) to grant the public the right to access environmental information. We argue that these policies could contribute to local environmental public participation and increase the frequency of environmental complaints. The policy variable measured how strong the interpretive effects of these policies were. We used the number of existing provincial laws and regulations, as well as comprehensive plans, which were collected from the Law Star website.

Second, political support may boost public participation. Scholarship achieves a discernable consensus that there is a positive connection between political support and political behavior, such as voting and contacting officials [41]. In recent years, the NPC and Political Consultative Conference (PCC) has worked hard to advance environmental protection. Representatives from the NPC and PCC facilitate the articulation of citizen interest into environmental affairs [5,6]. The more political support that a citizen can perceive and obtain, the more likely that they will tend to engage in public affairs. The reason for this hypothesis is that political support from the Local People's Congress can serve as a signal that they are in favor of one certain political issue, such as environmental protection, over others, which promotes environmental public participation. The greater political support in certain policy areas also shows that the Chinese government is more likely to allow and to encourage citizens to contact deputies about their concerns regarding specific policy issues that are related to the citizens' personal interests. We used a proxy variable for political support, measured by the number of environmental policy proposals put forward by representatives of Province People's Congress during the period of the National People's Congress, which was derived from the China Environmental Yearbook.

4.1.3. Control Variables

Environmental degradation is rampant in China, and it is not evenly spread across provinces [78–80]. Some scholars have investigated the role of the density of different forms of pollution [21] crossing jurisdictions, complainers' political resources, such as their personal connections with public officials [22], and their personal norms and perceived control of behaviors and attitudes in predicting citizens' intentions to participate in environmental complaint behaviors [15]. With the development of urbanization, environment degradation is an increasingly serious problem in China, and highly visible environmental degradation and its associated health problems have drawn public attention [4]. Environmental authorities received over 130,000 complaints during 2017, mostly related to air, water, and noise pollution. An increase of 1% in air emissions induces an increase of approximately 0.2% in citizen complaints to the environmental authorities. Thus, complaints can be strongly affected by exposure to some forms of harmful pollution, because of its visibility. On one hand, exposure to harmful pollutants can increase people's complaint behaviors [21]. On the other hand, provincial governments are rational and will be more likely to encourage public participation in policy solutions to environmental problems when the risks that they face are more serious [81,82]. Therefore, in addition to socioeconomic variables and sociopolitical variables, environmental pollution variables are included to account for their effects on public participation. We anticipate that complaints are strongly affected by exposure to harmful pollutants. The data for environmental pollution levels were collected from the China Environmental Statistical Yearbook. While individuals' demographic factors, such as age and gender are often included to explain political participation behaviors, the data for individual-level demographics of complaint filers are not available. Moreover, aggregate-level or provincial-level demographics, such as ratios of age or gender should be very close to the overall ratio of the whole country, and they should have very few variances. Additionally, using aggregate-level demographics fails to reflect diversities among individuals, which can lead to obscured results in testing the influences of these variables. Therefore, both individual-level and aggregate-level demographics were not included in our study.

4.2. Data

We used a 13-year panel dataset to analyze factors influencing environmental participation at the provincial level in China. The definitions and data sources of the variables are listed in Table 1.

Table 1. Definitions and data source of variables.

Variables	Definitions	Data Sources
Dependent variables		
Complaint letters	Annual complaint letters per 100,000 population from 2005 to 2015 in four central-controlled municipalities and 26 provinces	China Environmental Yearbook
Complaint visits	Annual complaint visits per 100,000 population from 2005 to 2015 in four central-controlled municipalities and 26 provinces	China Environmental Yearbook
Socioeconomic variables		
GDP	Provincial per capita GDP	China Statistical Yearbook
Educational level	Population with above high-school level education per 100,000 people	China Statistical Yearbook
Sociopolitical variables		
Environmental policies	The number of annually issued provincial multiple laws and regulations, as well as comprehensive plans	Law star dataset http://www.law-star.com/
Political Support	The number of environmental policy proposals put forward by representatives of the Province People's Congress during the period of the National People's Congress (NPC)	China Environmental Yearbook
Control variables		
Environmental pollutants emission	Total volume of wastewater discharged (in 100 million tons)	China Environmental Statistical Yearbook
discharge level	Total volume of industrial waste gas emissions (in 100 million cube meters)	China Environmental Statistical Yearbook
	Total volume of industrial solid wastes discharged (in 10,000 tons)	China Environmental Statistical Yearbook

Descriptive statistics of the variables are presented in Table 2.

Table 2. Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max	Observations
Complaint visits	1837.156	1628.574	2	9097	N = 403
Complaint letters	12,685.56	17282.8	16	115,392	N = 403
Socioeconomic variables					
per_GDP	31070.4	21,525.45	3686	107,960	N = 403
Education	3210.794	707.0653	1120	4931	N = 403
Sociopolitical variables					
Environmental policies	29.92308	25.8866	1	167	N = 403
Political support	186.2139	152.3312	1	1196	N = 373
Control variables					
Waste water discharged	74,601.96	71,364.36	353	715,121	N = 403
Waste gas emission	15,242.23	13,532.88	13	79,121.3	N = 403
Industrial solid wastes discharged	236,749.7	710,386.7	1	6,300,000	N = 403

4.3. Model Specification

A series of tests were applied to identify the best model. A set of Moran's tests were conducted to test the spatial autocorrelation of the dependent variables. If the panel data was non-spatially autocorrelated, then it indicated that we should choose the Ordinary Least Squares (OLS) method; otherwise, we had to use the Spatial Regression Method. Based on the adjacent matrix composed of 0 and 1, data were analyzed with Matlab. The Moran's I indexes measuring the spatial correlations of the complaint letters and the visits were not statistically significant at the 5% level for almost every year. The results suggested that spatial autocorrelation effects in complaint letters and visits did not exist. Therefore, we used the Non-Spatial Panel Data Model to estimations.

Moreover, a Hausman test was conducted to test the specifications of Fixed-Effect versus Random-Effect Models. The null hypothesis that the difference between the coefficients estimated by the two specifications is not systematic was rejected, indicating the choice of the Fixed-Effect Model. An F-test was conducted, to test the specifications of the Pooled-Effect versus the Fixed-Effect Models. The null hypothesis that the difference between the coefficients estimated by the two specifications is not systematic was rejected, indicating the choice of the Fixed-Effect Model. Robust standard errors were applied in the estimation, to address potential heteroscedasticity.

Corresponding to the SES model and the Policy Feedback Theory, two fixed-effects regression models are used to test, separately, how socioeconomic and sociopolitical factors influenced the environmental complaints. The mathematical formulas can be expressed as:

$$\ln participation_{i,t} = \beta \ln socioeconomic_{i,t} + \gamma \ln Z_{i,t} + \alpha_i + \mu_{i,t}$$

$$\ln participation_{i,t} = \beta \ln sociopolitical_{i,t} + \gamma \ln Z_{i,t} + \alpha_i + \mu_{i,t}$$

where i represents 26 provinces and four direct-controlled municipalities, and t represents the time period (2005–2015). Given the highly skewed distribution of socioeconomic and sociopolitical variables, the log of these variables was employed and substituted in the regression, to measure the elasticity between the variables and to reduce the influence of variable heteroscedasticity on the regression results. $\ln participation$ are the natural logarithms of the complaint letters and visits, and $\ln socioeconomic$ are the natural logarithms of socioeconomic determinants, including education, GDP, the dependency ratio of population, and the natural logarithms of sociopolitical determinants, including the existing environmental policies and political support. The existing environmental policies captured multiple provincial laws and regulations, as well as comprehensive plans. Political support was measured by the number of environmental policy proposals put forward by representatives of Province People's Congress during the period of NPC. Z denotes the control variables for the environmental conditions, namely industrial wastewater, industrial waste gas, and industrial solid waste. $u_{i,t}$ is the error term, and α_i is the intercept for each entity, and β and γ are the parameters to be fitted?

5. Analysis and Results

The coefficient estimates and the associated standard errors of all the Ordinary Least Squares (OLS) models are presented in Tables 3 and 4. Each model type had two specifications. Specifications 1 and 2 included, as independent variables, the provincial per-capita GDP and the population with above high-school level education per 100,000 people, to test the socioeconomic status hypothesis. Specifications 3 and 4 included, as independent variables, the number of annually issued multiple provincial laws and regulations, as well as comprehensive plans, and the number of environmental policy proposals put forward by representatives of the Province People's Congress during the period of National People's Congress, to test the sociopolitical status hypothesis.

In Specifications 1 and 2, we found that citizens in less economically developed provinces were more likely to engage themselves in participating in environmental protection. Holding the other variables constant, the coefficient could be interpreted thus: for every percentage increase in per-capita GDP, a decrease of 0.78% and 0.4% in complaint letters and visits per 100,000 people occurred, respectively. Our results are consistent with Jones et al. [35] and Haeberle [34], in that higher economic areas should have less complaints because of the fewer social needs. These results can also be found in the environmental field, because lower economic areas are usually more seriously environmentally polluted areas, where citizens have more environmental concerns to complain of.

In terms of the educational level, the results on education were statistically significant and positively associated with complaint letters, which was consistent with our expectation that improving the educational level could contribute to increasing public environmental participation. If the average percentage of the population with above high-school level education increases by one unit, province/central-controlled municipalities will experience an increase in number of compliant letters by about 1.42%, when holding other variables constant. Surprisingly, the coefficient of educational level on compliant visits was insignificant, although the sign was consistent with our hypothesis.

Table 4 demonstrates the effect of sociopolitical status on public participation. In terms of environmental policies, our results contradicted our hypothesis: by showing that policies are positively associated with public participation, our results suggested that every unit percentage increase in the enactment of policies was associated with the reduction of complaint visits by approximately 0.19%. The results were at odds with our hypothesis derived from specific regulations on public complaint visits. We believed that one possible explanation was to be found in the different principles for citizens to make their complaints. Citizens cannot make a repeated complaint; if the letters reader submit the same letters and visits matters to higher authorities in the receiving and handling department within the prescribed time limit, the higher authorities will not accept the matter.

The relationship between political support from representatives of the Province People's Congress and public participation was significantly positive, which was consistent with our expectation. Specifically, holding other variables constant, a 1% increase in the number of environmental policy proposals put forward by representatives of the Province People's Congress during the period of the National People's Congress, would lead to a 0.627% increase in complaint visits. However, we did not find statistical support for significant impacts from environmental policies, or political support towards complaint letters.

As for control variables in this analysis, the results were slightly unexpected. The total volume of wastewater discharged had a significantly positive effect on the complaint letters, while showing no significant effect on the complaint visits. Both industrial waste gas emissions and industrial solid wastes were surprisingly negatively correlated with complaint letters. We believe that several explanations could be made in these results. First, it may be the visibility of pollution that induces the complaints, rather than its damaging impact. Industrial waste gas emissions and industrial solid wastes, which are less visible than wastewater discharges, did not increase the complaints. Second, pollution can occur in various ways in cities or at a lower level than the first administrative level—the province—in China. In other words, the influence of pollution on public complaints may be obscured by the various forms of pollution crossing cities within each single province.

Table 3. Socioeconomic determinants of air pollution in China at the province-level dependent variable: complaint letters and complaint visits.

	(1)	(2)
	Complaint Letters	Complaint Visits
Ln_per_GDP	−0.779 *** (0.168)	−0.403 * (0.215)
Ln_Education	1.422 *** (0.292)	0.247 (0.333)
Ln_Waste_water	1.016 *** (0.361)	0.547 (0.423)
Ln_Waste_gas	−0.560 *** (0.130)	0.0756 (0.270)
Ln_Industrial_solid	−0.0690 * (0.0406)	−0.0562 (0.0447)
Constants	−0.0545 (4.304)	6.957 (5.736)
<i>N</i>	403	403
<i>R</i> ²	0.329	0.057

Standard errors in parentheses. * $p < 0.1$, *** $p < 0.01$.**Table 4.** Sociopolitical determinants of air pollution in China at the province-level dependent variable: complaint letters and complaint visits.

	(3)	(4)
	Complaint Letters	Complaint Visits
Ln_Environmental_policies	−0.0846 (0.0844)	−0.191 *** (0.0646)
Ln_Political_support	0.177 (0.195)	0.627 *** (0.180)
Ln_Waste_water	1.416 *** (0.384)	0.485 (0.321)
Ln_Waste_gas	−1.079 *** (0.151)	−0.388 *** (0.126)
Ln_Industrial_solid	−0.0640 * (0.0352)	−0.0394 (0.0286)
Constants	3.340 (4.442)	3.247 (3.725)
<i>N</i>	403	403
<i>R</i> ²	0.273	0.284

Standard errors in parentheses. * $p < 0.1$, *** $p < 0.01$.

6. Discussion

This research confirms that education increases the frequency of complaint letters. However, our research challenges the role of SES in promoting complaint visits and the role of economic conditions in increasing environmental complaints. As we expected, existing political support increased the level of complaint visits by promoting the general public's political efficacy. However, surprisingly, more environmental regulations that are viewed as conveying positive messages to the public and encouraging them to participate in environmental protection, decrease the frequency of complaint visits.

While both the SES Model and the Policy Feedback Theory have underlying assumptions that political resources such as time and money can promote environmental complaints, the Policy Feedback Theory suggests that these resources are provided through a top-down approach, or through the policy process itself. Moreover, Policy Feedback Theory emphasizes the interpretive effect, meaning that the general public makes decisions in filing environmental complaints, based on their

interpretation of the existing policies, or the political environment. Therefore, our results suggest that unlike Western democracies, in which the SES dominantly explains public participation in politics, the policy preference of the government and how the general public perceives and interprets the policy of the government determines the public's choices in visiting offices, in order to protect their environment in China. For example, more NPC proposals can strengthen the political resources of the public, and generate an optimistic expectation of the outcome and effectiveness of complaint visits. In contrast, more environmental regulations indicating a higher response from the provincial government for pro-environmental value can increase public satisfaction and lower their need to complain. Our research results call attention towards the influence of existing policies and the political environment. More importantly, environmental complaints may be increased or suppressed, depending on how the public interprets them. Future research can further examine this interpretative effect by distinguishing the effects of different policies.

Our research also provides implications for practitioners. As existing research has found, because complaint visits probably cost more in terms of time and money in the process of visiting the administrative organization on the reception day compared to letters, complaint letters are often more likely to be concerned with more trivial matters than complaint visits [83], or they may report on less significant environmental issues. Our research reveals the different underlying factors driving complaints letters versus visits. Therefore, provincial practitioners should notice this difference and adopt different policies to encourage different forms of environmental complaints.

Moreover, while more evidence is needed, our results also point towards a tendency for people living in a province with better economic conditions to be likely to also have a better environment, and thus they are less likely to complain. This result, and the negative influences of the range of existing environmental regulations imply that environmental complaints are considered by the general public to contribute to environmental issues when the general public is dissatisfied with their government's performance with regard to environmental issues. However, although the public participation system in China has long been restricted by the nation's culture of authoritarianism, environmental complaints are tolerated by the government. Therefore, at the individual level, some of the complaint filers with higher SES may also perceive the "Xinfang" system as a positive political opportunity to co-govern environmental issues with the government, and to suggest policy changes. Studies examining the different types of complaint letters and visits (e.g., reports of environmental violations versus making suggestions), and studies that used different methods, such as surveys, are necessary to further continue important dialogue on sustainability. Survey-based research can also help to detangle the connection between individual-level differences and environmental complaints. Finally, our OLS models do not address the issues of endogeneity which is often a concern in panel data. Therefore, future research can lag some of the explanatory variables and adopt dynamic model, in order to address these issues.

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