

# ***The Cost of Green Transition: Assessing the Impact of Environment Regulation Intensity on Economic Growth in Traditional Industrial Cites***

**Zhengkai Wang**

*University of California Santa Barbara, Santa Barbara, USA*

*wangzhengkai2024@outlook.om*

**Abstract.** Our sample comprises 31 provincial-level administrative areas in China, which cover the Eastern, Central, and Western regions as well as both developed and developing regions. This broad range of coverage allows our study to represent all of China and provides general conclusions about the link between China's environmental policy and economic growth. According to the regressing results, the environmental policy is actually good for economic growth, however, this effect mainly influences the SOE and urban areas. This study focuses on the economic effects or macro-level environmental benefits of environmental regulation, overlooking a fundamental question: what is the fate of the regions and the groups that bear the direct costs of transition for environmental protection efforts? This study aims to shift the perspective from macro analysis to the “shock” endured by micro-individuals.

**Keywords:** Environmental Regulation Intensity, Economic Growth, Employment, Social Stability, Income Distribution.

## **1. Introduction**

Economic development and employment are vital for both a country's stability and its people's daily lives: a growing economy expands industries, attracts investment, and creates more job openings—from factory roles to service positions—letting more people earn steady incomes to support their families, while stable employment in turn boosts consumer spending, drives up demand for goods and services, and encourages businesses to grow further, forming a mutual support cycle that keeps the society running smoothly and improves overall well-being.

Under the process of China's modernization, China that is a developing country faces the dual tasks of developing the economy and protecting the environment. With the acceleration of industrialization and urbanization, environmental problems in China have become increasingly prominent. The emission of major pollutants exceeds the environmental carrying capacity. The United Nations Conference on Environment and Development in 1992 regarded sustainable development as a common development strategy for the future, which was generally endorsed by governments of all countries. The Chinese government put forward ten countermeasures that China

should take for environment and development, clearly stating that taking the path of sustainable development is an inevitable choice for contemporary China and the future.

This study examines how environmental regulation intensity (measured by environmental protection investment) affects social stability in China's traditional industrial regions, using panel data from 31 provincial-level regions (sources include China Environmental Statistical Yearbook). Employing a fixed effects model with controls (GDP growth, industrial structure, urbanization), it focuses on urban/rural employment, wages, and wage gaps as stability indicators.

The paper is structured as follows: Section 2 reviews the literature. Section 3 outlines the data sources, key variables and the model. Section 4 presents empirical results, and Section 5 The analysis of the result. Section 6 suggestion. Section 7 conclusion.

## 2. Literature review

The main question that the Michael Greenstone and Rema Hanna want to solve whether environmental regulations in improving environmental quality negatively impact economic development and employment [1]. The contribution lies in providing causal evidence demonstrating that while environmental regulations improve health outcomes, they also create substantial economic adjustments. The research utilized enterprise-level data and environmental quality monitoring data from India spanning 1997-2008, collected from the Central Pollution Control Board of India and annual industrial enterprise surveys. By matching enterprise location data with environmental quality data, the study employed a difference-in-differences methodology to compare enterprise performance and environmental quality between regulated and non-regulated areas. The main independent variable (X) was environmental regulation intensity measured by strict implementation of pollution emission standards. The dependent variable (Y) was enterprise employment levels measured by number of employees. Control variables included enterprise age, scale, and industry characteristics. The result shows that environmental regulations allow 6% employees lose their job, at the same time air and water quality significantly improve and infant mortality decrease. The conclusion is that the decision maker must balance environmental benefits along with economic costs and need to consider compensation measures to mitigate negative impacts on affected enterprises and workers.

Walker focuses on how environmental policy can affect labor relocation across different regions and sectors [2]. The study solves the significant gap regarding friction costs and transition during labor reallocation processes, which moves beyond aggregate employment effects. Reed made important contributions by quantifying relocation cost cause by environmental regulations. Reed provides new perspectives for understanding the social impacts of environmental policies. The research use U.S. labor market data and enterprise emission data from 1990-2008, sourced from the Environmental Protection Agency (EPA) and the National Bureau of Labor Statistics. Through matching enterprise pollution emission records with employee employment track, the study tracked regulated enterprises and their employees' subsequent development using fixed effects models and event study methodology. The independent variable (X) is environmental regulation intensity measured by regulatory intensity of the Clean Air Act, while the dependent variable (Y) is labor reallocation costs measured by unemployment time, the loss of income, the loss of migration. Control variables included the number of labor force, skill characteristics, and regional economic conditions. The findings shows that workers affected by environmental regulations experienced long unemployment periods and high-income reduction. Environmental regulations caused considerable labor market relocation costs that are distributed across populations. And policy including better

reemployment support and skill training programs is necessary to be designed to mitigate negative social impacts.

Chen Zhenfeng focuses on two research questions: how environmental regulations can affect China's labor market and macroeconomic fluctuations, and how potential negative effects are reduced through policy design [3]. Its research methods involve constructing a Dynamic Stochastic General Equilibrium (DSGE) model that incorporates environmental pollution, environmental protection, and labor market frictions, while also accounting for the destructive impact of environmental pollution on production-and simulating the economic effects of environmental protection taxes by model parameter calibration and impulse response analysis. In this study, the environmental regulation variable (X) is the increase tax rate in environment protection, and the economic impact variables (Y) include labor market contraction (and macroeconomic fluctuations. The conclusion finds that a short-term increase in environmental protection tax rates may lead to a tight labor market and increase macroeconomic fluctuations; the study further proposes a key policy mix: if the government uses environmental protection tax revenues for enterprise employment subsidies, it will help alleviate the negative employment impacts and economic fluctuations caused by tax collection. Additionally, since environmental policies significantly alter the effectiveness of monetary policies (particularly their impact on unemployment), a policy combination that integrates an unemployment-targeted monetary policy mechanism with employment subsidies may achieve a win-win outcome for environmental protection, employment, and macroeconomic stability.

### 3. Methodology

#### 3.1. Data source and sample

The data source is from Chinese year book to make sure its reliability.

Research period:2010--2020. it avoids the special disruptions of the post-2020 pandemic period. Specifically, the environmental regulation data, which includes information on environmental investments and pollution control expenditures, is obtained from the China Environmental Statistical Yearbook; the social stability indicators, with unemployment rate data as a key component, are collected from the China Yearbook; and the economic and social control variables, covering GDP growth, industrial structure, and urbanization rate, are extracted from both the China Statistical Yearbook and provincial-level statistical yearbooks.

#### 3.2. Variables

This study incorporates budget, GDP (Gross Domestic Product), and population into the research framework as control variables; meanwhile, it defines Social Stability (Y)-the dependent variable-as measured by three indicators, namely the number of urban and rural employees, annual GDP growth rate, and the employees' wage levels in state-owned enterprises and non-state-owned enterprises, and takes Environmental Regulation Intensity (X)-the core independent variable-where regulatory stringency is specifically measured by environmental protection investment.

Table 1 shows the summary statistics for all variables.

Table 1. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
log of number of employees in urban	402	9.425	0.6565968	7.380661	11.22182
Log of wage	403	11.161	0.3910798	10.35144	12.34295
The log of wage from own-state business's employee	403	11.260	0.4265186	10.36385	12.48325
The log of wage from private business's employee	372	11.05762	0.36937	10.23753	12.24792
log of number of employees in rural	283	7.585571	0.873494	5.257495	8.863898
log of number of employees in urban	278	6.785448	0.987127	2.985828	8.625689

### 3.3. Model specification

To examine the effect of environmental regulation on social stability, I employ the following fixed effects model:

$$Y_{it} = \beta_1 ENV_{it} + \varepsilon_{it}$$

where  $Y$  denotes a vector of economic indicators including GDP, average wage employment; the environmental regulation of province  $i$ 's environmental budget in year  $t$ ;  $ENV$  is the Regulatory stringency/Policy implementation/Economic and Social Control Variables for province  $i$  in year  $t$ . The coefficient  $\beta_1$  captures the effect of environmental regulation on social stability and represents the key parameter of interest in this study, reflecting the impact of environmental regulation on social stability.  $\varepsilon_{it}$  is error term.

### 4. Results

Table 2 reports the estimates of equation (1). Column (1) shows that there is a significantly positive association between environmental budget and GDP. Column (1) without controlling fixed effects of region and year, shows that a 1% increase in environment budget is related to a 1% increase in GDP. In Column (2) we add fixed effects in our model. A 1% increase in environmental budget is related to a 0.2% increase in GDP.

Table 2. The effect of environment budget on GDP

Dependent variable: Log of GDP		
	(1)	(2)
log of environment budget	1.223*** (0.045)	0.215*** (0.027)
Constant	-1.678*** (0.422)	7.816*** (0.257)
Region	No	Yes
Year	No	Yes
N	402	402
R-sq	0.652	0.988

Notes: Estimates are obtained using OLS, with standard errors reported in parentheses. Significance levels: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ .

Table 3 shows that there is a significantly positive association between environmental budget and the wages of workers. We add fixed effects to our model. In Column (1), a 1% increase in environment budget is related to a 0.024% increase in average wage. In Column (2), a 1% increase in environment budget is related to a 0.039% increase in the employees' wage of state-owned business. In Column (3), a 1% increase in environment budget is related to a 0.007% increase in the employees' wage of other businesses. So, government funds have better increased the wages of state-owned employees, with little relationship with private enterprises.

Table 3. The effect of environmental budget on average wage

Dependent variable:	The log of wage	The log of wage from own-state business's employee	The log of wage from private business's employee
	(1)	(2)	(3)
log of environmental budge	0.024** (0.010)	0.039*** (0.014)	0.007 (0.012)
_cons	10.935*** (0.090)	10.890*** (0.132)	10.989*** (0.118)
Region	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	402	402	372
R-sq	0.991	0.983	0.984

Notes: Estimates are obtained using OLS, with standard errors reported in parentheses. Significance levels: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ .

Table 4 shows that here is a significantly positive association between environmental budget and the number of employees. We add fixed effects in our model. In Column(1), a 1% increase in environmental budget is related to a 0.1% increase in the number of employees in rural. In Column(2), a 1% increase in environmental budget is related to a 0.27% increase in the number of employees in urban.

Table 4. The effect of environmental budget on employment

Dependent variable:	log of number of employees in rural	log of number of employees in urban
	(1)	(2)
log of environmental budget	0.106* (0.061)	0.275*** (0.066)
Constant	6.583*** (0.572)	4.179*** (0.626)
Region	Yes	Yes
Year	Yes	Yes
N	282	277
R-sq	0.953	0.958

Notes: Estimates are obtained using OLS, with standard errors reported in parentheses. Significance levels: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ .

## 5. Discussion

As what we find previously, government invests more in the environment, GDP growth higher. This result verifies Keynes's theory in his classic work *The General Theory of Employment*: According to the national income identity  $Y=C+I+G$ , when government spending  $G$  increases, the gross domestic product  $Y$  will increase accordingly. It's benefit for whole society.

Focusing on public, from table2, we find that it true that the average wages increase, but government funds have better increased the wages of state-owned employees, with little relationship with private enterprise. Firstly, State-owned enterprises are usually closely linked to the government and are more likely to obtain government project and policy support. when t governments increase investment, enterprises within the system are often the priority one for undertaking projects. For example, large state-owned enterprise may undertaking project -- led by the government--like infrastructure construction, public serve. Zhang and Gao mention that state owned enterprises have innate advantage in receiving resources from government and policy preferences [4]. This advantage can allow them to enlarge their production scale, which means that they can provide more employment position and increase employees' wages.

Furthermore, private enterprises are at a relative disadvantage in obtaining government resources. On the one hand, with the lack of effective communication methods and experiences, it's hard for private enterprises to win in the competition projects which are caused by increasing investment from government. On the other hand, private enterprises have relatively small scale and are weak in risk-resistance ability. So, they are more sensitive to market competition and policy changed. Li, and Liu pointed out that private enterprises face great difficulties in financing [5]. When the increase in government spending leads to a rise in market capital demand, private enterprises may find it even more difficult to obtain sufficient credit support, thus limiting their ability to expand production and increase employment. Maksimovic verified that compared with large enterprises, small and medium - sized enterprises (including many private enterprises) face more obstacles in obtaining external financing, which restricts their expansion ability when government spending increases [6]. Bertrand found in "Politically connected firms" that political connections play an important role in enterprises' access to resources [7], and the relatively weak political connections of private enterprises put them at a disadvantage in the distribution of government spending.

From table 3, we can find that government funds have better increased the number of job position of state-owned employees, with little relationship with private enterprise. Urban areas have a more diversified and concentrated industrial structure, covering several fields such as industry and services. When government spending increases, it is easier to find suitable investment projects and industries for support. For example, high - end manufacturing and modern service industries in cities can better undertake government investment in scientific and technological innovation and industrial upgrading, thus creating more job opportunities. Duranton and Puga mentioned that the industrial gathering in cities forms a diversified industrial ecosystem [8], which can better utilize the externalities brought by government investment, thus creating more jobs. Gottlieb pointed out in "The wealth of cities: Agglomeration economies and spatial equilibrium in the United States" that the diversified industrial structure in cities makes them respond more positively to government spending [9] [10] and can more effectively convert government investment into employment growth.

**Population Agglomeration Effect:** Cities have a dense population and a large labor market, which can provide for enterprises with abundant human resources. When the government invests in and undertakes projects in cities, it can make more efficient use of local labor resources and achieve rapid employment growth. Unlike rural or other areas, cities have relatively concentrated population and industrial foundation. Therefore, they are more likely to grab the employment opportunities brought by the government's spending because population aggregation has some positive effects such as labor market sharing and knowledge spillover which are conducive to job creation.

## **6. Policy suggestion**

### **6.1. Policy support and fair resource allocation for private enterprises**

There should be special policies for private enterprises which ensure that when state-owned enterprises and private enterprises bid together for a project or when competing for government procurement, they have equal opportunity. For example, a few projects could be let out only for bid by private enterprises. Private enterprises could obtain approval from the government for governmental projects should also be made easier. Government should offer more funding, tax cuts and other resources to private companies. This will reduce their cost. Zhou Li'an said in his report that with an appropriate policy design by the government, the local government can give more attention to private enterprises [11] to make it a level playing field.

Improve the Financing Environment for Private Enterprises

Financial institutions should lend private firms more money which can lower costs/conditions. Government should incentive new products in finance like IP-backed loans and SCF. Financial system reform/new products are vital as banks can finance most if not all investments made by the firm with a ROE higher than cost of financing. Finance can help private firms get money they need. Financial system underdeveloped infrastructure affects private firms much more [12].

### **6.2. Narrow the regional employment gap**

Should spend more on rural infrastructure which makes it easier for businesses to invest in building factories and providing jobs. For example building rural roads and commerce service centers, Lin Yifu said that infrastructure is important in poor regions since it helps bridge regional inequality [13]. Spending on public infrastructure stimulates the economy. Aschauer pointed out that the impact of public infrastructure on output growth in developing countries is substantial [14].

The government should make urban industries move to rural and other areas. It can help different regions' industries work together by building industrial parks and starting special industries. The government can give benefits and money to industries that move. This will make them want to set up factories in rural areas and help local employment and the economy. Fan Jianyong said that moving industries is a good way to make different regions develop together and make jobs more evenly spread [15]. Krugman also said that moving industries can make regions develop better [16]. The government should make policies to help industries move to different regions in a good way.

### **6.3. Pay attention to social equity and people's livelihood**

The government should offer different employment training and vocational education programs. These programs should fit the jobs which offer for different regions and enterprises. Especially, it should train workers in private enterprises and rural areas. This will make them better at getting jobs and more able to compete. It can also make job opportunities become fair. Lai Desheng said that

improving workers' education and skills is important for getting better jobs and making people's incomes more similar [17]. Heckman said that the government spending on personal training, like vocational education, is very important for helping people get jobs and make society fair [18].

## 7. Conclusion

This study focus on China's dual goals of economic development and environmental protection, filling a literature gap by shifting environmental regulation research from macro environmental-economic benefits to micro impacts on social stability (employment, income distribution) in traditional industries. Using data from 31 Mainland China provinces from China Environmental Statistical Yearbook, China Statistical Yearbook, it takes environmental protection investment (for regulation intensity) as the core independent variable, the economic growth (urban/rural employment, wages, private wage gaps as dependent variables, and GDP growth, industrial structure, urbanization as controls. Through a fixed effects model finds that environmental regulation cause 1% more environmental budget, 0.2% GDP, 0.1% rural employment, 0.27% urban employment growth, but with uneven benefits (more wage gains for SOEs than private firms, more urban employment benefits).

## References

- [1] Greenstone, M., & Hanna, R. Environmental regulations, air and water pollution, and infant mortality in India [J]. *American Economic Review*, 2014, 104(10), 3038-3072.
- [2] Walker, W. R. The transitional costs of sectoral reallocation: Evidence from the clean air act and the workforce [J]. *The Quarterly journal of economics*, 2013, 128(4), 1787-1835.
- [3] Chen, Z. F. Environmental regulations, labor market and macroeconomic fluctuations [J]. *China Industrial Economics* 2025, 3, : 45-62.
- [4] Zhang, J., & Gao, Y. Analysis of government expenditure and economic growth in China based on panel data [J]. *Economic Research Journal*, 2007(8), 32-41.
- [5] Li, D. K., & Liu, L. L. Fiscal policy in China's stability [J]. *Journal of Financial Research*, 2009(5), 28-39
- [6] Beck, T., A., & Maksimovic, V. Financial and legal constraints to firm growth: Does firm size matter? [J]. *Journal of Finance*, 2005(60), 2599-2637.
- [7] Bertrand, M., Schoar, A., & Thesmar, D. Politically connected firms. [J]. *Quarterly Journal of Economics*, 2007(122), 1091-1126.
- [8] Duranton, G., & Puga, D. Micro-foundations of urban agglomeration economies [C]. In J. V. Henderson & J. F. Thisse (Eds.), *Handbook of Regional and Urban Economics*, Volume 4. Amsterdam: Elsevier, 2004: 2063-2117.
- [9] Reed, J. Labor market frictions and environmental regulation: The cost of transition [J]. *Journal of Labor Economics*, 2013, 31(2): 345-378.
- [10] Glaeser, E. L., & Gottlieb, J. D. The wealth of cities: Agglomeration economies and spatial equilibrium in the United States [J]. *Journal of Economic Literature*, 2009, 47(4): 983-1028.
- [11] Zhou, L. A. Research on the promotion tournament model of local officials in China [J]. *Economic Research Journal*, 2007, 7: 36-50.
- [12] Beck, T., Levine, R., & Loayza, N. V. Finance and the sources of growth [J]. *Journal of Financial Economics*, 2000, 58(1-2): 261-300.
- [13] Lin, Y. F. Development strategy, self - generating ability and economic convergence [J]. *China Economic Quarterly*, 2003, 2(2), 269 - 300.
- [14] Aschauer, D. A. Is public expenditure productive? [J]. *Journal of Monetary Economics*, 1989, 23(2): 177-200.
- [15] Fan, J. Y. The integration of the Yangtze River Delta, regional specialization and the spatial transfer of manufacturing industries [J]. *Management World*, 2004, 11: 77-84.
- [16] Krugman, P. Increasing returns and economic geography [J]. *Journal of Political Economy*, 1991, 99(3): 483-499.
- [17] Lai, D. S. *Education and Income Distribution* [M]. Beijing Normal University Press, 2001.
- [18] Heckman, J. J. (2000). Policies to foster human capital [j]. *Research in Economics*, 2000, 54(1): 3-36.