



Government Environmental Subsidies and Corporate Employment: Evidence from China

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Abstract. Globally, government environmental subsidies play a critical role in supporting corporate innovation and driving green transitions, yet their specific impact on corporate employment has not been thoroughly investigated. This paper empirically analyzes the dual effects of government environmental subsidies on corporate employment. On one hand, such subsidies can stimulate fixed asset investments, expand production capacity, ease financing constraints, and consequently create more job opportunities. On the other hand, subsidies may lead to short-term infrastructure upgrades and the installation of pollution control equipment, which fosters the growth of production and technical positions, as well as employment for individuals with undergraduate degrees or lower. This study contributes significantly to the literature on the relationship between government subsidies and employment, particularly in the context of global research on environmental regulations and corporate employment structures. Additionally, the findings offer valuable insights for policymakers worldwide, emphasizing the importance of balancing green economic promotion with employment security when designing subsidy policies to achieve sustainable development and inclusive employment growth.

Keywords: Government Environmental Subsidies, Corporate Employment, Fixed Asset Investment, Production Scale, Financing Constraints

1 Introduction

In recent years, government subsidies have emerged as a significant economic policy tool, profoundly influencing enterprises' production operations and employment behaviors. Extensive research indicates that government subsidies can effectively alleviate firms' financial constraints, thereby promoting technological innovation^[1], enhancing investment scales^[2], improving the credit quality of enterprises^[3], and facilitating wage growth for employees^[4]. However, compared to general economic subsidies, environmental subsidies have unique implications for corporate behaviors. For instance, Zhang et al. found through empirical research that green credit subsidies significantly enhance firms' capacity for ecological innovation, reduce operational costs, and drive rapid development in the environmental protection industry^[5]. The subsidies provided

by the government to support ecological innovation are positively correlated with green enterprises, revealing a potential spillover effect that indirectly promotes green employment ^[6]. Moreover, environmental subsidies can provide firms with ample financial support, enabling them to adopt more advanced environmental technologies ^[7]. However, some studies express reservations regarding the employment effects of environmental subsidies. While these subsidies can elevate firms' technological levels in the short term, the additional cost pressures they create may compel firms to reduce expenditures in other areas, particularly concerning labor costs ^[8]. To meet environmental requirements, firms often need to invest significantly in technological transformations or equipment upgrades; this shift in resource allocation may inhibit their expansion in other business areas, leading to staff reductions or fewer new job creations ^[9].

Given the inconsistencies in existing research on this issue, this study will employ empirical analysis to further explore the specific impacts of government environmental subsidies on corporate hiring, aiming to determine whether these subsidies have a positive promotional effect on hiring behavior or a negative suppressive effect. This study extends the existing literature by focusing on the impact of government subsidies, provides a theoretical expansion on the relationship between environmental regulation and corporate hiring behavior.

2 Hypotheses

As an economic stimulus measure, government subsidies can effectively promote economic growth and employment under specific circumstances. In this context, government environmental subsidies may enhance corporate hiring. Government environmental subsidies can provide direct financial assistance for corporate green transformation and environmental projects ^[10], effectively alleviating firms' financing constraints and reducing their financial pressures. Second, due to the high technical and financial requirements associated with environmental projects, some enterprises exhibit weak willingness to invest in environmental measures ^[11]. Moreover, government environmental subsidies also serve a "hidden guarantee" function. Firms that receive these subsidies are typically viewed as possessing market potential and social responsibility, attracting the attention of social capital and investors. This can further alleviate companies' financing difficulties, helping stabilize and increase labor hiring.

Hypothesis 1: Government environmental subsidies can enhance the overall employment levels of enterprises.

When enterprises face policy incentives, they may prioritize capital-intensive investments over labor, particularly in contexts with stringent environmental requirements ^[12]. In other words, environmental subsidies encourage firms to invest more in eco-friendly equipment, automated production lines, and technological innovations to meet environmental goals, thereby reducing their reliance on traditional labor ^[13]. Additionally, when examining the economic impact of environmental subsidy policies, some studies indicate that while these subsidies can positively drive corporate green transformation and reduce emissions, their effectiveness may fall short of expectations in highly competitive industries. Specifically, environmental subsidies may incentivize

firms to over-invest in green technology innovations, leading to economic returns that do not match these investments, thereby increasing operational costs and forcing firms to cut expenditures in other areas, thereby implementing cautious hiring practices to avoid burdensome labor costs in the future. Therefore, we propose the following hypothesis:

Hypothesis 2: Government environmental subsidies lead to a decrease in the overall employment level of enterprises.

3 Research Design

3.1 Model Specification and Variable Selection

This study aims to investigate the impact of government environmental subsidies on corporate employment and establishes the following basic regression model for analysis:

$$\ln employee_{i,t} = \alpha + \beta inGES_{i,t-1} + \lambda X_{i,t-1} + \varphi_i + \mu_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable $\ln employee_{i,t}$ represents corporate employment, measured by the number of employees in publicly listed company i in year t . To mitigate endogeneity issues as much as possible, this study uses lagged data for both the core explanatory variable and the control variables. Following previous studies^[14], the core explanatory variable, government environmental subsidies $inGES_{i,t-1}$, refers to government funding related to environmental protection. The natural logarithm of the number of environmental subsidies plus one is used as the variable for environmental policy subsidies. Control variables $X_{i,t-1}$ are shown in Table 1. This study controls for year fixed effects μ_t and individual fixed effects φ_i to eliminate the interference of time trends that do not vary with individuals. The random error term is represented by $\varepsilon_{i,t}$.

Table 1. Variable Definition Table.

Variable	Variable Name	Definition
inemploy	Corporate Employment	Logarithm of the Number of Employees in Listed Companies
inGES	Government Environmental Subsidy	Logarithm of Environmental Subsidy Amount plus 1
inwage	Wage Level	Logarithm of Employee Wage Level
size	Company Size	Natural Logarithm of Total Assets
Lev	Debt-to-Asset Ratio	Ratio of Total Liabilities to Total Assets
Cashflow	Cash Flow Ratio	Ratio of Net Cash Flow from Operating Activities to Total Assets
ROE	Return on Equity (ROE)	Ratio of Net Profit to Average Shareholder Equity
age	Company Age	Difference between Current Year and Year of Establishment

TobinQ	Growth Ability	Ratio of Market Value to Total Assets
Top1	Shareholding Ratio of the Largest Shareholder	Ratio of Number of Shares Held by the Largest Shareholder to Total Shares

3.2 Data Source

This study uses A-share listed companies from the Shanghai and Shenzhen stock exchanges in China as the research sample, with data sourced from the CSMAR database and the Wind database. The study period is set from 2008 to 2023. To reduce the interference of outlier samples, the following treatments were applied to the raw data, referencing existing research methods: (1) data from the financial industry was excluded; (2) companies with statuses of “ST,” “*ST,” “suspended listing,” “termination of listing,” and “delisting arrangement period” were excluded; (3) missing key variables removed; (5) the top and bottom 1% of key continuous variables were trimmed. After data adjustments, a total of 38,058 sample observations were obtained.

4 Empirical Results and Analysis

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the main variables in this study.

Table 2. Descriptive Statistics.

Variable	Observations	Mean	Std. Dev.	Median	Min	Max
inemploy	38058	7.689	1.248	7.606	4.007	11.284
inGES	38058	3.510	5.963	0.000	0.000	17.714
inwage	38058	11.625	0.609	11.619	6.388	17.899
size	38058	22.154	1.329	21.946	17.641	28.636
Lev	38058	0.412	0.204	0.404	0.007	1.056
Cashflow	38058	0.049	0.075	0.048	-0.744	0.839
ROE	38058	0.075	0.142	0.079	-4.857	2.379
age	38058	10.536	7.688	9.000	1.000	33.000
TobinQ	38058	2.033	1.865	1.588	0.625	122.189
Top1	38058	0.347	0.151	0.326	0.003	0.900

4.2 Regression Results

Table 3 reports the regression analysis results between government environmental subsidies and corporate employment. The coefficient of inGES is significantly positive at the 1% level, indicating that a 1% increase in government environmental subsidies leads to a 0.002% expansion in corporate employment. Calculations based on the

observed mean values suggest that every additional ¥1.7 million in government environmental subsidies results in about 12 new employees. This may be because environmental subsidies encourage companies to make long-term investments, such as increasing fixed assets and expanding production capacity, which in turn promotes employment.

Table 3. Regression Results.

	(1)	(2)	(3)	(4)
	inemploy	inemploy	inemploy	inemploy
inGES	0.036*** (15.813)	0.036*** (15.590)	0.034*** (15.707)	0.002*** (4.960)
wage				-0.450*** (-74.736)
size				0.631*** (131.328)
Lev				0.107*** (5.520)
Cashflow				0.268*** (8.864)
ROE				0.094*** (6.030)
age				0.003*** (3.861)
TobinQ				0.023*** (16.541)
Top1				0.101*** (3.276)
_cons	7.563*** (346.751)	7.533*** (196.216)	7.461*** (41.186)	-1.244*** (-10.907)
Year Fixed Effects	No	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes
Observations	38058	38058	38058	38058
R ²	0.029	0.033	0.088	0.491

Note: Values in parentheses are robust standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Unless otherwise specified, the same applies to the following tables.

4.3 Robustness Check

To verify the robustness of the baseline regression results, this paper conducts tests from multiple perspectives, including addressing endogeneity issues, excluding the impact of the pandemic, and other robustness checks.

Instrumental Variable Method. Endogeneity is a key step in empirical research, typically caused by omitted variable bias and bidirectional causal relationships. Therefore, this study employs the two-stage least squares method to address the endogeneity problem, using corporate environmental information disclosure (EID) and lagged two-period government environmental subsidies (L. inGES) as instrumental variables for government environmental subsidies. Table 4 reports the 2SLS regression results. the regression coefficients of the instrumental variables EID and L. inGES are significantly positive at the 1% level. The Kleibergen-Paap Wald rk F statistic values were 238.82 and 92.67, both greater than the critical value of 16.38 for the 10% bias in the Stock-Yogo weak ID test, rejecting the null hypothesis of “the instrumental variables are weakly identified” at a high level.

Table 4. Instrumental Variable Regression Results.

Variables	(1)	(2)	(3)	(4)
	First Stage Regression inGES	Second Stage Regression inemploy	First Stage Regression inGES	Second Stage Regression inemploy
IV: EID	0.581*** (0.035)			
GES (EID)		0.090*** (0.009)		
L. inGES			0.540*** (0.005)	
GES (L. in- GES)				0.003*** (0.001)
Control Vari- ables	Yes	Yes	Yes	Yes
Year Fixed Ef- fects	Yes	Yes	Yes	Yes
Firm Fixed Ef- fects	Yes	Yes	Yes	Yes
Observations	38058	38058	32532	32532

Other Robustness Checks. *Variable Replacement.* A dummy variable for government environmental subsidies (GES_dum, where a company receiving subsidies is coded as 1 and otherwise as 0) and the incremental amount of government environmental subsidies $\Delta GES(lnGES_{t-1} - lnGES_{t-2})$ were used to measure the explanatory variable of government environmental subsidies. *Excluding the Impact of the COVID-19 Pandemic.* Referring to the study by Huang et al.^[15], the COVID-19 pandemic has had adverse effects on employment in Chinese enterprises. To eliminate the impact of the exogenous shock from the COVID-19 pandemic on the employment model in this

study, data after 2022 was removed, and regression was conducted using data from 2008 to 2020. *Controlling for industry and region.* Although the bidirectional fixed effects model controls for individual and year fixed effects, it does not simultaneously account for industry and region-specific factors that change over time, which may overlook certain unobservable factors. The results of Table 5 show that government environmental subsidies significantly positively affect enterprise employment scale at the 1% level.

Table 5. Other Robustness Tests.

	(1)	(2)	(3)	(4)	(5)	(6)
	inemploy	inemploy	inemploy	inemploy	inemploy	inemploy
GES_dum	0.030*** (4.134)					
ΔGES		0.001* (1.733)				
inGES			0.001** (2.314)	0.0015*** (3.7570)	0.0016*** (4.1181)	0.0015*** (3.7570)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Industry Fixed Effects	No	No	No	Yes	No	Yes
Year-Region Fixed Effects	No	No	No	No	Yes	Yes
Observations	22423	18647	22423	38058	38058	38058
R ²	0.453	0.394	0.453	0.507	0.493	0.507

5 Mechanism Test

5.1 Fixed Asset Investment

We believe that environmental subsidy policies, as a form of proactive intervention, can increase enterprises' cash flow, providing funding support for production and operation, thus driving companies to expand production and enhance employment levels. This study measures fixed asset investment using "the proportion of newly added fixed assets to total assets this year (NA)," calculated as "(newly added fixed assets this year / total assets at year-end) * 100."

5.2 Production Scale Expansion

Government environmental subsidies can directly provide financial support to enterprises, enhancing their capacity to expand production. This paper uses the logarithm of operating revenue as an indicator to measure the production scale of enterprises.

5.3 Relief of Financing Constraints

Sun argue that government environmental subsidies can alleviate financing constraints by filling funding gaps, thereby enhancing corporate performance^[16]. To examine the impact of government environmental subsidies on financing constraints, this study employs the KZ index method developed by Kaplan and Zingales (1997) to measure corporate financing constraints.

Table 6 report the regression results, showing that the coefficient of inGES remains significantly positive at the 1% level.

Table 6. Mechanism Test of Financing Constraint Relief.

	Fixed Asset Investment		Production Scale Ex- pansion		Financing Constraint Re- lief	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
	L_NA	inemploy	L_lnyysr	inemploy	L_KZ	inemploy
inGES	0.028*** (4.302)	0.001*** (2.773)	0.007*** (5.143)	0.002*** (4.336)	-0.007*** (-4.741)	0.001*** (3.781)
L_NA		0.003*** (6.908)				
L_lnyysr				0.012*** (6.800)		
L_KZ						-0.007*** (-4.721)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Ef- fects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Ef- fects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26989	26989	31828	31828	38058	38058
R ²	0.206	0.418	0.076	0.471	0.178	0.508

6 Further Research

6.1 Heterogeneity Test at the Regional Level

China’s vast territory exhibits significant regional differences in economic development, society, and culture, all of which may lead to pronounced regional heterogeneity in how government environmental subsidies affect enterprise employment. Table 7 show that government environmental subsidies significantly promote the employment levels of enterprises in the eastern region.

Table 7. Regional Heterogeneity Test.

	(1)	(2)
	Eastern Enterprises	Central and Western Enterprises
inGES	0.003*** (2.399)	-0.000 (-0.102)
Control Variables	Yes	Yes
Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Observations	27102	10769
R ²	0.728	0.724

6.2 Industry-Level Heterogeneity Test

Enterprise Factor Intensity. Compared to capital-intensive enterprises, labor-intensive enterprises rely more on labor rather than equipment and technology, and their employees face a higher risk of unemployment^[17]. Table 8 indicate that government environmental subsidies have a positive effect on the employment levels of labor-intensive enterprises.

Table 8. Heterogeneity Test of Enterprise Factors.

	(1)	(2)
	Labor-Intensive	Resource-Intensive
inGES	0.005*** (2.476)	0.000 (0.309)
Control Variables	Yes	Yes
Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Observations	13063	24599
R ²	0.712	0.748

Industry of the Enterprise. Zhao found that while China is the world's most comprehensive and largest manufacturing country, it still faces issues such as inadequate coordination in the manufacturing sector and high pollution levels amidst rapid expansion^[18]. The regression results are shown in Table 9. The regression coefficient for manufacturing enterprises is significant at the 1% level, while it is not significant for service sector enterprises. This indicates that government environmental subsidy policies significantly expand employment scale in the manufacturing sector.

Table 9. Heterogeneity Test of Enterprises by Industry.

	(1)	(2)
	Manufacturing Enterprises	Service Enterprises
inGES	0.001*** (3.447)	0.001 (1.643)
Control Variables	Yes	Yes
Year Fixed Effects	Yes	Yes
Firm Fixed Effects	Yes	Yes
Observations	25095	12963
R ²	0.438	0.391

6.3 The Impact on Employment Structure

Previous discussions have mainly focused on the impact of government environmental subsidies on the overall scale and changes in employment but have not yet addressed the aspect of employment quality. To analyze changes in the skill structure of enterprise employment more thoroughly, this study classifies employees from two perspectives: educational background and job type. Table 10 show that the estimated coefficients for low-skill and medium-skill employees (high school and below, and undergraduate and junior college) are significantly positive.

Table 10. Government Environmental Subsidies and Employee Educational Structure.

	(1)	(2)	(3)
	Postgraduate and Above	Undergraduate	High School and Below
inGES	-0.155 (-1.202)	0.183*** (2.639)	0.288*** (3.361)
Control Variables	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Observations	38058	38058	38058
R ²	0.284	0.264	0.203

Next, this study categorizes employees based on their job roles into production, sales, technical, comprehensive management, and other categories. The results presented in Table 11 show that in columns (1), (3), and (4), environmental subsidies significantly enhance employment levels in production and comprehensive management positions.

Table 11. Government Environmental Subsidies and Employee Job Structure.

	(1) Production	(2) Sales	(3) Technical	(4) General Manage- ment	(5) Others
inGES	0.248*** (5.350)	-0.031 (-0.849)	0.083*** (2.600)	0.081*** (3.190)	-0.022 (-0.695)
Control Variables	Yes	Yes	Yes	Yes	Yes
Year Fixed Ef- fects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Ef- fects	Yes	Yes	Yes	Yes	Yes
Observations	38058	38058	38058	38058	38058
R ²	0.636	0.642	0.759	0.834	0.114

7 Conclusion

The research indicates that government environmental subsidies significantly increase the number of employees in enterprises. Mechanism testing reveals that investments in fixed assets by enterprises, leading to expanded production scales and alleviated financing constraints, are the main pathways through which government environmental subsidies influence corporate employment. Heterogeneity analysis further demonstrates that the employment enhancement effects of government environmental subsidies are more pronounced in eastern regions, labor-intensive enterprises, and manufacturing industries. Finally, this paper also explores the dynamic changes in employment structures due to environmental subsidies, finding that these subsidies significantly enhance employment for low- and medium-skilled labor and personnel in production, technical, and managerial positions, thus improving labor force employment levels and labor structure, and alleviating structural unemployment issues. However, as environmental subsidies impact corporate employment in various ways, the model in this paper has limitations and requires further exploration from other perspectives.

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