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The Influence of Economic Development and Government Investment on Pro-Environmental Behavior in China

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Abstract

China's pollution problem continues to worsen because of the nation's rapid economic expansion. To improve the environment, governments need to allocate resources to environmental initiatives, enforce regulations, and facilitate collaboration in environmental management with public participation. This study analyzes the differences in Chinese public participation in environmental protection between the private and public spheres using the Chinese General Social Survey (CGSS) 2021. Multiple regression is employed to investigate the factors influencing Chinese pro-environmental behavior and to explore the connection between pro-environmental behavior, government investment, and economic development. The research shows that economic development has a favorable impact on pro-environmental behavior in the private sector. Government work effectiveness positively influences pro-environmental behavior, whereas government pollution governance in the public realm adversely impacts it. Economic development influences government pollution governance and the public's pro-environmental behavior. Various elements, such as individual characteristics, the external environment, and social psychological components, have different levels of impact on the public's pro-environmental behavior. The results will enhance understanding of Chinese environmental behaviors, enabling the creation of more effective policies to boost public participation and improve environmental management in China.

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1. Introduction

China's rapid economic development has led to substantial environmental pollution. The country's urbanization is increasing due to economic development, exacerbating environmental pollution challenges caused by the fast-growing population. China's severe ecological and environmental circumstances are a consequence of the prolonged and unwarranted exploitation of resources such as water, land, forests, and minerals, along with the lack of necessary protections and environmental infrastructure development (Niu et al., 2022). Zhao et al. (2021) argue that China's pursuit of rapid economic development through an expanded economic development model has led to environmental damage. Local governments' activities under fiscal decentralization are the main driving force behind China's economic model (Khan et al., 2021). Fiscal decentralization over a particular historical period has positively influenced China's continuous and fast economic expansion. However, it has also distorted the incentives of local governments, leading to increased regional environmental damage (Cai et al., 2022).

The government must ensure that environmental protection and governance are basic public services because they are crucial to citizens' health. The Chinese government is currently placing an increasing amount of emphasis on ecological civilization building and environmental preservation and has implemented numerous measures to improve the environment. China has made significant progress in environmental protection, according to the country's environmental performance review. Nevertheless, due to institutional flaws and shortcomings in the country's environmental policy implementation, the effectiveness and efficiency of China's current environmental efforts are insufficient (Liu et al., 2021). Moreover, China has a relatively low environmental performance index in the world and has long faced the challenges of "high cost, high pollution, and high energy consumption," which hinder its economic and social progress. Additionally, China's environmental governance is a "monologue" under government control (Yang et al., 2022).

Every individual is obligated and responsible for protecting the environment, along with the state and government. Long-term environmental conservation and the development of an ecological society are unattainable without public engagement. Chinese individuals exhibit a low degree of environmental protection behavior and lack a strong willingness to participate in volunteer environmental preservation activities. Many Chinese citizens do not understand the importance of environmental protection, and some lack the ability to consciously adhere to environmental laws and regulations. The huge environmental challenges that China is facing force the government to mobilize the whole society to support, manage, and participate in environmental protection. The majority of earlier studies see residents as isolated individuals and ignore their opinions on environmental and broader socio-political aspects, including their views on the role of the government (Tsai et

al., 2021). While studies on pro-environmental behavior have become more popular in advanced economies since the 1970s, there is a dearth of comparable studies in developing nations (Bhattacharyya et al., 2020).

In terms of the definition of behavior related to protecting the environment, Farrukh et al. (2023) refer to pro-environmental behavior (PEB), which encompasses the actions of individuals and society aimed at reducing negative environmental impacts, enhancing environmental sustainability, and addressing numerous environmental challenges. PEB includes both proactive actions that benefit the environment (such as recycling) and the avoidance of actions that harm it (such as reducing air travel). Public engagement is primarily seen through various forms of PEB, such as adopting sustainable behaviors, making public appeals, participating in environmental decision-making, and other actions related to environmental governance, as civic consciousness grows (Yang et al., 2022). Hidalgo-Crespo et al. (2023) state that encouraging pro-environmental behaviors, such as waste reduction, recycling, reusing, and composting, to lessen the quantity of waste that ends up in landfills, has become much more widely recognized in recent years.

Therefore, the present study is innovative and significant as it utilizes data from the 2021 Chinese General Social Survey to compare and analyze the differences between private and public participation in environmental preservation in China, using the most recent data to demonstrate the current state of research. It also investigates the factors influencing pro-environmental behavior among the Chinese public, with a particular focus on how government investment and economic development impact such behavior. The study examines how government work effectiveness, gender, education, residency, political affiliation, media usage, social trust, and awareness of environmental protection influence the pro-environmental behavior of the Chinese population. The study's results will enhance the understanding of the pro-environmental behavior of the Chinese population and the factors influencing it.

2. Literature Review and Theoretical Background

Various theories and models are employed to elucidate pro-environmental conduct. The first type of model posits that environmental behavior is influenced by external variables. Social norms are shown as a key factor that governs pro-social behavior in the Norm Activation Model (NAM), which is subsequently broadened to encompass individuals' ethical obligations that drive their actions (Farrow et al., 2017). The second type of model examines internal aspects, such as the theory of planned behavior, which posits that an individual's actions are rational decisions shaped by their attitude. The Value-Belief-Norm (VBN) theory explains how beliefs form between individuals and their environment, leading to an increased sense of responsibility, activation of internal social norms, and motivation to engage in environmentally friendly behaviors (Wan & Du, 2022).

These theories, however, fall short of explaining the inconsistency that exists between the mind and environmental behavior. Even though some individuals have a positive attitude towards the environment and are interested in environmental issues, they do not engage in PEB as part of their normal activities (Steg & Vlek, 2009). Internal motives are not the only factor taken into account when individuals make behavioral decisions

because they are subject to a variety of extrinsic limitations and constraints. To enhance research, individuals gradually incorporate external environmental factors into the study of behavior (Stern & Oskamp, 1987).

The Attitude-Behavior-Context (ABC) theory provides a framework for understanding inconsistencies. The ABC hypothesis states that both external context elements and internal attitude variables influence an individual's behavior in the environment. Beliefs, norms, intentions, and other psychological traits make up the internal attitude variables, whereas social traits like the institutional environment, the physical infrastructure, the economic structure, and social competence make up the external contextual elements (Hong & Park, 2018). The predominant explanation for assessing how external influences influence sustainable conduct is the ABC theory, which posits that contextual elements are the primary determinants of an individual's behavior (Guagnano et al., 1995).

2.1 Influencing Factors of Pro-Environmental Behavior

In addition to these models and the above factors, Kollmuss and Agyeman (2002) examined both internal and external variables that impact pro-environmental behavior. According to Hong and Park (2018), more studies on pro-environmental behavior have begun to examine multi-level factors, focusing not only on individual-specific factors such as interests, norms, environmental awareness, and values, but also on economic and environmental conditions, cultural characteristics, and government regulations as external factors. Farrukh et al. (2023) mentioned that internal environmental factors include emotions, cognitions, attitudes, and beliefs, while external environmental variables encompass legislation, norms, and societal pressures. Elements like motivation, environmental knowledge, awareness, emotion, responsibility, priorities, and institutional, economic, social, and cultural aspects have also been identified as influential. A study by Tian and Chen (2023) stated that while environmental awareness and knowledge cannot fully determine environmental behavior, they are nonetheless essential factors and prerequisites for enhancing environmental behavior. The findings of Chen et al. (2023) demonstrated how social context, cognitive preferences, and general awareness interact to shape public engagement in environmental protection.

2.2 Citizens' PEBs: Public and Private Spheres

Private-sphere environmental behavior mostly involves surface-level or individual techniques of environmental protection used in daily life. Public-sphere pro-environmental behavior refers to an individual's contribution to the public sphere environment through social interactions, based on high-level environmental behaviors stemming from surface-level behaviors (Stern, 2000; Lange & Dewitte, 2019). Scholars have categorized behaviors in many ways. Individuals in the public domain might choose to support environmental groups that resonate with their personal values or ideas by becoming members or making donations. Some individuals could participate in demonstrations against certain environmental rules or corporate pollution. Individuals can adopt ecologically friendly habits in their own lives, such as purchasing organic produce, using public transportation, and improving their recycling routines, to reduce negative impacts on the environment (Tsai et al., 2021). The public sphere benefits vast groups by encompassing strangers in addition to oneself, neighbors, and friends, while the private sphere is mostly concerned with an individual's family or local community (Ouyang et al., 2022). Niu et al. (2022) mentioned that individuals may engage in environmental

governance through several means, like environmental petitions, public opinion, the Chinese People's Political Consultative Conference (CPPCC) recommendations, The National People's Congress (NPC) motions, and more.

Assessing citizens' PEBs is crucial in both public and private settings. Regardless of the type of environmental action a person takes, it has the potential to have a significant positive impact on the environment (Wu et al., 2019). According to Lee et al. (2014), engaging in pro-environmental conduct as a decent citizen may require some level of personal sacrifice. These practices often involve engaging in public activities such as supporting environmental groups and reaching out to government leaders to express concerns about the environment. Lu et al. (2017) suggested that public behaviors, such as endorsing policies and engaging in environmental citizenship, might indirectly promote environmental preservation. Individuals may help safeguard the environment by volunteering and taking eco-friendly measures in their personal lives.

In terms of government and environmental management, the PEBs in the public and private spheres of citizens could have various effects on the interactions between citizens and the government (Im et al., 2014). Public behavior by citizens frequently reflects their desired public values and views towards the government. Private citizen behavior, which takes a more personalized approach, may also be linked to a citizen's faith in and obedience to the government.

2.3 Economic Development and Pro-Environmental Behavior

In studies on the impact of economic development on pro-environmental behavior, scholars have found that the level of economic development can explain different behaviors in different countries, cultures, and contexts. According to Haller and Hadler (2008), more developed nations—like Austria, the Netherlands, and New Zealand—are more willing to make sacrifices for the environment. This willingness is not very high in many post-communist nations (e.g., East Germany, the Czech Republic, Bulgaria, and Latvia). The findings of Çarkocğlu and Kentmen-Çin (2015) indicate that citizens of wealthier nations seem to be more receptive to policies and behavioral adjustments connected to environmental protection.

In their study of China, Yang et al. (2019) used data from 288 prefecture-level cities. The study indicated that there is greater public involvement with environmental concerns in cities that have better economic conditions, resulting in notable environmental improvements in those places. According to Liu et al. (2023), regional heterogeneity shows that public environmental concern has a larger impact on lowering environmental pollution in Chinese cities that are not under economic strain.

Scholars often demonstrate the economic development level in their studies by utilizing income per capita. Stockwell (1962) asserts that economic development in a country is a multifaceted process, with increases in real income per capita being significant indications, among many others. Changes in a society's social and economic well-being are strongly correlated with fluctuations in per capita income. Du et al. (2022) discovered that higher income reinforces pro-environmental behavior, and engaging in pro-environmental activities is linked to both income level and income satisfaction. According to Wang et al. (2023), individual demands for the quality of their non-material lives increase as their wages grow, leading them to be more likely

to engage in environmental preservation activities when they have higher income levels. There is a direct relationship between environmental concerns and personal wealth or economic well-being (Wong et al., 2011).

The hypothesis is as follows, according to the analysis provided:

H1: Economic development has a significant positive impact on the public's pro-environmental behavior, that is, the propensity to adopt pro-environmental behavior increases with the degree of economic development in the community.

2.4 Government Investment and Pro-Environmental Behavior

Most scholars researching the governance effects of environmental fiscal investment believe it reduces environmental pollution (Zhang & Dong, 2023). The economy may influence public health by addressing environmental issues that endanger the well-being of individuals. Zhang and Dong (2023) discovered that China is showing growing interest in energy conservation and environmental preservation in terms of government spending. Environmental protection is currently a key government priority, alongside social security, healthcare, and education. China's financial investment in environmental improvement focuses on controlling air, water, and soil pollution, as well as ecological protection, clean energy development, and environmental monitoring and management systems in different provinces. However, given the context of environmental governance, this study introduces Hypothesis 2:

H2: Government pollution governance has a significant negative impact on the public's pro-environmental behavior; that is, the more government investment in the area where the public is located, the less likely they are to choose pro-environmental behavior.

In studies evaluating government work and public implementation of pro-environmental behavior, Haller and Hadler (2008) hold the view that citizens will be more aware of ecological issues and prepared to take action to protect the environment if their government takes these issues seriously, for example by offering facilities that encourage pro-environmental behavior. A study by Kulin and Johansson Sevä (2021) demonstrated that individuals who care about the environment are more likely to act in a way that is supportive of the environment (in the public domain) in nations with just, efficient, and impartial governments. Additionally, in nations with highly effective governments, citizens are often more inclined to act in ways that support the environment in both domains. According to Yang et al. (2022), with the involvement of numerous stakeholders, the government mainly controls environmental governance in China. Individuals' attitudes towards the environment and their level of satisfaction with government pollution governance would be impacted by the process of engaging in environmental governance and putting various PEBs into practice. Therefore, in light of the aforementioned analysis, Hypothesis 3 is put forth in this study:

H3: Government work effectiveness has a significant positive impact on the public's pro-environmental behavior; that is, the higher the public evaluation of government work, the greater the possibility of choosing pro-environmental behavior.

2.5 Economic Development and Government Investment in Pro-Environmental Behavior

Liu et al. (2023) found that in China, the interplay between political centralization and economic decentralization significantly impacts the willingness of local governments to tackle environmental pollution through “promotion competitions.” Local governments sometimes prioritize local economic development over their social duty for environmental conservation, leading to the neglect of important social welfare indicators such as environmental quality (Hong et al., 2020). Xiao and Liu (2018) analyzed panel data from 30 provinces in China spanning from 2003 to 2013; their findings showed that the local economic level remains a significant factor in shaping environmental governance. Wu et al. (2023) found a complex relationship between public environmental behavior, participation, and regional economic development, with a behavior- and region-specific quantitative connection among them. The public’s environmental behavior and participation respond to the regional economic development level, which is influenced by multiple factors.

Overall, the academic research on public pro-environmental behavior is extensive, although there are still significant shortcomings. The influence of the macro-environment is often disregarded, particularly when considering the level of regional economic development. Furthermore, the impact of China’s specific circumstances is often overlooked. In environmental governance, the Chinese government’s actions play a crucial role in influencing the public’s pro-environmental behavior, which differs from public engagement mechanisms in Western nations. This study examines how economic development and government investment influence the public’s pro-environmental behavior. Public pro-environmental behavior is influenced by economic development and government pollution governance. The impact of government pollution governance on pro-environmental behavior is not constant and varies based on the level of economic development. Economic development moderates the relationship between government pollution governance and public pro-environmental behavior. In accordance with the analysis above, Hypothesis 4 is presented as follows:

H4: Economic development has a moderating effect on government pollution governance and public pro-environmental behavior.

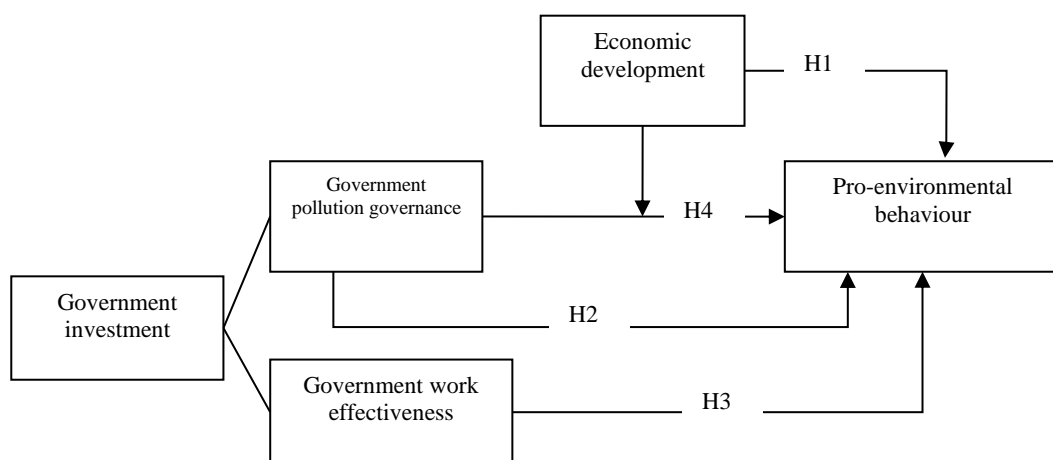


Figure 1: A comprehensive analytical framework for the impact of economic development and government input on pro-environmental behavior

3. Data and Method

The main data is from the environment module of the 2021 Chinese General Social Survey (CGSS). Beginning in 2003, CGSS is China's earliest nationwide, all-inclusive, and ongoing academic research project and is a widely recognized micro-authoritative database. Renmin University of China's National Survey Research Centre (NSRC) oversees the project's administration, execution, and data distribution. This study also includes data from 31 provinces in China, collected from the "China Statistical Yearbook." The effective sample size is 1604, comprising participants aged 18 to 95 years old. In this study, SPSS is used to process the questionnaire data, and the reliability and validity of the questionnaire are tested. The Cronbach's alpha coefficient for reliability analysis was 0.701. The validity analysis result showed that the KMO value was 0.564 and the Bartlett p-value was 0, which meets the analysis requirements. Overall, the survey subjects accurately depict the actual situation of the Chinese public's pro-environmental behavior, making the sample representative and scientifically valid.

3.1 Variable Used

The dependent variables are pro-environmental behavior in the private and public spheres. According to the questionnaire, the responses are divided into five items: very unwilling, unwilling, not necessarily, willing, and very willing, which are assigned values of 1, 2, 3, 4, and 5, respectively, and the average value for each item is calculated. The average value of pro-environmental behavior in private spheres is 4.15, and in public spheres, it is 3.72. This indicates that private sphere behavior is more favorable in terms of pro-environmental actions compared to the public sphere.

The independent variables are economic development and government investment. The mean economic development value is 10.49 with a standard deviation of 0.32, showing variation in economic development levels among provinces. Government contribution consists of governance and job evaluation by the government. The mean value of government pollution governance is 0.07 with a standard deviation of 0.04. The government work effectiveness is calculated as the mean of H8 and H11, with an average score of 3.89. This indicates that the public's opinion aligns with the assessment of government work. The variables used are summarized in Table 1.

In this study, the control variables (Table 2) consist mostly of individual characteristics, external situational factors, and social psychological factors. Individual characteristics encompass gender, age, location of residence, education level, and political affiliation. External situational factors consist of media consumption, social trust, and social communication. According to Si, Jiang, and Meng (2022), social psychological factors include ethics, environmental attitude, and environmental values. In this study, social psychological factors encompass awareness of environmental preservation and perception of environmental pollution.

Table 1: Dependent and independent variables

Dependent variables	Private sphere's pro-environmental behavior	The garbage generated by family life is often classified and discarded. Household items are recycled and reused.
		Willingness to discuss garbage sorting plans with other residents.
		Willingness to participate in the public welfare work to keep the environment clean regularly as a volunteer.
	Public sphere's pro-environmental behavior	If the government's tax increase can be used specifically to improve the problem of urban waste disposal, there is a willingness to accept a reasonable tax increase. Given the opportunity, there should be an initiative to negotiate with the government, environmental protection organisations, experts, garbage disposal departments, and other relevant agencies.
Independent variables	Economic development	The per capita income logarithm of each province.
	Government pollution governance	The amount of investment in environmental pollution control / general public budget
	Government work evaluation	How has the local government solved environmental problems in residential areas in the past five years? How has the central government solved China's domestic environmental problems in the past five years? One-sided emphasis on economic development over environmental conservation efforts = 1; insufficient attention, insufficient investment in environmental protection = 2; efforts were made, but the effect was not good = 3; made great efforts and achieved certain results = 4; have made great achievements = 5. The average value for each item is calculated.

Table 2: The control variables

Control variables	Individual characteristics	Gender	Male = 0; Female = 1
		Political parties	The masses = 0; The member of the Communist Youth League = 1; A member of the democratic party = 3; A member of the Communist Party of China = 4
		Place of residence	Rural area = 0; Urban area = 1
		Age	The age of the respondents
		Education	Primary school and below = 1; junior high school = 2; senior high school = 3; junior college = 4; undergraduate students = 5; graduate students and above = 6
		Income	Per capita annual income of respondents. Expressed as the logarithm of per capita annual income
	External situations	Social interaction	A31: Do you socialise and visit others in your spare time? never = 1; infrequently = 2; sometimes = 3; frequently = 4; very frequently = 5
		Social trust	A33: Do you agree that most individuals in this society are trustworthy? strongly agree = 5; somewhat agree = 4; uncertain = 3; somewhat disagree = 2; strongly disagree = 1
		Media usage	A28: How often did you utilise media in the past year? never = 1; infrequently = 2; sometimes = 3; frequently = 4; very frequently = 5
		Social psychological factors	Environmental pollution perception H2: How significant do you consider various types of environmental problems in the area you live in? extremely serious = 5; somewhat serious = 4; common = 3; not too serious = 2; not serious = 1

Environmental knowledge protection	H10: How much do you know about environmental protection? no knowledge = 0; basic understanding = 1, greater understanding = 2; comprehensive understanding = 3
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Table 3 summarizes the employed variables' descriptive statistics. The average gender value is 0.5, indicating a well-balanced male-to-female ratio among the respondents. The respondents had an average age of 53.54 years with a standard deviation of 2.45, indicating that they are mostly young and middle-aged. The mean residence value is 0.56 with a standard deviation of 0.49, suggesting that respondents are predominantly urban residents, with minimal distinction between rural and urban residents. The average education level is 2.45, indicating low educational attainment among respondents. The mean income is 10.72 with a standard deviation of 2.31, indicating that the income level of the respondents is relatively high, but the income gap is significant. The mean political affiliation value is 0.24, suggesting that most respondents are not members of the CPC.

Table 3: Descriptive statistics of the variables

	Variables	N	Average value	Standard deviation
Dependent variable	Private pro-environmental behavior	1604	4.15	0.73
	Public pro-environmental behavior	1604	3.72	0.82
Independent variable	Economic development	1604	10.49	0.32
	Government investment			
	Government pollution governance	1604	0.07	0.04
	Government work effectiveness	1604	3.89	0.82
Control variable	Individual characteristics			
	Gender	1604	0.5	0.5
	Political parties	1604	0.24	3.14
	Place of residence	1604	0.56	0.49
	Age	1604	53.54	2.45
	Education	1604	2.45	1.36
	Income	1604	10.83	2.31
	External situation			
	Social intercourse	1604	2.65	1.097
	Social trust	1604	3.67	0.973
Media usage	1604	2.34	0.62	
Social psychology				
Environmental pollution perception	1604	4.32	1.28	
Environmental knowledge protection	1604	1.32	0.39	

The mean media usage number is 2.34 with a standard deviation of 0.62, suggesting that most respondents use media rarely, although there are some variations. The mean value for social trust is 3.67, suggesting that most respondents believe that the great majority of individuals are trustworthy. The mean value of social intercourse is 2.65, whereas the average is 1.10. The mean score for environmental protection

knowledge is 1.32, suggesting that most respondents have a limited understanding of environmental protection. The mean perception of environmental pollution is 4.32, suggesting that most respondents believe that local environmental pollution is already significant. They may lack sufficient knowledge of environmental protection, but they are able to recognize the deteriorating state of the environment.

3.2 The Econometric Model

To empirically analyze the impact of economic development and government investment on public pro-environmental behavior, a multiple linear regression model is established based on the above variables. The basic expression of the model is as follows:

$$Y = \beta_0 + \sum_{i=1}^{12} \beta_i X_i + \varepsilon$$

where Y represents public pro-environmental behavior, while the parameters β are the regression coefficients. X represents the independent variables (economic development and government investment) and control variables (individual characteristics, external situations, social psychological factors). The index i represents the number of independent variables and control variables, and ε represents random error terms.

4. Results and Discussion

The first three models analyse pro-environmental behavior in public settings as dependent variables (Table 4), whereas the later three models (Table 5) analyse pro-environmental conduct in private settings as dependent variables. Control variables like individual characteristics, external situations, and social psychological factors are included in models 1 and 4. Models 2 and 5 introduce economic development, two government investment indicators of Government pollution governance, and government work effectiveness to the existing models. Models 3 and 6 incorporate the interaction of economic development and Government pollution governance.

Table 4: Regression analysis of economic development and government investment on pro-environmental behavior (Public sector)

Variables	Public sphere pro-environmental behavior		
	Model 1	Model 2	Model 3
Independent variable			
Economic development	—	-0.399 (0.067)	-3.948*** (0.158)
Government investment			
Government pollution governance	—	-3.591*** (0.441)	-4.238*** (0.208)
Government work effectiveness	—	3.855*** (0.026)	4.081*** (0.026)
The interaction of economic development and Government pollution governance	—	—	4.163*** (0.202)

Variables	Public sphere pro-environmental behavior		
	Model 1	Model 2	Model 3
Control variable			
Individual characteristics			
Gender	0.495 (0.040)	0.404 (0.040)	0.533 (0.040)
Age	-0.205 (0.002)	-0.382 (0.002)	-0.371 (0.002)
Education	-1.514 (0.021)	-1.409 (0.021)	-1.401 (0.021)
Political parties	3.429*** (0.061)	3.442*** (0.061)	3.421*** (0.060)
Place of residence	2.127** (0.046)	1.932* (0.047)	1.939* (0.046)
Income	-1.454 (0.009)	-1.546 (0.009)	-1.477 (0.009)
External situation			
Social intercourse	1.378 (0.019)	1.335 (0.019)	1.585 (0.019)
Social trust	5.078*** (0.022)	4.713*** (0.022)	4.739*** (0.022)
Media usage	2.946*** (0.037)	2.845*** (0.037)	2.926*** (0.037)
Social psychology			
Environmental pollution perception	1.697* (0.016)	0.292 (0.017)	0.371 (0.017)
Environmental knowledge protection	5.267*** (0.056)	4.921*** (0.056)	4.866*** (0.055)
Sample size	1604	1604	1604
R-squared	0.69	0.85	0.95
Adjusted R-squared	0.63	0.77	0.87
F	11.751***	11.338***	11.874***

*, **, and *** indicate that each variable is significant at the level of 10%, 5%, and 1%, respectively. Standard errors in parentheses.

Table 5: Regression analysis of economic development and government investment on pro-environmental behavior (Private sector)

Variables	Private sphere pro-environmental behavior		
	Model 4	Model 5	Model 6
Independent variable			
Economic development	—	3.972*** (0.060)	-1.442 (0.143)
Government investment			
Government pollution governance	—	-0.440 (0.398)	-3.434*** (0.189)
Government work effectiveness	—	3.522*** (0.023)	3.703*** (0.023)

Variables	Private sphere pro-environmental behavior		
	Model 4	Model 5	Model 6
The interaction of economic development and Government pollution governance	—	—	3.426*** (0.183)
Control variable			
Individual characteristics			
Gender	2.249** (0.037)	2.310** (0.036)	2.422** (0.036)
Age	0.157 (0.001)	-0.608 (0.001)	-0.599 (0.001)
Education	-0.351 (0.019)	-0.973 (0.019)	-0.963 (0.019)
Political parties	1.629 (0.055)	1.588 (0.055)	1.562 (0.055)
Place of residence	-2.091** (0.042)	-1.495 (0.042)	-1.503 (0.042)
Income	0.450 (0.008)	0.500 (0.008)	0.565 (0.008)
External situation			
Social intercourse	0.060 (0.017)	0.113 (0.017)	0.316 (0.017)
Social trust	1.734* (0.020)	1.572 (0.020)	1.579 (0.020)
Media usage	4.502*** (0.034)	4.086*** (0.033)	4.154*** (0.033)
Social psychology			
Environmental pollution perception	1.611 (0.015)	0.733 (0.015)	0.799 (0.015)
Environmental knowledge protection	1.668* (0.050)	1.455 (0.050)	1.395 (0.050)
Sample size	1604	1604	1604
R-squared	0.43	0.59	0.66
Adjusted R-squared	0.37	0.51	0.58
F	7.152***	7.655***	7.995***

*, **, and *** indicate that each variable is significant at the level of 10%, 5%, and 1%, respectively. Standard errors in parentheses.

4.1 Impact of Economic Development on Private-Sphere Pro-Environmental Behavior

Regression analysis of models 2 and 5 shows that economic development has a substantial beneficial impact on pro-environmental conduct in private spheres at a 1% significance level but no significant influence in public realms. Hypothesis 1 is somewhat accurate. The economic development variable measures income per capita for provinces and not individual income. Thus, a negative coefficient means that provinces with higher income per capita will have fewer pro-environmental actions by citizens. This aligns with the study findings of Du et al. (2024) and Wang et al. (2023). Most Chinese citizens may find it more realistic to integrate environmental protection principles into their daily lives due to the active involvement of the private sector in the

daily lives of residents. Wang et al. (2023) found that low-income individuals are prevented from engaging in public sector environmental behaviors due to the financial requirements involved, like environmental donations and participation in social organization environmental activities, which are typically linked to higher economic status.

In addition, citizens' PEBs involve activities like contributing to environmental organizations through membership fees or donations and participating in environmental protests or rallies. These activities are largely voluntary and can lead to substantial costs for these individuals, ranging from financial loss to facing charges for unlawful protests. Li et al. (2022) stated that when individuals' position and power increase, their sense of community responsibility also grows, impacting economic development beyond personal income. Residents with a higher subjective perceived class status are more inclined to express their needs, exercise their civil rights, and actively participate in public environmental behaviors.

4.2 Effectiveness of Government Investment on Pro-Environmental Behavior

Results from the regression analysis of models 2 and 5 indicate that government work effectiveness can significantly and positively influence pro-environmental behavior in the private and public spheres at a 1% significance level. In other words, higher public evaluation of government work leads to increased pro-environmental behavior among the public. Thus, Hypothesis H3 is confirmed. The pro-environmental behavior of the Chinese populace is influenced by both individual circumstances and government initiatives. Increased public approval of government actions leads to greater receptiveness to government communication and a proactive adoption of pro-environmental behaviors. This confirms that a positive public perception of government operations increases the likelihood of individuals choosing pro-environmental behaviors. This aligns with the findings of Sun et al. (2020), indicating that individuals are more likely to engage in environmental governance and implement pro-environmental behavior when they are content with the government's environmental management and have confidence in the efficacy of environmental policy measures.

On the other hand, government pollution governance negatively affects pro-environmental behavior in the public domain at a 1% significance level. This means that increased government investment in the governance of public environments leads to a decrease in pro-environmental behavior among the public. Hypothesis H2 is partially supported as it has no influence on the private sphere. Wong (2010) argues that China's non-democratic institutions and structure have led to inadequate representation of the public interest. Chinese residents currently depend on the government's ability to effectively deal with their country's environmental problems. According to Wang et al. (2021), increased environmental protection efforts by local governments result in greater comfort among residents because they improve residents' perceptions of their mental health and quality of life. The public depends more on the government for financial support in environmental management than acting as responsible citizens, leading to the establishment of a government-dependent environmental protection framework. The transparency of environmental information significantly affects the efficacy of environmental governance. Citizens, corporations, and social groups may not have

assured access to environmental information due to its complexity and exclusivity, which can hinder the effectiveness of government monitoring and governance (Niu et al., 2022).

4.3 The Moderating Influence of Economic Development Between Government Pollution Governance and Public Pro-Environmental Behavior

The regression analysis findings for models 3 and 6 indicate that the relationship between economic development and government pollution governance significantly and positively influences pro-environmental behavior in both the public and private domains at a 1% significance level. Hypothesis H4 is therefore confirmed. The more advanced the economic development in the public's location, the better government pollution governance can mitigate negative impacts.

Improved economic conditions provide the government with more financial resources for environmental protection and sustainable development projects. Improvements in regional economic development would broaden the reach of government public services' universal advantages, hence boosting government support for pro-environmental behavior. The government may invest in environmental technologies, support the clean energy industry, and encourage and support pro-environmental behavior by focusing more on social welfare and sustainable development goals.

The public tends to shift responsibility for environmental preservation to the government and corporations due to perceived risks and costs associated with adopting pro-environmental behavior, leading to insufficient personal knowledge and a sense of responsibility for environmental protection. Improved economic conditions lead to heightened environmental awareness among individuals, resulting in shifting environmental standards and less reliance on government intervention for environmental protection. According to the economic affluence hypothesis, people would strive for higher-quality environments as a nation's economy grows or as their own socioeconomic status rises. It is possible to commit more resources and funds to improving the environment (Si et al., 2022).

Dong et al. (2023) share the perspective that in regions with greater economic development, governments have better technical resources, while citizens possess higher political awareness and legal knowledge, leading to more effective public participation and easier resolution of environmental issues. Wang et al. (2021) found that citizens in central and western China prioritize government behavior, while those in eastern China focus on individual environmental behaviors to mitigate pollution-related health risks.

4.4 The Influence of Control Variables on Public Pro-Environmental Behavior

The regression analysis results of the control variables of each model are generally consistent with the research conclusions of the related literature. According to models 1 and 4, several deductions can be made:

Individual Characteristics

Gender has a considerable positive impact on private-sphere environmental behavior at a 5% significance level, but it does not have a significant effect on behavior in the public domain. Women have a positive correlation with gender, suggesting they prioritize private domains of pro-environmental behavior more than men. Women are more inclined to make sacrifices than men (Haller & Hadler, 2008; Wang et al., 2023). Residential location significantly influences pro-environmental behavior at a 5% significance level, with varying

outcomes in both spheres. Public exposure to environmental pollution can lead to collective actions, such as free-riding or following the crowd, which impede the transformation of individual environmental protection behaviors into collective ones. Political parties have a notable influence on pro-environmental behavior in the public sphere at a 1% significance level, while showing no significant impact in the private sphere. This suggests that party members exhibit better pro-environmental behavior in the public sphere due to increased constraints and the necessity to collaborate with government efforts on environmental conservation.

External Situations

Media consumption has a strong positive impact on pro-environmental conduct in both the public and private domains at a 1% significance level. Individuals who use the media more often are exposed to a greater amount of scientific knowledge about environmental protection, leading to enhanced pro-environmental behavior. Leng et al. (2022) found that media coverage of environmental issues and risks may enhance the public's understanding of the importance and immediacy of environmental preservation endeavors. The public can benefit from environmental protection information published in the media by increasing their awareness and involvement in environmental protection activities (Wang et al., 2023). Social trust has a considerable effect on pro-environmental conduct in both the public and private domains at a 1% significance level. Other scholars have reached a comparable conclusion. Nouri et al. (2022) investigated the impact of social and cultural factors and discovered a strong and substantial positive correlation between social elements such as knowledge, dedication, trust, and public engagement in urban environmental preservation.

Social Psychological Aspects

Knowledge of environmental protection has a 1% positive influence on pro-environmental behavior in both the public and private domains. A comprehensive grasp of the environment and a thorough risk assessment increase the willingness to make sacrifices for the environment (Haller & Hadler, 2008). Enhanced environmental knowledge can lead individuals to better understand environmental challenges, fostering more concern and accountability towards the environment (Cao et al., 2020; Ouyang et al., 2022).

At a 10% significance level, the perception of environmental pollution has significant positive effects on public pro-environmental behavior but has no effect on private behavior. Tsai et al. (2021) elucidate this occurrence in their study. The respondents' opinions of environmental risk can only be linked to their public environmental behaviors through their willingness to make compromises. Concessions made for the environment partially influence the correlation between private environmental risk perceptions and PEBs. Flatø (2020) concluded that the extent of local environmental pollution significantly impacts the community's inclination to engage in environmental protection practices. The more severe the pollution in an area, the more likely residents are to incorporate initiatives to safeguard the environment into their everyday routines. Zeng et al. (2023) suggest that concerns about environmental issues, such as environmental hazards and climate change, might impact individual behavior to promote sustainable consumption.

4.5 Robustness Tests

Table 6 shows the results of robustness tests, verifying the reliability of the empirical analysis by recalculating the model using simple random sampling with a sample size of 1,000. Models 7 and 8 pertain to pro-environmental behavior in the public sphere, whereas models 9 and 10 relate to the private sphere. According to the models, economic development may have a notable beneficial impact on pro-environmental behavior in the private sphere at a 1% significance level. Government work assessment at a 1% significance level can effectively enhance pro-environmental behavior in both the private and public spheres. Government pollution governance considerably inhibits pro-environmental behavior in the public sphere at a 1% significance level. Economic development has a 1% moderating influence on government pollution governance and pro-environmental behavior in both the public and private spheres. The previously mentioned results are consistent with earlier studies, indicating that the findings in this study are robust and representative.

Table 6: Results of robustness test estimation

Variables	Public sphere pro-environmental behavior		Private sphere pro-environmental behavior	
	Model 7	Model 8	Model 9	Model 10
Independent variable				
Economic development	-0.389	-3.920 ^{***}	3.968 ^{***}	-1.453
Government investment				
Government pollution governance	-3.654 ^{***}	-4.213 ^{***}	-0.419	-3.443 ^{***}
Government work effectiveness	3.827 ^{***}	4.053 ^{***}	3.529 ^{***}	3.713 ^{***}
The interaction of economic development and Government pollution governance	—	4.136 ^{***}	—	3.435 ^{***}
Control variable				
Individual characteristics				
Gender	0.432	0.559	2.300 ^{**}	2.411 ^{**}
Age	-0.584	-0.563	-0.537	-0.519
Education	-1.258	-1.255	-1.015	-1.011
Political parties	3.395 ^{***}	3.377 ^{***}	1.602	1.577
Place of residence	1.837 [*]	1.848 [*]	-1.462	-1.466
External situation				
Social intercourse	1.361	1.609	0.105	0.307
Social trust	4.762 ^{***}	4.786 ^{***}	1.554	1.560
Media usage	2.832 ^{***}	2.912 ^{***}	4.090 ^{***}	4.158 ^{***}
Social psychology				
Environmental pollution perception	0.314	0.392	0.725	0.791
Environmental knowledge protection	4.936 ^{***}	4.881 ^{***}	1.451	1.390

*, **, and *** indicate that each variable is significant at the levels of 10%, 5%, and 1%, respectively.

5. Conclusion

This study utilizes microdata and associated macro-data from CGSS 2021 to conduct a multiple linear regression analysis. An empirical examination was conducted to analyze the impact of economic development

and government intervention on environmentally friendly public behavior and its underlying processes. The study yielded the following conclusions:

Economic development has a statistically significant beneficial impact on pro-environmental conduct in the private sector at a 1% significance level. Furthermore, a 1% increase in government work assessment can effectively enhance pro-environmental conduct in both the commercial and public sectors. At a significance level of 1%, government pollution governance greatly hinders pro-environmental activity in the public sphere. Economic development influences government pollution governance and popular pro-environment behaviors. Economic development and government pollution governance positively influence pro-environmental conduct in both the public and private sectors by 1%. Finally, individual characteristics, external circumstances, and social-psychological factors all have different levels of influence over public pro-environmental behavior.

China is actively working on improving the public participation system in environmental management and decision-making to improve the ecological environment. As public understanding and awareness of environmental preservation increase, more individuals will start to focus on and become involved in environmental concerns. To assist China in establishing more effective policies to promote pro-environmental behavior in the future, the following ideas are proposed based on the results:

1. The government should prioritize enhancing the financial system, increasing financial investments, and raising public expectations. The primary focus should be on improving the efficiency of expenditures to ensure environmental protection and governance. Increasing the proportion of spending on environmental protection within the total fiscal budget may impact other sectors (Bergh & Karlsson, 2010).
2. The legal and administrative frameworks that facilitate public involvement in environmental management and conservation must be improved. Enhancing public awareness of environmental issues is crucial to expanding society's rights and interests related to the environment, including rights to environmental monitoring, information, claims, and discussion (Niu et al., 2022). This will promote opportunities for public participation in environmental management and conservation.
3. The government should promote the simultaneous growth of the economy and the environment. In underdeveloped regions, the government might promote environmental conservation by offering incentives like tax breaks. The promotion of eco-conscious decisions among businesses and individuals can engage them in environmental conservation initiatives.
4. The use of social media should be improved. The results confirm that media exposure has a beneficial impact. Given the established impact of the Internet and social media on public opinion, it is important to consider their role in promoting government policies aimed at fostering environmental behavior (Wang et al., 2018). Media can expedite the achievement of sustainable development (Gentzkow & Shapiro, 2010).

Enhancing public engagement in environmental conservation is essential for addressing environmental challenges. Lihua et al. (2020) noted that conventional government-led environmental regulation and governance in China have been substituted by a structure for governance that highlights shared responsibility between the public and the government. Unlike the conventional government-led approach, the public, as stakeholders in environmental governance, can contribute to practical solutions for environmental issues and influence the government's environmental governance through their environmental attitudes and monitoring behavior. In the future, the public should actively fulfill their responsibility for environmental protection by following the suggestions of the NPC, the ideas of the CPPCC, and online popular opinion (Dong et al., 2023). Furthermore, the public should enhance their understanding of the environment. Chinese urban residents are aware of environmental concerns but have a poor comprehension of high-level environmental issues, according to Tian & Chen (2023). Enhancing environmental knowledge can encourage more pro-environmental behaviors and provide the government with valuable references for environmental decision-making.

Although the study yielded valuable insights, it also had limitations. The data originates from China and may not be easily generalized. Future studies may require data from many nations to enhance external validity. The present study's conclusions may be pertinent for individuals from specific cultural backgrounds. Additional research should assess the extent to which the findings may be applied to other contexts and examine how the study approach can be adapted for use in various countries and cultures. The questionnaire data index utilized in this study pertains to behavioral intention rather than actual behavior. Past studies have shown a clear connection between behavioral intention and behavior, indicating that behavioral intention may effectively forecast actual behavior. Subsequent research could delve more deeply into this topic. The present study focuses on environmental pollution investment in China due to historical issues and government priorities rather than environmental financial expenditure, which diminishes the emphasis on public health concerns in environmental governance. Finally, the findings from different provinces and cities in China demonstrate regional diversity. In the future, it should be classified into categories based on economic development or other criteria for analysis.

References

- Bhattacharyya, A., Biswas, K., & Moyeen, A. (2020). Determinants of pro-environmental behaviors—A cross country study of would-be managers. *Australasian Accounting, Business and Finance Journal*, 14(2), 51-71.
- Bergh, A., & Karlsson, M. (2010). Government size and growth: Accounting for economic freedom and globalization. *Public Choice*, 142, 195-213.
- Cai, H., Tong, Z., Xu, S., Chen, S., Zhu, P., & Liu, W. (2022). Fiscal decentralization, government behavior, and environmental pollution: Evidence from China. *Frontiers in Environmental Science*, 10, 901079.

- Cao, H., Zhu, X., Heijman, W., & Zhao, K. (2020). The impact of land transfer and farmers' knowledge of farmland protection policy on pro-environmental agricultural practices: The case of straw return to fields in Ningxia, China. *Journal of Cleaner Production*, 277, 123701.
- Carkoğlu, A., & Kentmen-Çin, Ç. (2015). Economic development, environmental justice, and pro-environmental behavior. *Environmental Politics*, 24(4), 575–597.
- Chen, W., Di, K., Cai, Q., Li, D., & Liu, C. (2023). Research on motivational mechanisms and pathways for promoting public participation in environmental protection behavior. *International Journal of Environmental Research and Public Health*, 20(6), 5084.
- Chen, M., Qian, X., & Zhang, L. (2015). Public participation in environmental management in China: Status quo and mode innovation. *Environmental Management*, 55, 523-535.
- Dong, L., Wang, Z., & Zhou, Y. (2023). Public participation and the effect of environmental governance in China: A systematic review and meta-analysis. *Sustainability*, 15(5), 4442.
- Du, S., Cao, G., & Huang, Y. (2024). The effect of income satisfaction on the relationship between income class and pro-environment behavior. *Applied Economics Letters*, 31(1), 61–64.
- Farrow, K., Grolleau, G., & Ibanez, L. (2017). Social norms and pro-environmental behavior: A review of the evidence. *Ecological Economics*, 140, 1-13.
- Farrukh, M., Raza, A., Mansoor, A., Khan, M. S., & Lee, J. W. C. (2023). Trends and patterns in pro-environmental behavior research: A bibliometric review and research agenda. *Benchmarking: An International Journal*, 30(3), 681-696.
- Flatø, H. (2020). Socioeconomic status, air pollution and desire for local environmental protection in China: Insights from national survey data. *Journal of Environmental Planning and Management*, 63(1), 49-66.
- Gentzkow, M., & Shapiro, J. M. (2010). What drives media slant? Evidence from US daily newspapers. *Econometrica*, 78(1), 35-71.
- Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships: A natural experiment with curbside recycling. *Environment and Behavior*, 27(5), 699-718.
- Haller, M., & Hadler, M. (2008). Dispositions to act in favor of the environment: Fatalism and readiness to make sacrifices in a cross-national perspective. *Sociological Forum*, 23(2), 281-311.
- Hidalgo-Crespo, J., Velastegui-Montoya, A., Amaya-Rivas, J. L., Soto, M., & Riel, A. (2023). The role of personality in the adoption of pro-environmental behaviors through the lens of the Value-Belief-Norm Theory. *Sustainability*, 15(17), 12803.
- Hong, Y., Lyu, X., Chen, Y., & Li, W. (2020). Industrial agglomeration externalities, local governments' competition and environmental pollution: Evidence from Chinese prefecture-level cities. *Journal of Cleaner Production*, 277, 123455.
- Hong, Z., & Park, I. K. (2018). The effects of regional characteristics and policies on individual pro-environmental behavior in China. *Sustainability*, 10(10), 3586.

- Khan, Z., Ali, S., Dong, K., & Li, R. Y. M. (2021). How does fiscal decentralization affect CO2 emissions? The roles of institutions and human capital. *Energy Economics*, 94, 105060.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.
- Kulin, J., & Johansson Sevä, I. (2021). Quality of government and the relationship between environmental concern and pro-environmental behavior: A cross-national study. *Environmental Politics*, 30(5), 727-752.
- Lange, F., & Dewitte, S. (2019). Measuring pro-environmental behavior: Review and recommendations. *Journal of Environmental Psychology*, 63, 92-100.
- Lee, Y. K., Kim, S., Kim, M. S., & Choi, J. G. (2014). Antecedents and interrelationships of three types of pro-environmental behavior. *Journal of Business Research*, 67(10), 2097-2105.
- Leng, X., Zhong, S., & Kang, Y. (2022). Citizen participation and urban air pollution abatement: Evidence from environmental whistle-blowing platform policy in Sichuan, China. *Science of The Total Environment*, 816, 151521.
- Li, D., Zhao, L., Ma, S., Shao, S., & Zhang, L. (2019). What influences an individual's pro-environmental behavior? A literature review. *Resources, Conservation and Recycling*, 146, 28-34.
- Li, Z. F., Wu, J. C., & Deng, S. (2022). The effect of destination social responsibility on tourists' pro-environmental behavior. *Asia Pacific Journal of Tourism Research*, 27(12), 1233-1246.
- Lihua, W. U., Tianshu, M. A., Yuanchao, B. I. A. N., Sijia, L. I., & Zhaoqiang, Y. I. (2020). Improvement of regional environmental quality: Government environmental governance and public participation. *Science of the Total Environment*, 717, 137265.
- Liu, N., Liu, Y., & Yu, X. (2023). The impact of public environmental concern on environmental pollution: The moderating effect of government environmental regulation. *PLOS ONE*, 18(8), e0290255.
- Liu, Y., Wang, A., & Wu, Y. (2021). Environmental regulation and green innovation: Evidence from China's new environmental protection law. *Journal of Cleaner Production*, 297, 126698.
- Lu, H., Liu, X., Chen, H., Long, R., & Yue, T (2017). Who contributed to "corporation green" in China? A view of public-and private-sphere pro-environmental behavior among employees. *Resources, Conservation and Recycling*, 120, 166-175.
- Nasrabadi, Z. T., Motahari, S., Farahani, M., & Azadbakht, B. (2023). Determinants of public participation in urban environmental protection: An exploratory qualitative study. *Journal of Human Environment and Health Promotion*, 9(3), 159-167.
- Niu, Y., Wang, X., & Lin, C. (2022). A study on the impact of organizing environmental awareness and education on the performance of environmental governance in China. *International Journal of Environmental Research and Public Health*, 19(19), 12852.

- Nouri, H., Khoshnit, A., & Omrani, A. (2022). The role of social and cultural indicators affecting the amount of citizens' participation in preserving the urban environment. The 13th International Research Conference on Management, Economy and Development, Iran.
- Ouyang, X., Qi, W. E., Song, D., & Zhou, J. (2022). Does subjective well-being promote pro-environmental behaviors? Evidence from rural residents in China. *International Journal of Environmental Research and Public Health*, 19(10), 5992.
- Si, W., Jiang, C., & Meng, L. (2022). The relationship between environmental awareness, habitat quality, and community residents' pro-environmental behavior—Mediated effects model analysis based on social capital. *International Journal of Environmental Research and Public Health*, 19(20), 13253.
- Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407-424.
- Stern, P. C., & Oskamp, S. (1987). Managing scarce environmental resources. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology* (Vol. 2, pp. 1043-1088). New York, NY: Wiley.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behavior: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317.
- Stockwell, E. G. (1962). The relationship between population growth and economic development. *American Sociological Review*, 27(2), 250-252.
- Sun, Q., Fang, K., & Liu, T. (2020). Impact of social norms and public supervision on the willingness and behavior of farming households to participate in rural living environment improvement: Empirical analysis based on generalized continuous ratio model. *Resources Science*, 42, 2354-2369.
- Tian, H., & Chen, S. (2023). Structural analysis of environmental literacy of urban residents in China—Based on the questionnaire survey of Qingdao residents. *Sustainability*, 15(6), 5552.
- Tsai, C. C., Li, X., & Wu, W. N. (2021). Explaining citizens' pro-environmental behaviors in public and private spheres: The mediating role of willingness to sacrifice for the environment. *Australian Journal of Public Administration*, 80(3), 510-538.
- Wa, D., & Zhang, Z. (2023). Research on E-Government adoption in environmental governance from the perspective of public participation: Empirical analysis based on 31 provinces in China. *Polish Journal of Environmental Studies*, 32(2), 1383-1391.
- Wan, Q., & Du, W. (2022). Social capital, environmental knowledge, and pro-environmental behavior. *International Journal of Environmental Research and Public Health*, 19(3), 1443.
- Wang, C., Wang, Z., & Zhang, Y. (2023). Exploring the differences and influencing factors of public participation in environmental protection behavior in the private and public spheres in China. *Polish Journal of Environmental Studies*, 32(5), 4301-4311.
- Wang, S., Zhou, H., Hua, G., & Wu, Q. (2021). What is the relationship among environmental pollution, environmental behavior, and public health in China? A study based on CGSS. *Environmental Science and Pollution Research*, 28, 20299-20312.

- Wong, T. K., Wan, P. Wong, T. K. Y., & Wan, P. S. (2011). Perceptions and determinants of environmental concern: The case of Hong Kong and its implications for sustainable development. *Sustainable Development, 19*(4), 235-249.
- Wong, K. K. (2010). Environmental awareness, governance and public participation: Public perception perspectives. *International Journal of Environmental Studies, 67*(2), 169-181.
- Wu, W. N., Liu, L. Y., & Brough, C. (2019). No time for composting: Subjective time pressure as a barrier to citizen engagement in curbside composting. *Waste Management, 91*, 99-107.
- Wu, J., Gao, G., Zhang, B., & Yang, Z. (2023). Relationships between economic development and resident environmental behavior and participation in areas with different economic and similar natural and cultural conditions. *Environmental Research Communications, 5*(7), 075007.
- Xi, W. (2017). A study on China's system of public participation in environmental protection—Taking Haikou's "Two Constructions" for example. *IOP Conference Series: Earth and Environmental Science, 51*(2017), 012012.
- Xiao, J. Y., & Liu, P. (2018). Threshold effects of fiscal spending on environmental governance and tests—Based on inter-provincial water environmental governance panel data from 2003–2013. *Finance and Trade Research, 29*, 68-79.
- Yang, R., Chen, J., Wang, C., & Dong, Y. (2022). The influence mechanism and path effects of pro-environmental behavior: Empirical study based on the structural equation modeling. *Polish Journal of Environmental Studies, 31*(5), 4447-4456.
- Yang, X., Dong, X., Jiang, Q., & Liu, G. (2019). Factors influencing public concern about environmental protection: An analysis from China. *Discrete Dynamics in Nature and Society, 2019*, 5983160.
- Zeng, Z., Zhong, W., & Naz, S. (2023). Can environmental knowledge and risk perception make a difference? The role of environmental concern and pro-environmental behavior in fostering sustainable consumption behavior. *Sustainability, 15*(6), 4791.
- Zhang, D., & Dong, X. (2023). From the perspectives of pollution governance and public health: A research of China's fiscal expenditure on energy conservation and environmental protection. *International Journal of Environmental Research and Public Health, 20*(11), 6018.
- Zhang, L., Fukuda, H., & Liu, Z. (2019). Public willingness to pay for sand and dust weather mitigation: A case study in Beijing, China. *Journal of Cleaner Production, 217*, 639-645.
- Zhao, J., Zhao, Z., & Zhang, H. (2021). The impact of growth, energy and financial development on environmental pollution in China: New evidence from a spatial econometric analysis. *Energy Economics, 93*, 104506.