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Summary

With the appearance of "wellbeing stagnation", the Chinese government has gradually realized the negative impact of increasingly severe environmental problem on people's wellbeing, and has then has formulated a series of environmental policies. Based on the balanced panel data from2014 to 2018 from China Family Panel Studies (CFPS)and by means of the fixed effects model, we analyze the relationships between heterogeneous environmental regulations (ERs) and subjective wellbeing (SWB) from the perspective of diligent governance. Our results show that command-control environmental regulation (CER) and voluntary environmental regulation (VER)have positive effects on SWB, but there existthe heterogeneity effects in the links between ERs and SWB. Vulnerable populations, including those with rural hukou, less educated, have paidmore attention to VER, whereas the view of other groups is the opposite. Similarly, the people with low incomes or living in economically underdeveloped areas or western region, are sensitive to VER, while the others only pay attention to CER.The SWB of those with better health can be enhanced by CER, and the SWB of those with poor health are unaffected by CER and VER.Further channel analysis illustrates that CER can improve SWB by increasing people's evaluation of the government, while VER cannot. Our results imply that the people would place more weight on environmental governance as their income rises, and can help the government institute more flexible environmental policies to improve people's wellbeing.

Keywords: Subjective wellbeing; environmental regulations; heterogeneity; balanced panel data; China

JEL Classification: Q53; Q56; O13; R11; P28; H11

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Can the diligent governance increase subjective wellbeing? New evidence from environmental regulations in China

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Abstract: With the appearance of "wellbeing stagnation", the Chinese government has gradually realized the negative impact of increasingly severe environmental problem on people's wellbeing, and has then has formulated a series of environmental policies. Based on the balanced panel data from 2014 to 2018 from China Family Panel Studies (CFPS) and by means of the fixed effects model, we analyze the relationships between heterogeneous environmental regulations (ERs) and subjective wellbeing (SWB) from the perspective of diligent governance. Our results show that command-control environmental regulation (CER) and voluntary environmental regulation (VER) have positive effects on SWB, but there exist the heterogeneity effects in the links between ERs and SWB. Vulnerable populations, including those with rural hukou, less educated, have paid more attention to VER, whereas the view of other groups is the opposite. Similarly, the people with low incomes or living in economically underdeveloped areas or western region, are sensitive to VER, while the others only pay attention to CER. The SWB of those with better health can be enhanced by CER, and the SWB of those with poor health are unaffected by CER and VER. Further channel analysis illustrates that CER can improve SWB by increasing people's evaluation of the government, while VER cannot. Our results imply that the people would place more weight on environmental governance as their income rises, and can help the government institute more flexible environmental policies to improve people's wellbeing.

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1. Introduction

Wellbeing is the ultimate pursuit of social development, as well as the highest evaluation of life quality. With the development of the economy and human civilization, people are increasingly yearning for a happy life and focus more on the spiritual pursuit. Improving the people's wellbeing is the ultimate goal of economic development and the public policy, and has received the attention of all countries. The United Nations designated March 20 as the International Day of Happiness. However, as economy is growing, subjective wellbeing (SWB) of Chinese has gone in the opposite direction (Easterlin et al., 2012). The "World Happiness Report" published by the United Nations shows that among 156 major countries, China ranks 84th in 2015, and the report points out that the Chinese in 2015 are less happy than in 1990. On the one hand, China has not taken into account the people's wellbeing while developing its economy, leading to "wellbeing stagnation" (Bartolini and Sarracino, 2014). On the other hand, growing levels of pollution have made a very profound influence on the daily lives of people. Obviously, environmental pollution has become an important factor to restrict the improvement of SWB (Levinson, 2012).

With the environmental problem has become increasingly prominent, a large number of scholars have taken to studying the relation between environmental quality and subjective wellbeing, which focus mainly on the perspectives of climate conditions and air quality (Rehdanz et al., 2015; Zhang et al., 2017). However, it is generally known that environmental pollution is an outgrowth of economic development. Compared with the area economically under-developed, the economically developed area may have greater pressure on environmental governance and poor environmental quality. In addition, as a public good, the environment cannot be resolved just by the market, so the government plays a pivotal role in it. The local government needs to maintain comprehensive development level. While sustaining economic growth, the environmental quality of each region has unique equilibrium that is determined by industrial structure, economic development and so on, so there is no comparison between each province. In other words, if the same environmental quality is achieved by different provinces, their governments have such a variety of effort levels. At the same time, SWB is a comprehensive index, which is affected by multiple factors, and environmental quality is only one factor. Thus, it seems not appropriate to only study the connection between environmental pollution and SWB, which seems to ignore the

difference of economic characteristics between each province. And such research pays so much attention to the achievements that it ignores the government's efforts. Although environmental quality is influenced by other factors in each region, environmental regulations (ERs) are a variety of public policies set for the environmental problem, and the implementation and enforcement of measures are more independent. With the increasing negative impact of environmental pollution on people's lives and the raising public awareness of environmental preservation, more and more people have begun to actively join in protecting the environment. ERs can more reflect how significant the government considers environmental issues to be, and would ease the concerns of the public for environmental pollution, thereby promoting their satisfaction with government. Moreover, public policies are designed to better improve people's wellbeing (Chen and Li, 2012), and a diligent government may be more popular. Therefore, if people are significantly sensitive to environmental pollution, will environmental regulations, as a kind of public policies, still have positive impacts on subjective wellbeing under the established achievements (the current environment pollutes)? Will different types of environmental regulations have heterogeneous effects? These questions seem to have been given little attention.

In order to address the above questions, this study divides environmental regulations (ERs) into command-control environmental regulation (CER) and voluntary environmental regulation (VER) (Zhu et al., 2021). CER and VER measure the actions and the commitments of the government in environmental governance respectively. Based on balanced panel data which matches the data of the China Family Panel Studies (CFPS) with provincial macro data, the impacts of CER and VER on SWB are respectively investigated in detail. Since this study mainly attaches importance to the efforts in environmental governance rather than the achievements, considering the possible influence of environmental pollution on SWB, we introduce environmental pollution as a control variable. And we further discuss the people's evaluation of the government, the mechanism behind how ERs influence SWB. In theory, this study provides a new angle for evaluating the public policy, and future research can investigate the policy from the perspective of people's wellbeing. In practice, this paper can help the government to clarify the present situation of local governance measures in environment, and contribute to improving the management system. Our conclusions are meaningful for the government to formulate the

optimum environmental regulations to improve subjective wellbeing in accordance with the local conditions.

The remainder of the paper is organized as follows. Section 2 provides literature review and Section 3 lists empirical design. Section 4 discusses benchmark analysis, including panel fixed effect results, robustness checks and endogeneity tests, while Section 5 describes advanced analysis, including heterogeneous effects and channel analysis. The conclusions and policy implications are shown in Section 6.

2. Literature review

The study of happiness economics has achieved fruitful results in the last 20 years. Happiness economics originates from the “Easterlin Paradox”, that is, people with higher incomes are more likely to find wellbeing within a country, but the average wellbeing of a country will not increase with the growth of per capita GDP. This has aroused extensive discussions, and the relationship between income and SWB has received more attention. Easterlin (2005) believes that the relation between income and SWB almost entirely depends on relative income. Due to comparing mentality, when everyone becomes richer, people will not become much happier, because, on average, relative income has not changed and perhaps even become more deteriorate, which is also proved by Clark et al. (2008) from a theoretical perspective. Boyce et al. (2010) propose a rank-income hypothesis, indicating that it is income rank not income level that affects life satisfaction. Along with the continuously growing resident income in the future, the income gap will gradually widen, leading to income inequality. And income inequality will exacerbate the decline in SWB (Delhey and Dragolov, 2013; Zhang and Churchill, 2020). The environment seems to have a positive relationship with income inequality (Heerink et al., 2001). Higher-income families have the ability to obtain more social resources, including those cause pollution, but the environmental cost needs to be borne by the entire society.

It is certain that economic factor is one of the most important factors affecting SWB (Su et al., 2021). In addition, the impact of the ecological environment on SWB has been paid more and more attention (Welsch, 2006; Zhang et al., 2017). Economic development has not only exacerbated income inequality but also brought environmental pollution. With the increase of

income, the demand for green environment is also rising, and the impact of the environmental quality on SWB has become more and more valued (MacKerron and Mourato, 2009; Chen et al., 2013). Levinson (2012) finds that air pollution can significantly make people unhappier, and calculates that the willingness to pay for a unit of air quality is $459 a year. Ferreira et al. (2013) detect that reducing SO_2 concentrations is likely to enhance life satisfaction in Europe. Zhang et al. (2017) distinguish SWB into long-term life satisfaction and short-term hedonic happiness, and point out that air pollution would reduce hedonic happiness, while it has no effect on life satisfaction. With the deteriorating environment, energy poverty has emerged. Energy poverty has a negative impact on health and SWB (Zhang et al., 2019; Zhang et al., 2021). There is no doubt that these researches help us deeply understand the reasons for "wellbeing stagnation", but they may not discern the nature of the question.

In fact, as an organization that manages social public affairs, the government formulates social rules and public policies which are the foundation of one country's economy. The ultimate goal of the government and its policies is to increase national welfare. Thus, the behaviors of the government may be an important precondition for increasing SWB (Samanni and Hol-mberg， 2010). Studying the external factors affecting SWB has guiding significance for perfecting policies (Altindag and Xu, 2017). Chen and Li (2012) find that government quality has far more enhancing effect on residents' wellbeing than economic growth. Sun and Xiao (2012) examine two types of social policies that are related to income distribution and social security, concluding that perceived fairness has an impact on life satisfaction. Gao and Zhai (2017) evaluate the urban Dibao by studying the SWB of the poor in China. Existing references have proved that the public policy and environmental pollution have great effects on SWB (Levinson, 2012; Zhang et al., 2017). Environmental regulations seem to play an irreplaceable role in the relationship between environmental pollution and SWB, so studying environmental governance would better reveal the reasons behind them. Few studies have paid attention to the impact of environmental regulations on people's daily lives. The satisfaction with the public service of the ecological environment will increase personal life satisfaction (Zhou et al., 2015). Wang et al. (2021) point out that demanding city to disclosure its air quality data, as a kind of environmental regulations, could significantly increase SWB. They only consider the impact of single policy, and the result is incomprehensive.

The pertinent literatures usually have regarded environmental quality as an intermediary variable, that is, ERs may affect SWB by improving environmental quality. Such study has paid more attention to the effect of policy implementation and failed to highlight the impact of the government's efforts on the public. As analyzed above, the value of environmental quality is affected by many factors and they are not comparable among various provinces. Therefore, we calculate the environmental pollution of each province and control it in the model, which better characterizes the value that the people place on the government's efforts in environmental governance. In addition, the related studies have not considered the heterogeneous contacts and the potential mechanism between ERs and SWB, and not used panel data that can better reveal the causal relationship between ERs and SWB.

Early literatures used single indicator to measure environmental regulation (Zhang et al., 2011), such as emission charges and pollution control investment expenditures. Some scholars also used composite indicator composed of major pollutants to measure environmental regulation (Shen et al., 2017). However, it fails to distinguish between different types of environmental regulations, whether single indicator or composite indicator (Bo et al., 2018). In recent years, more and more scholars have realized the heterogeneity of ERs. Existing literatures that research on the heterogeneity of ERs mostly divide it into command-control environmental regulation, voluntary environmental regulation and market-incentive environmental regulation (Chen and Monahan, 2010; Xie et al., 2017; Zhu et al., 2021). Market-incentive environmental regulation means that the government manages the environmental problem by regulating the market. However, we mainly discuss the relationship between the government's efforts in environment and personal subjective wellbeing, and regulating the market will affect firm performance, thereby impacting personal income level, so it is not adopted. We finally choose command-control environmental regulation (CER) and voluntary environmental regulation (VER) to measure the actions and the commitments of the government in environmental governance respectively. CER refers to the government's compulsory environmental governance actions. This study mainly refers to the government's investment actions in environmental governance which belongs to the public expenditure and reflects the government's positive governance. Reasonable government public expenditure can improve social welfare (Hu and Lu, 2012). VER is informal environmental

regulation, which refers to the public spontaneously participate in environmental supervision and governance. Political participation is one of the important means to improve wellbeing (Stiglitz et al., 2010).

The main contributions of this paper are as follows. Firstly, to the best of our knowledge, this research is the first one to focus on investigating the influence of government's efforts in environment on the public under the established achievements. Combining ERs with SWB and controlling environmental pollution, we test the importance of environmental governance from the perspective of people's wellbeing. Secondly, this paper distinguishes the heterogeneity of different environmental regulations, different human groups and different regions, which have important policy inspirations for environmental governance. Thirdly, this study not only examines the direct impact of ERs on SWB, but also the potential mechanism behind them. Finally, we enrich the study of the people's wellbeing. We take ERs as an example to explore the impact of the public policy on SWB, and more accurately reveal the relation between the government actions and local people's wellbeing.

3. Empirical design

3.1. Sample

The data used in this paper is from China Family Panel Studies (CFPS) which has been launched by the Chinese Social Science Survey Center of Peking University. The CFPS is a nationwide large-scale longitudinal social survey, and reflects the changes in the Chinese society, economy, population, education and health by tracking and collecting data of individuals, families, and communities. The CFPS started in 2010, and all family members in the baseline survey and their future children are defined as gene members who will be interviewed every two years as the permanently tracker. It provides a wealth of information at the individual level and household level, covering subjective perception, demographics and social activities, among others, so it is widely used in studying subjective wellbeing (Zhang and Churchill, 2020).

According to statistics of Baidu search engine, the search volume of "smog" in 2013 was 14 times that of 2012. At the same time, people's environmental awareness has also begun to awaken (Li et al., 2021). A similar situation prevails in CFPS. The CFPS asks respondents that how would

they rate the severity of the environmental problem in China, in the range of 1 (not severe) to 10 (extremely severe). The average value of this question in 2010 and 2012 at the provincial level are lower than other years. Moreover, only a few cities have released air pollution index (API) before 2013. Since all cities must disclose air pollution information in 2014, and people have begun to be aware of the seriousness of pollution (Wang et al., 2021). Environmental regulations would be paid more attention only if people award that they are confronted with environmental crisis. Therefore, we use the last three waves of the CFPS, balanced panel data from 2014, 2016 and 2018 with a total of 46161 observations.

3.2. Variables

3.2.1 Subjective wellbeing (SWB)

In the CFPS, each family member older than 16 will be answered such a question, "Are you satisfied with your life?", and they can choose the score from 1 to 5, where 1 represents very unsatisfied and 5 represents very satisfied. We employ this question to measure *SWB*. This question is usually employed to measure SWB in the previous studies (Appau et al., 2019; Zhang and Churchill, 2020). In the data that we have selected, the number of people who answered "very satisfied" is the largest, accounting for 32.20%, followed by "quite satisfied" with 31.11%, "normal" with 28.35%, and the least "less satisfied" and "very dissatisfied" are 5.68% and 2.66%, respectively.

3.2.2 Environmental regulations (ERs)

This study mainly explores whether SWB will increase through the government's efforts in environmental governance, and we divide ERs into command-control environmental regulation (CER) and voluntary environmental regulation (VER), representing actions and commitments respectively.

(1) Command-control environmental regulation (CER)

CER refers to the government's compulsory pollution control regulations (Tang et al., 2020). In this study, we mainly discuss the investment in environmental protection which represents the positive actions of governance. In the existing literature, CER has been measured in many ways, such as the number of pollution inspections at the industry level (Brunnermeier and Cohen, 2003), investment in the "three simultaneous" projects for environment (Li et al., 2019), and the ratio of

investment in treatment of industrial pollution sources to industrial added value (Zhang et al., 2011), etc. Based on data availability, we use the proportion of the investment in environmental governance to GDP as an indicator of CER (Yin et al. 2015). Alternatively, we follow Zhang et al. (2011) and construct another measure of CER, the proportion of investment in controlling industrial pollution to industrial added value (*CER1*), which is used for a robustness test.

(2) Voluntary environmental regulation (VER)

VER refers to the public voluntarily participate in environmental governance, which plays a role of supervision. As the practical actions, CER evaluates the government investment in environmental protection. Moreover, sometimes the government actively takes comments from the public and makes commitments for improvement, which also plays an important role in increasing popular support. Public participation reflects the public's awareness of environmental protection and social responsibility, and thus the public voluntarily assumes the responsibility of improving environmental quality (Carvalho et al., 2019). Public participation can alleviate the problem of information asymmetrical between the regulator and the regulated, which is a key problem of environmental policy. Thus, it can be regard as a kind of environmental regulation (Li et al., 2018), and can be distinguished as pre-incident and post-incident. One is before pollution problems occur, the public participates in the formulation of environmental policies, while the other is that the public complains to the government about the environmental pollution behaviors when the problem is occurring (Wu et al., 2020). The total number of environmental protection recommendations by local People's Congress and CPPCC per 10000 permanent residents (Zhong et al., 2021) and the total number of telephone and internet environmental complaints per 10000 permanent residents are employed to measure *VER* and *VER1*, respectively. And *VER1* is used in the robustness test.

3.2.3 Environmental pollution (EP)

The measurement of environmental pollution in existing references mainly uses a single pollutant emission, such as the SO_2 emission per unit of GDP (Tang et al., 2021), PM_{10} (Levinson, 2012), water pollution (Pan and Chen, 2021). The environmental matter is caused by multiple pollutants, so in order to ensure the accuracy of the analysis, we follow Ren et al. (2020) and construct an environmental pollution index (*EP*) which is calculated by using the waste water

emission per unit of industrial added value, the SO_2 emission per unit of industrial added value, and the soot (dust) emission per unit of industrial added value. The larger *EP*, the more serious the pollution problem, and *EP* also means the achievement of environmental governance. The detailed calculation is as follows:

Firstly, we use Eq. (1) to standardize the waste water emission per unit of industrial added value, the SO_2 emission per unit of industrial added value, and the soot (dust) emission per unit of industrial added value of each province.

$$P_{pj}^{*} = \frac{[P_{pj} - min(P_p)]}{[max(P_p) - min(P_p)]} \tag{1}$$

where P_{pj}^{*} and P_{pj} are the standardized value and the actual value of the p_{th} pollutant emission per unit of industrial added value in j_{th} province separately; and $max(P_p)$ and $min(P_p)$ represent the minimum and maximum value of the p_{th} pollutant across all provinces.

Secondly, we compute the weight of each pollutant in each province respectively, as shown in Eq. (2).

$$W_{pj} = \frac{P_{pj}}{\bar{P}_p} \tag{2}$$

where $\bar{P}_p$ is the average value of the p_{th} pollutant across all provinces.

Finally, *EP* of j_{th} province could be defined by:

$$EP_j = \frac{1}{3}\sum_{p=1}^{3} W_{pj} P_{pj}^{*} \tag{3}$$

3.2.4 Other control variables

Based on correlative references (Churchill et al., 2019; Zhang et al., 2021), other control variables we choose can be separated into three categories. The first category is individual-level variables, including *age*, *gender*, *objective health*, *marriage*, *education* and *hukou*. The second category is household-level variables, including household income per capita (*fincome*), household expense per capita (*fexpense*) and whether have children younger than 7 at home (*child*). The third category is province-level variables which reflect regional economy development, including per capita gross domestic product (*lnGDP*) and industrial structure (*second*).

The descriptive statistics of all variables are given in Table 1. Among them, the province-level variables are lagging one year. All macro data in this paper are from China Statistical Yearbook and the China Environmental Statistics Yearbook, and all micro data in this paper are from the CFPS.

Table 1 Descriptive statistics

Variable		Definition	Mean	SD
Subjective wellbeing (*SWB*)		Level of life satisfaction (very dissatisfied = 1, very satisfied = 5)	3.845	1.024
Command-control environmental regulation	*CER*	The proportion of the investment in environmental governance in GDP	1.249	0.569
	CER1	The proportion of investment in controlling industrial pollution in industrial added value	3.111	2.014
Voluntary environmental regulation	*VER*	The total number of environmental protection recommendations by local People's Congress and CPPCC per 10000 permanent residents	0.119	0.0378
	VER1	The total number of telephone and internet environmental complaints per 10000 permanent residents	7.478	7.201
Fiscal Freedom (*fifr*)		The proportion of central transfer payment in total local fiscal revenue	1.099	0.761
Environmental pollution (*EP*)		See in Eq. (1) - Eq. (3)	0.330	0.413
lnGDP		Per capita gross domestic product (ln)	10.75	0.413
Second		The value-added of secondary industry/GDP	0.443	0.0679
Hukou		Urban hukou=0, rural hukou =1	0.719	0.449
Gender		Male=1	0.507	0.500
Age		Age (in years)	50.18	13.91
Education		Illiteracy=1, primary school=2, middle school=3, high school=4, university=5, postgraduate=6	2.539	1.244
Marriage		Have a spouse=1	0.890	0.313
Child		Have children younger than 7 at home=1	0.314	0.464
Objective health		Have had any chronic disease=0, Have not had any chronic disease=1	0.810	0.392
Subjective health		A five-point scale (poor health=1, excellent health=5)	2.907	1.217
Govern		The evaluation of the government (worse than before=1, good achievement=5)	0.507	0.500

Income_level	Subjective personal income level (poorly income=1, high income=5)	2.658	1.040
Fexpense	Household income per capita (ln)	9.419	0.911
Fincome	Household expense per capita (ln)	9.385	1.089

3.3. Methodology

The fixed effect model is built for empirical analysis, which is shown in Eq. (4).

$$SWB_{ijt} = \beta_0 + \beta_1 ER_{njt} + \beta_2 X_{it} + \beta_3 Z_{jt} + \lambda_t + \mu_i + \varepsilon_{ijt} \quad (4)$$

where SWB_{ijt} is the subjective score of life satisfaction of the i_{th} respondent living in the j_{th} province in the t_{th} year; ER_{njt} denotes the n_{th} kind of ERs that are command-control environmental regulation and voluntary environmental regulation individually, and *CER* and *VER* are used in baseline regression, which would be replaced by *CER1* and *VER1* respectively in the following analysis for robustness. X_{it} represents a series of individual-level and household-level control variables, including *age*, *gender*, *objective health*, *marriage*, *education*, *hukou*, *fincome*, *fexpense* and *child*. By studying the relevant literature, this model also includes a set of province-level control variables (Z_{jt}) which consist of *lnGDP* and *second*. We also control the unobservable individual fixed effect (μ_i) and time fixed effect (λ_t). Considering that family members have many similarities in genetic genes, lifestyle, and living environment, their SWB may appear autocorrelation, so we use household-level clustering robust standard errors (Wang and Luo, 2020).

4. Benchmark analysis

4.1. Panel fixed effect results

We present the fixed effect results in Table 2. In Columns (1) and (2), we only introduce *CER* and *VER*, respectively. The coefficients of *CER* and *VER* are both significantly positive at the 10% level. In Columns (3) and (4), we add individual-level and household-level control variables. And the coefficients remain highly significant and positive. In Columns (5) and (6), we further control province-level variables. Compared with Columns (3) and (4), the coefficients of *CER* and *VER*

becomes larger, and they are also statistically significant at the 5% level, suggesting that people believe actions and commitments of the government under the established achievements (environmental pollution). Under the same conditions, the more industrious governance can improve the people's wellbeing. Such results show that ERs can improve SWB, whether government investment governance or public participation. After controlling a series of macro and micro variables, ERs still significantly enhance SWB, indicating that the government's efforts can be seen and recognized by the public.

In Columns (5), the coefficient of *CER* is 0.035, significant at the 5% level, which represents that 1% increase in the investment in environmental governance per GDP can raise a 0.035 unit in *SWB* on a 1-5 point scale. For government investment, the public can see the real actions of the government for improving environmental quality. The government is willing to spend the limited fiscal expenditures on the environment, indicating that it attaches great importance to the environmental problem. In addition to, this behavior will increase the public's evaluation of the government, thereby enhancing SWB. In Columns (6), the coefficient of *VER* is 0.507, significant at the 5% level, which implies that 1% increase in the total number of environmental protection recommendations by local People' Congress and CPPCC per 10000 permanent residents can raise a 0.507 unit in *SWB* on a 1-5 point scale. For public participation, the public can participate in policy formulation and make proposals. Although the government has not yet turn commitments into real actions, those behaviors reflect its determination to improve environmental quality. At the same time, the public's sense of participation will also increase their confidence in the improvement of environmental quality, thereby increasing the expectation for a better life in the future.

Besides, *objective health*, *marriage*, *fexpense* and *fincome* have significantly positive effects on *SWB*, which are consistent with some existing literatures (Jiang et al., 2012; Knight and Gunatilaka, 2010; Zhang and Churchill, 2020). Furthermore, urban *hukou* leads to higher SWB than rural hukou. Whether have children younger than 7 at home (*child*) can also influence SWB: children are more sensitive to environmental pollution, so the family members have higher demands for clean environment, and they worry about the health of their own children, thereby leading to lower SWB. However, GDP per capita (*lnGDP*) has a negative impact on SWB which

is consistent with the finding of Bartolini and Sarracino (2014), and their results prove "Easterlin Paradox": economic growth is not certain to higher wellbeing. The Relative Income Theory gives us a good explanation for this phenomenon. This theory believes that people are always accustomed to comparing with others, and the "bandwagon effect" makes their own SWB change in the opposite direction as the income level of others increases. Especially when a country's economy is developing rapidly, the increasing absolute income may be accompanied by a widening income gap. In addition, *gender*, *age*, *education* and *EP* do not have significant effect on SWB.

Table 2 Baseline results

Dependent Variable: *SWB*	(1)	(2)	(3)	(4)	(5)	(6)
CER	0.025*		0.025*		0.035**	
	(1.73)		(1.74)		(2.15)	
VER		0.394*		0.419*		0.507**
		(1.68)		(1.79)		(2.00)
Hukou			-0.095***	-0.094***	-0.094***	-0.094***
			(-2.59)	(-2.58)	(-2.59)	(-2.58)
Gender			-0.302	-0.304	-0.295	-0.299
			(-1.24)	(-1.25)	(-1.24)	(-1.26)
Age			-0.019	-0.019	-0.019	-0.019
			(-1.34)	(-1.33)	(-1.35)	(-1.34)
Objective health			0.040***	0.039***	0.040***	0.040***
			(2.64)	(2.64)	(2.66)	(2.65)
Education						
primary			0.024	0.024	0.024	0.024
			(0.49)	(0.49)	(0.49)	(0.49)
middle school			0.009	0.011	0.005	0.007
			(0.13)	(0.16)	(0.07)	(0.11)
high school			-0.063	-0.062	-0.067	-0.065
			(-0.72)	(-0.71)	(-0.76)	(-0.74)
university			-0.174*	-0.173*	-0.173*	-0.172*
			(-1.73)	(-1.72)	(-1.73)	(-1.72)
graduate			-0.158	-0.164	-0.156	-0.164
			(-0.56)	(-0.58)	(-0.56)	(-0.58)
Marriage			0.149***	0.151***	0.151***	0.152***
			(3.68)	(3.71)	(3.72)	(3.75)
Child			-0.043**	-0.044**	-0.042**	-0.043**
			(-2.51)	(-2.54)	(-2.43)	(-2.49)
Fexpense			0.016*	0.016*	0.016*	0.016*

			(1.87)	(1.88)	(1.88)	(1.89)
Fincome			0.018**	0.018**	0.019***	0.019***
			(2.56)	(2.56)	(2.68)	(2.66)
EP					-0.003	0.004
					(-0.09)	(0.09)
lnGDP					-0.351***	-0.347***
					(-4.21)	(-4.18)
Second					0.613	0.833**
					(1.51)	(2.01)
Constant	3.788***	3.781***	4.467***	4.450***	7.874***	7.715***
	(169.21)	(139.87)	(6.44)	(6.41)	(7.41)	(7.26)
Individual FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.064	0.064	0.066	0.066	0.066	0.066
Observations	46,161	46,161	46,161	46,161	46,161	46,161

Notes: *, **, and *** represent the significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

4.2. Robustness test

In order to strengthen the scientific rigor of this study, we conduct robustness tests in the following ways: Firstly, we replace the measurements of ERs and income for robustness test; Secondly, we use Order Logit and Order Probit models to replace the fixed effect model; Thirdly, we winsorize the continuous variables to control the influence of extreme values on the results; Lastly, considering the province-level missing variables, we add province fixed effect to the model.

4.2.1 Alternative measures

The environmental regulation has been done by different measures, and taking only one of these measures may cause deviation. Therefore, we verify the robustness of the results by alternative measures of *CER* and *VER*. We refer to Zhang et al. (2011) and Zheng and Shi (2017), and adopt the proportion of investment in controlling industrial pollution to industrial added value and the total number of telephone and internet environmental complaints per 10000 permanent residents to measure ERs and they are named *CER1* and *VER1* respectively. The results shown in Columns (1) and (2) of Table 3 suggest that our conclusions are robust, that is, after controlling the achievement of government governance, the government's governance actions and determinations can still increase SWB.

Moreover, the income level has a great influence on the living standard. In the benchmark regression of this study, household income per capita (*fincome*) is used to measure the income level. However, *fincome* ignores fixed assets and regional differences which can reflect the relative income level (Fairbrother, 2013). In CFPS, one question is asked: "How do you compare your income to local residents?" in the range of 1 (poorly income) to 5 (high income). We employ this question to measure subjective personal income level (*income_level*) that images relative income level. Therefore, we use *income_level* to do robustness analysis. The results are shown in the last two columns of Table 3, implying that subjective personal income level (*income_level*) can still significantly and positively affect SWB, which also proves the robustness of our results.

Table 3 Robustness to different measures of ERs and income

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	Alternative measures of ERs		Alternative measure of income	
CER			0.033**	
			(2.08)	
VER				0.522**
				(2.07)
CER1	0.010**			
	(2.55)			
VER1		0.003*		
		(1.94)		
Fincome	0.019***	0.019***		
	(2.66)	(2.64)		
Income_level			0.177***	0.177***
			(27.80)	(27.81)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.066	0.066	0.096	0.096
Observations	46,161	46,161	46,161	46,161

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

4.2.2 Different models

In the benchmark analysis, we treat *SWB* as a continuous variable. However, *SWB* can also be regarded as an ordered discrete variable. In the circumstances, Ordered Logit model and Ordered Probit model equally apply to this study (Wooldridge, 2010). Therefore, we construct an Ordered

Logit model and an Ordered Probit model to check on our results, as shown in Table 4. Columns (1) and (2) present the results of the Ordered Logit model, and Columns (3) and (4) present the results of the Ordered Probit model. The regression results of each model have little difference under large sample, indicating that whether *SWB* is regarded as a continuous variable or a discrete variable, CER and VER still have a positive effect on SWB.

Table 4 Robustness to different models

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	Ordered Logit	Ordered Logit	Ordered Probit	Ordered Probit
CER	0.070**		0.047***	
	(2.28)		(2.59)	
VER		1.037**		0.630**
		(2.27)		(2.28)
Control Variables	YES	YES	YES	YES
Province FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Pseudo R^2	0.026	0.026	0.026	0.026
Observations	46,161	46,161	46,161	46,161

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

4.2.3 Different specifications

First, in order to reduce the influence of extreme values on the research conclusions, we winsorize the main continuous variables by 5% to further proof the robustness of the previous conclusions. As shown in Columns (1) and (2) of Table 5, after the continuous variable is treated with winsorization on the 5% quantile, the results of the two kinds of environmental regulations are also consistent with the previous regression. CER and VER have a stable enhancing effect on SWB, which represent the benchmark is not a spurious regression affected by outliers. These results further display that the public not only values the achievements, but also would be moved by the government's actions and commitments.

Second, the baseline regression in this study only controls the time fixed effect and the individual fixed effect. Although most respondents did not change provinces, this possibility does exist. Therefore, if the province fixed effect is not added, the important province-level variables that do not change with time may be omitted, which will make the estimation results biased and

inconsistent (Shi and Li, 2020). In order to avoid this problem, we further add the province fixed effect, whilst preserving the time fixed effect and the individual fixed effect. The reexamination results are shown in the last two columns of Table 5, we can find that compared with the baseline regression, the coefficients of *CER* and *VER* are insignificant differences.

Table 5 Robustness to different specifications

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	Winsorization		Add province FE	
CER	0.035**		0.041**	
	(2.15)		(2.30)	
VER		0.509**		0.729**
		(2.01)		(2.17)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Province FE	NO	NO	YES	YES
R-squared	0.066	0.066	0.066	0.066
Observations	46,161	46,161	46,161	46,161

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

4.3. Dealing with endogeneity

This study controls individual fixed effect, time fixed effect, and a series of macro and micro variables in the baseline regression, and adds province fixed effect to the robustness test, which largely avoid the problem of missing variables. However, the factors that affect SWB at the provincial level are more complicated, and it is difficult to fully add them in the model, so there may be other omitted variables. This paper introduces two stage-least-squares (2SLS) to address endogenous problems. Referring to Wang et al. (2012), we use fiscal freedom (*fifr*) to construct instrument variable, and we also use the proportion of central transfer payment to total local fiscal revenue to measure it. The fiscal decentralization system under political promotion and economic incentive has stimulated keen competition among local governments. In order to attract investment, local governments try to relax the environmental regulations (Silva and Caplan, 1997), because the promotion of local officials is inextricably linked to the economic development. Therefore, the province with higher fiscal freedom will spend more fiscal expenditure on economic development instead of environmental governance. In other words, the higher fiscal freedom, the relaxer

environmental regulations, that is, the government that has higher fiscal freedom make the less effort in environment, which meets the correlation assumption. Moreover, we employ one-period lagged fiscal freedom. The current residents' SWB has no effect on the previous local fiscal revenue, which can satisfy the exogeneity assumption.

The IV results are reported in Table 6. Columns (1) and (3) show the results of first stage, and we find a negative relationship between fiscal freedom and *ERs*, which is consistent with our analysis. The *F*-statistics of first stage are both greater than 10, meaning that there are no weak instruments issues. Columns (2) and (4) show the results of second stage, after using instrumental variable, fiscal freedom, CER and VER both can improve SWB, and the coefficients are significant at the 10% level. The above results proved the robustness of our conclusions.

Table 6 IV results

	(1)	(2)	(3)	(4)
Dependent Variable:	*CER*	*SWB*	*VER*	*SWB*
CER		0.477*		
		(1.73)		
VER				2.090*
				(1.77)
fifr	-0.197***		-0.045***	
	(-8.37)		(-31.28)	
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
F-statistic of first stage	70.07		978.13	
R-squared	0.420	0.072	0.277	0.097
Observations	46,125	46,125	46,125	46,125

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

5. Further analysis of heterogeneous effects and channel

5.1. Heterogeneous effects

5.1.1 Heterogeneity tests based on individual characteristics

Considering that the subjective wellbeing has individual differences, we explore the differences between different groups based on individual characteristics. To some degree, hukou depends on a person's growing environment which has a great influence on subjective cognizance

in China. The strict hukou system has restricted the free movement of the workforce and has led to unequal treatment. A person with an urban hukou can enjoy more social resources, including social welfare, insurance system, and children's education. Those with a rural hukou come to a city only as migrant workers. At the same time, most measures for cleaning environment would reduce the employment opportunities of migrant workers, and the achievements are more beneficial for local residents living in the city. Table 7 shows that CER has a significant positive impact on SWB of the people with an urban hukou, while VER can effectively promote SWB of the people with a rural hukou. There are two reasons. First, CER reflects the actual governance actions. The government mainly controls urban environmental pollution. Compared with the people with a rural hukou, those with an urban hukou have more chances to see the governance processes that contribute to the increasing SWB of the people with an urban hukou. Second, VER reflects the government's commitments to environmental governance. Residents with urban hukou likely have better knowledge, and they generally place more weight on practical actions than on commitments. Besides, residents with rural hukou have less chances to see actual governance actions, so they are more likely to trust the commitments.

Table 7 Heterogeneity in ERs on SWB by hukou status

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Urban hukou*		*Rural hukou*	
CER	0.081***		0.017	
	(2.82)		(0.85)	
VER		-0.141		0.775***
		(-0.27)		(2.63)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.071	0.070	0.065	0.066
Observations	12,962	12,962	33,199	33,199

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

Since ancient times, the impact of education on subjective preferences has always been a common phenomenon in various fields. As the saying goes, knowledge changes destiny. The group with better education has more choices and can obtain more social resources. Similarly,

facing government treatment measures, people who have received more education have richer and deeper views. We define those who have never graduated from high school as a less educated group, and those who have graduated from high school as a more educated group. As shown in Table 8, VER has a positive effect on the SWB of the people with less educated, while CER can improve the SWB of the people with more educated. The existing literatures have also proved that the SWB of the people with different education levels is also different (Zhang et al., 2017). The people with more educated are more care about the achievements, and they prefer to see the government turn governance action from commitment into reality. The people with less educated seem to ignore the governance actions, and are more willing to believe in the government's ambitious plans.

In summary, vulnerable populations, including those with rural hukou, less educated, are more willing to believe the commitments of the government without consideration whether the commitments will turn out to be an empty one. Thus, VER significantly improve their subjective wellbeing, and CER has no significant effect on them. The people who with urban hukou or more educated are more sensitive to practical actions. They believe what they see. Therefore, compared with VER, CER can improve their subjective wellbeing more.

Table 8 Heterogeneity in ERs on SWB by educational levels

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Less educated (education≤3)*		*More educated (education>3)*	
CER	0.018		0.102***	
	(0.92)		(3.55)	
VER		0.674**		-0.106
		(2.27)		(-0.24)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.066	0.066	0.076	0.074
Observations	36,109	36,109	10,052	10,052

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

5.1.2 Heterogeneity tests based on family characteristics

According to Maslow's Hierarchy of Needs, as the economy rises, low-level needs have been

met, and the people begin to pursue high-level needs. ERs discussed in this study is a high-level need, so it is necessary to explore whether they have different influence on different economic level groups. Considering that family interests affect every family member, we define the people with higher household income per capita as a higher income level group, and others as a lower income level group. Table 9 reports that CER has a positive effect on the SWB of the higher income level group, while VER can prove the SWB of the lower income level group. The results indicate that environmental pollution makes a big difference to people's lives, especially among the low-income groups, because they do not have enough money to fight pollution. Therefore, all groups hope that the government can effectively control environmental issues. However, CER will offset the government's expenditure on other welfare policies. The people with bad economic foundations also hope that environmental issues can be alleviated, so they are willing to trust the government's commitment to environmental governance, that is, VER. Whereas they mainly pursuit basic needs, for them, the benefits of economic development have offset the damage caused by environmental pollution, so CER has not improved their quality of life. For the group with better economic foundations, their income level is higher than the average level, and the social resources they obtain are more abundant. Similarly, they can also get more benefits from environment improvement. Doing is better than saying, and they seem to worry that what the government says is better than what it does. So compared with VER, the group with better economic foundations are more trust CER.

Table 9 Heterogeneity in ERs on SWB by household income levels

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Lower income level (0-50%)*		*Higher income level (50%-100%)*	
CER	0.014		0.067***	
	(0.56)		(2.68)	
VER		1.091**		0.014
		(2.12)		(0.04)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.080	0.080	0.064	0.063
Observations	23,592	23,592	22,569	22,569

Notes: *, **, and *** represent significance at 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are t-values.

5.1.3 Heterogeneity tests based on regional characteristics

China is the third largest country in the world, and its territory spans many latitudes and longitudes. The customs and natural resources of various regions in China are different. There are many gaps in economic development and environmental quality between various regions, and the local government has policy implementation freedom to a certain degree. Thus, there are some differences between the concrete measures in the practice of ERs in various regions. Tables 10-12 present the impact of ERs on SWB by regional economic development, geographical location and regional greening rate cohort, respectively.

The results reported in Table 10 and Table 11 show that CER can only promote the SWB of the people living in economically developed areas or eastern region, while VER significantly enhance the SWB of the people living in economically undeveloped areas or western region. As we all know, the economy of the eastern region is superior to that of the western region. Therefore, the results of the two analyses prove with one another, suggesting the robustness of our conclusions. A likely explanation for this involves the fact that the governments of economically undeveloped areas and western region pay more attention to economic development. Although they have also made commitments to environmental governance, the strained finances can't afford to too much environmental expenditure. Therefore, they wish that they can work hard in environmental governance, but the spirit is willing, but the flesh is weak, resulting in CER not being able to effectively improve SWB. In economically developed areas and eastern region, there are sufficient funds to support environmental governance, so local residents are more willing to see actual actions (CER) rather than verbal promises (VER).

In general, the results show that CER will promote the SWB of the people with higher income level or living in economically developed areas or eastern region, while VER can enhance the SWB of the people with lower income level or living in economically undeveloped areas or western region. The people with higher income level or living in economically developed areas always believe what they see, not just what you say, so they recognize the government's real actions more than the commitments. It is widely perceived that improving environmental quality may be at the sacrifice of delaying economic growth, and it may harm the interests of the lowest classes, majority of them are low-income earners. The people with lower income level or living in

economically underdeveloped areas or western region pay more attention to their own income growth when caring about the environment. Therefore, CER that spends many fiscal expenditures could not increase their SWB, and they are more willing to trust in VER which embodies their wish for a better environment but may not influent their income. This conclusion is consistent with Tian and Yang (2006), which shows that the relation between SWB and income level is inverse "U" shape, and when income level exceeds the threshold level, non-income factors will play a great role.

Table 10 Heterogeneity in ERs on SWB by regional economic development

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Economically undeveloped areas*		*Economically developed areas*	
CER	0.003		0.168***	
	(0.13)		(2.72)	
VER		0.811**		-0.202
		(1.99)		(-0.57)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.062	0.062	0.060	0.060
Observations	29,492	29,492	16,669	16,669

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

Table 11 Heterogeneity in ERs on SWB by geographical location

Dependent Variable:	(1)	(2)	(3)	(4)	(5)	(6)
SWB	*Eastern region*		*Central region*		*Western regions*	
CER	0.337***		0.042		0.041	
	(5.79)		(1.38)		(0.95)	
VER		0.268		0.231		3.328***
		(0.82)		(0.14)		(5.48)
Control Variables	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-squared	0.079	0.076	0.053	0.053	0.069	0.071
Observations	19,698	19,698	11,154	11,154	15,309	15,309

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

Furthermore, urban afforestation shows how significantly the government considers the

environment to a certain extent. Compared with tall buildings, scenic amenity can improve wellbeing (Ambrey and Fleming, 2011; Du et al., 2021). Therefore, we divide all provinces into lower greening rate provinces and higher greening rate provinces according to the green space rate of built district. Table 12 illustrates that both CER and VER are positively link to SWB in higher greening rate provinces, but have no effect in lower greening rate provinces, verifying main conclusions of our study. This may be because the provinces with higher greening rate have paid more attention on the environmental issues, which embodies their determination to clean the environment. Their usual efforts have also increased the public trust, so that measures for protecting environment can effectively improve SWB. The provinces with lower greening rate have some shortages in greening, leading the public not to believe that the government can seriously solve environmental problems.

Table 12 Heterogeneity in ERs on SWB by regional greening rate

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Lower greening rate*		*Higher greening rate*	
CER	-0.008		0.118***	
	(-0.30)		(3.60)	
VER		0.850		0.917***
		(1.60)		(2.98)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.066	0.066	0.075	0.074
Observations	24,536	24,536	21,625	21,625

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

5.1.4 Heterogeneity tests based on interaction terms

As previously discussed, better health condition leads to higher SWB. We test the influences of ERs on each health condition group by interaction terms between health condition and ERs. Health condition is distinguished into subjective health and objective health. *Subjective health* is measured by a question in CFPS, “how would you rate your health status?” in the range of 1 (poor health) to 5 (excellent health), and *objective health* is constructed by a dummy variable, “during the past six months, have you had any doctor-diagnosed chronic disease?”, which 0 represents that

you have had any chronic disease and 1 represents that you have not had any chronic disease. Columns (1) and (3) in Table 13 show the results of two interaction terms between health conditions and *CER*, and both coefficients are statistically significant at the 10% level, indicating that better health conditions foster stronger relationship between CER and SWB. Moreover, Columns (2) and (4) in Table 13 show the results of two interaction terms between health status and *VER*, and both coefficients of two interaction terms are insignificant. Those findings suggest that CER has different influences on different health condition groups, while VER has no effect. The discovery points out the better health condition group is more sensitive to the effects of CER than the worse health condition group, which is consistent with the common sense. The group with poor health has higher requirements for environmental quality, and they accept the real achievements more than the lengthy governance process. However, the group with better health has lower demand for a cleaner environment, so they are more tolerant of environmental governance. But compared with promising ideas on paper, they are more willing to believe in real actions.

Table 13 Heterogeneity tests of interaction terms between ERs and health

Dependent Variable:	(1)	(2)	(3)	(4)
SWB	*Subjective Health*		*Objective Health*	
CER	0.027*		0.030*	
	(1.65)		(1.83)	
VER		0.516**		0.477*
		(2.04)		(1.87)
Subjective health	0.091***	0.091***		
	(15.71)	(15.77)		
ER × Subjective health	0.014*	-0.114		
	(1.68)	(-0.84)		
Objective health			0.037**	0.039**
			(2.48)	(2.57)
ER × Objective health			0.041*	0.538
			(1.67)	(1.43)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.075	0.075	0.066	0.066
Observations	45,186	45,186	45,186	45,186

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

5.2. Potential channel analysis

This section tries to test potential channel through which ERs influence SWB. We use the mediating effect model below:

$$SWB_{ijt} = \beta_0 + \beta_1 ER_{njt} + \beta_2 X_{it} + \beta_3 Z_{jt} + \lambda_t + \mu_i + \varepsilon_{ijt} \quad (4)$$

$$M_{ijt} = b_0 + b_1 ER_{njt} + b_2 X_{it} + b_3 Z_{jt} + \lambda_t + \mu_i + \varepsilon_{ijt} \quad (5)$$

$$SWB_{ijt} = c_0 + c_1 ER_{njt} + c_2 M_{ijt} + c_3 X_{it} + c_4 Z_{jt} + \lambda_t + \mu_i + \varepsilon_{ijt} \quad (6)$$

where M_{ijt} is the intermediary variable of the i_{th} respondent living in the j_{th} province in the t_{th} year. The first step Eq. (4) coincides with the baseline regression in this study, so this section only shows the regression results of Eq. (5) and Eq. (6).

Greater satisfaction with government public services can promote SWB (Zhou et al., 2015). Thus, we test whether ERs affect SWB through people's evaluation of the government (*Govern*). *Govern* is constructed by a question in CFPS, "how would you rate the performance of the county/district government last year?" on a scale of 1-5, where 1 represents worse than before and 5 represents good achievement. Columns (1) and (2) in Table 14 report that both the influence of *CER* on *Govern* and the effect of *Govern* on *SWB* are positively significant at the 1% level. The coefficient of *Govern* in Eq. (6) is significant, so Govern acts as a partial mediator between CER and SWB. And mediating effect accounts for 7.28% of the total effect. This indicates that the public has paid attention to the government investment in environmental governance. Such governance actions are generally accompanied by major projects which can be clearly observed by residents. Visible governance measures can better reflect the government's attention to environmental issues and the living environment, and thereby enhance the people's satisfaction with government work, which ultimately increasing SWB.

Columns (3) and (4) in Table 14 report that *VER* has no significant impact on *Govern*, while there is a positive relationship between *Govern* and *SWB*, meaning that Govern doesn't play a mediating effect part among the relationship of VER and SWB. VER in this study mainly represents the government's commitments, and many doubt whether the commitments can become true. In addition, the subjective evaluation is a long-term behavior, which could not be changed by

the current commitment. Therefore, VER cannot promote SWB by enhancing people's evaluation of the government.

Table 14 The channel analysis through people's evaluation of the government

	(1)	(2)	(3)	(4)
Dependent Variable:	*Govern*	*SWB*	*Govern*	*SWB*
CER	0.040**	0.028*		
	(2.56)	(1.70)		
VER			-0.018	0.412
			(-0.07)	(1.63)
Govern		0.055***		0.055***
		(7.88)		(7.91)
Control Variables	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
R-squared	0.007	0.070	0.007	0.070
Observations	44,992	44,992	44,992	44,992

Notes: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively; Robust standard errors are clustered at the household-level level; The numbers in parentheses are *t*-values.

6. Conclusions and implications

This study explores the underlying relationships between environmental regulations (ERs) and subjective wellbeing (SWB) using the fixed effects model, and separates ERs into command-control environmental regulation (CER) and voluntary environmental regulation (VER). We use balanced panel data of the CFPS from 2014, 2016 and 2018, and combine them with macro data of environmental regulation, environmental pollution and economic development.

Our benchmark analysis shows that, after controlling the environmental pollution, CER and VER that measure the actions and the commitments respectively, could enhance the SWB. A series of robustness tests suggest that results remain valid. This implies that in China, the people are not only focusing on accomplishments of environmental governance, but also value its process.

Our analyses of heterogeneous effects suggest that vulnerable populations, including those with rural hukou, less educated, have paid more attention to VER, whereas the view of other groups is the opposite. Similarly, the people, including those with low incomes or living in economically underdeveloped areas or western region, are sensitive to VER, suggesting that

environmental governance is a high-level need. For these groups, they are looking forward to a cleaner and better environment, but hope that the government will give development priority, because CER will need fiscal support while VER that could be just a series of oral promises may not need. For others, however, only CER can boost their SWB, because they are richer and pursuit a higher level of needs, indicating that with the development of economy in China, environmental governance will become increasingly important. The SWB of those with better health can be enhanced by CER, and the SWB of those with poor health are unaffected by CER and VER. The people with poor health prefer to a greener living environment, they concentrate on a clean and comfortable environment instead of the endeavor of government that they are unsure whether it will be successful or not.

Our channel analysis indicates that people's evaluation of the government performs the mediating function between CER and SWB, whereas it does not play an intermediary role between VER and SWB. The finding illustrates that, compared with the commitments, the actions of environmental governance can more change public attitudes towards the government.

Our analyses shed light on some important policy implications. Firstly, with the further growth in economy, citizens are more sensitive to public policies by comparison with economy (Altindag and Xu, 2017). In order to realize a better win-win situation for people's wellbeing and environment, the Chinese government should continue to strengthen environmental governance. Secondly, the government's efforts can be appreciated by the public. The government should further optimize policy tools and adopt efficient and sustainable governance measures rather than ones which are eager for instant results. Thirdly, the government should be fully aware of the heterogeneous impact of different types of environmental regulations on subjective wellbeing, and establish a more targeted policy mix. Fourthly, the government should understand the impact of environmental regulations on different groups, and pay more attention to the vulnerable, such as the less-educated or the poor or those living in economically underdeveloped areas. Finally, the local government need to adjust multiple environmental regulations based on own circumstances, and actively guide the public to involve in environmental governance. The government also should take more advices from the masses and strive to meet commitments, thus building public trust.

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