ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

A Study on the Impact of Environmental Regulation on Employment--Empirical perspective based on heterogeneity and mediating effects model

Shuwen Zheng

Business School, East China University of Political Science and Law, Shanghai, China, 201620

Abstract: *Based on the new development pattern, taking the path of high-quality development requires an integrated arrangement of environmental protection and employment. This paper constructs OLS, FEM, systematic GMM, and mediating effect models based on panel data of 31 provinces and cities in China from 2012-2019 to analyze in detail the impact of environmental regulation on employment and its mechanism of action. The innovations of this paper are: examining the employment effects of environmental regulations based on the regional heterogeneity between the north and the south; examining the employment effects of environmental regulations on tourism-rich provinces and relatively less tourism-rich provinces; examining the employment effects of environmental regulations from the perspective of employment heterogeneity; and including consumer confidence in the indicator layer of mediating variables together with technological progress and FDI to examine their mediating effects on employment.*

Keywords: *environmental regulation, employment, consumer confidence, heterogeneity, intermediation effect*

1. Introduction

In recent years, more and more scholars have put forward different views on the impact of environmental regulations on employment. From the perspective of mechanism, Bartik (2017) [1] and Dechezlepretre (2017) [2] proposed that the production cost increased by environmental regulation would lead to the reduction of consumer demand through price transfer, thus inhibiting employment, while Raff and Earnhart (2019) [3] believed that such as federal prosecution and fines Such environmental regulations will inhibit employment because law enforcement officials are "pro-social"; Hafstead and Williams (2018) [4] put forward from the results that environmental regulation only redistributes jobs and has little impact on employment. Two years later, they confirmed this conclusion again through general equilibrium analysis [5]. Moffa (2021) [6] found that regional GHG initiatives had no significant impact on employment growth by using data from ten northeastern states of the United States.

Domestic research started late, but developed rapidly. Early scholars paid attention to the nonlinear relationship between environmental regulation and employment [7], [8]. In recent years, the heterogeneity and mediating effect of environmental regulation on employment have been paid more and more attention. At present, scholars have deeply explored the different effects of environmental regulation on employment from the perspectives of East, West and East heterogeneity [4], income heterogeneity [9], urban resource heterogeneity [10], and environmental protection law heterogeneity [11]. As for intermediary effect, both the literature by building to industrial structure, technological progress, the mediation effect of FDI as intermediary index model [12], the introduction of environmental regulation and the variables in the model is proposed according to the interaction of the item [9] and aggregation levels associated with r&d as intermediary variable model [13] further analyzing environmental regulation affect the path of employment.

To sum up, after sorting out the relevant literature, it can be found that there is no very consistent conclusion on the "impact of environmental regulation on employment". With the deepening of research, the focus of attention has begun to shift from the direct effects [8] of reducing the scale effect and increasing the substitution effect of employment to the mediating effect [11]. In addition, the research method has changed from a single control variable [8] and cross-term test [10] to a mediating effect model [13], which provides us with abundant information to deeply understand the impact and

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

mechanism of environmental regulation on employment. However, the relevant literature on explaining the employment effect of environmental regulation through mediating variables appeared relatively late, and the social situation is changing rapidly, so the existing literature inevitably has some unfinished business[14].

In view of the gaps in the existing literature, the possible marginal innovations of this paper are as follows :(1) under the background of the coordinated development of the east, the middle and the west, the gap tends to converge, and the north-south difference becomes a new focus, the employment effect of environmental regulation is investigated based on the regional heterogeneity of the north and the south; (2) Under the background of the continuous emergence of "people's growing needs for a better life" and tourism becoming a new economic growth point, the employment effects of environmental regulations on provinces with abundant tourism resources and provinces with relatively less tourism resources are investigated; (3) Under the background of "high-quality employment", employment is divided into high education employment and low education employment, and the employment effect of environmental regulation is investigated from the perspective of employment heterogeneity. (4) Based on the increasingly important role of consumer confidence in the uncertain environment, consumer confidence, technological progress and FDI are included in the index level of mediating variables, and their mediating effect on employment is investigated.

2. Mechanisms and research hypotheses of environmental regulations affecting employment

(1) In addition to directly increasing firms' production costs to discourage employment and accentuating labor price advantages to promote employment, environmental regulations also indirectly affect employment through three mediating variables: technological progress, FDI, and consumer confidence. This paper proposes Hypothesis 1: Environmental regulation directly promotes employment.

(2) Environmental regulation tightens financial constraints and environmental regulation increases environmental uncertainty. This paper proposes Hypothesis 2: Environmental regulation promotes employment by inhibiting technological progress.

(3) Environmental regulations weaken the comparative advantage of the country and provide alternative markets in other countries under environmental regulations. This paper proposes hypothesis 3: Environmental regulation promotes employment by weakening FDI.

(4) According to Keynes' "animal spirits" theory, psychological expectations or consumer confidence affects people's decision-making behavior and thus macroeconomics, with implications for employment [15]. This paper proposes Hypothesis 4: Environmental regulation promotes employment by increasing consumer confidence.

3. Model construction and variable definition

Using employment size as the explanatory variable, a benchmark regression model of the effect of environmental regulation on employment is constructed:

$$L_{it} = cons + a_0 regu_{it} + a_1 gdp_{it} + a_2 cap_{it} + a_3 wage_{it} + a_4 fiscal_{it} + \varepsilon_{0it} \quad (1)$$

Taking technological progress as an example, a mediating effects model is constructed:

$$L_{it} = cons + b_0 regu_{it} + b_1\, gdp_{it} + b_2 cap_{it} + b_3 wage_{it} + b_4 fiscal_{it} + \varepsilon_{1it} \quad (2)$$

$$s_{it} = cons + c_0 regu_{it} + c_1 gdp_{it} + c_2 cap_{it} + c_3 wage_{it} + c_4 fiscal_{it} + \varepsilon_{2it} \quad (3)$$

$$L_{it} = cons + +d_0 regu_{it} + d_1 gdp_{it} + d_2 cap_{it} + d_3 wage + d_4 fiscal + d_{5_{sit}} + \varepsilon_{3it} \quad (4)$$

where I refer to each province and city, t represents the year, and ε0, ε1, ε2, and ε3 are random disturbance terms. lit is the employment size of the region I in year t, reguit is the strength of environmental regulation in the region I in year t, sit corresponds to the level of progress in the region I in year t, and gdpit, capital, wages, and fiscal are the level of demand, the level of capital stock, the level of wages, and the level of fiscal spending in the region I in year t, respectively. capital stock, wage level, and fiscal expenditure in year t.

Explanatory variables: The explanatory variable is employment size (Lit), and the logarithm of the

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

percentage of the employed population in each province to the total population of the country is used to reflect the employment size, to exclude the influence of the scale effect on the results caused by factors such as geographical size and population in each province and city.

Core explanatory variables: In this paper, environmental regulation (regu) is chosen as the core explanatory variable, based on the availability of data, and to avoid endogeneity, the proportion of environmental terms in the total number of words in the government work reports of each region in each year is used as the measure.

Mediating variables: (1) technological progress (s), measured by the logarithm of the number of patent applications per capita in each province and city, the more patent applications per capita, the faster the technological progress; (2) FDI (FDI), measured by the logarithm of foreign direct investment per capita in each province and city; (3) consumer confidence (cf), measured by the logarithm of the number of domestic performance audiences of arts performance groups.

Control variables: (1) aggregate demand status (gdp) (2) capital stock (3) fiscal spending (fiscal) (4) wages (wage).

4. Results and Discussion

4.1 Baseline regression results and analysis

Table 1: Regression results of the effect of environmental regulation on employment

	(1) OLS	(2) OLS	(3) FEM	(4) sys GMM
regu	0.024** (2.54)	0.070 (1.54)	0.013*** (3.90)	0.011** (2.14)
regu2		-0.003 (-1.03)		
gdp	0.324** (4.1)	0.316*** (3.97)	0.510* (1.95)	0.389 (1.53)
wage	0.655*** (4.85)	0.621*** (4.46)	0.824* (2.90)	-0.333 (-0.69)
cap	-0.138* (-1.74)	-0.121 (-1.5)	-0.182 (-0.88)	-0.258 (-1.39)
fiscal	-0.798 (-1.03)	-0.064 (-0.82)	-0.026 (-0.15)	0.143 (0.91)
cons	-4.447*** (-3.76)	-4.327*** (-3.65)	-6.444 (-1.78)	-192.611** (-2.43)
L.1				0.705*** (3.44)
AR(1)				0.084
AR(2)				0.822
Sargan test				0.905
Hansen test				0.940

A benchmark regression model of the effect of environmental regulation on employment is constructed, and the regression results are shown in Table 2. The regression coefficient of environmental regulation is positive at the 5% significance level, and environmental regulation significantly promotes employment, which verifies the hypothesis of this paper.1 This indicates that at this stage, China can promote both environmental protection and employment, capturing the "double dividend" and the "dual paradox "does not occur in China. Looking at the control variables, the coefficients of demand level and wage level are both positive at the 1% significance level, indicating that the higher the demand level, the more consumption, and the more employment can be accommodated as consumption drives the development of related industries through the multiplier effect; the higher the wage level, the more labor is attracted and the larger the employment scale, which also indicates that the substitution effect brought by higher wages exceeds the income effect at this stage in China.

To exclude the possible non-linear relationship between the variables and ensure the rigor of the constructed model, the squared term of environmental regulation is introduced in this paper, and the regression results are shown in column (2) of Table 2. The results show that the regression result of the

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

squared term of environmental regulation is negative but not significant. The possible explanation is that the positive effect of environmental regulation on employment is more prominent, and with the strengthening of environmental regulation, firms will choose to replace pollution factors with labor factors to survive in the fierce market competition and further consolidate their market power, thus expanding production scale and promoting employment [15].

4.2 Robustness analysis

To ensure the reliability of the results obtained from the benchmark regression model, this paper, on the one hand, uses the relevant data to replace the model to carry out robustness analysis, and on the other hand, considers the possible endogeneity of the model and establishes a system GMM model, and the regression results are shown in columns (3) and (4) of Table 1.

(1) Change the model. From the regression results in column (3) of Table 1, we can see that after constructing the fixed-effects model, environmental regulation promotes employment at the 1% significance level, and the direction and significance of the control variables on employment are consistent with the results obtained from the baseline regression model, which indicates that the conclusions of this paper are robust and reliable.

(2) Considering endogeneity. Considering the possible lagged effect of environmental regulation on employment and the endogeneity problem caused by the possible autocorrelation of employment itself, this paper constructs a systematic GMM model, and the results are shown in column (4) of Table 2. AR (2) is greater than 0.1, and there is no autocorrelation problem; Sargan and Hansen are both greater than 0.1, which means that all instrumental variables are exogenous and the instrumental variables are selected effectively; this indicates that the results estimated by the systematic GMM model are valid.

4.3 Heterogeneity Analysis

Table 2: Regression results based on heterogeneity

		Regional Heterogeneity		Feature Heterogeneity		Employment heterogeneity	
		South L	North L	Provinces with rich tourism resources L	Non-tourism-rich provinces L	Highly Educated Employment KL	Low Education Employment LL
regu		0.033*** (4.04)	-0.029** (2.2)	0.035*** (2.94)	0.023* (1.92)	0.024** (2.12)	0.039*** (3.99)
Whether to control	GDP	YES	YES	YES	YES	YES	YES
	wage	YES	YES	YES	YES	YES	YES
	cap	YES	YES	YES	YES	YES	YES
	fiscal	YES	YES	YES	YES	YES	YES
	cons	YES	YES	YES	YES	YES	YES

To explore the possible regional heterogeneity of environmental regulations on employment, this paper refers to established studies [16] and divides the 31 provinces into southern and northern provinces, and performs regressions separately. The regression results are shown in Table 2.

The regression results show that environmental regulation significantly promotes employment in southern provinces and significantly suppresses employment in northern provinces, and the employment effect of environmental regulation shows significant regional heterogeneity. Possible explanations for this are the difficulties in the transition of old and new dynamics and the outflow of human capital in the northern provinces compared to the southern provinces [16]. The traditional heavy industries in the northern provinces account for a large share of the economy, and the huge pollution caused by heavy industries makes the relevant enterprises under environmental regulations bear huge additional costs, which exert pressure on their production.

The regression results in Table 2 show that environmental regulations significantly promote employment in tourism-rich and tourism-less provinces, and the promotion effect is stronger for tourism-rich provinces than for tourism-less provinces. For tourism-rich provinces, the environment is more closely linked to economic development. After the implementation of environmental regulations, the

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

environmental quality is improved, the tourism industry develops rapidly and attracts more tourists, the driving effect of the tourism industry is highlighted, and the surrounding industries such as food, accommodation, culture and transportation, supporting industries and ancillary industries then prosper, and the industrial multiplier effect is released, thus providing more jobs.

Environmental regulation significantly promotes employment for all educational groups, but more so for low educational groups. The regression results are not consistent with the usual conjecture, and the possible explanation is that environmental regulations inhibit technological progress to some extent due to macro-environmental changes, severe international situations, and foreign technological blockade, when the competitive advantage and occupational barriers of the highly educated group are not as prominent, but their wages are higher compared to those of the low-educated group. Under the premise that environmental regulations add extra burden to enterprises, enterprises do not consider the positive externalities that high-education employment groups can bring in the long run, and prefer low-education groups with relatively low costs, thus adjusting the structure of hired labor to offset part of the employment-promoting effect on high-education groups, and finally, the net employment-promoting benefit for low-education groups is greater than that for high-education employment groups.

4.4 Intermediary effect analysis

Table 3: Regression results with technological progress and FDI as mediating variables

Technological progress as a mediating variable				FDI as a mediating variable		
Explanatory variables	Explained variable L	Explained variable s	Explained variable L	Explained variable L	Explained variable s	Explained variable L
reg	0.024** (2.54)	-0.383** (-2.3)	0.022** (2.23)	0.024** (2.54)	-0.098** (-2.24)	0.020** (2.14)
s/fdi			-0.0076** (-2.07)			-0.0403*** (-2.9)
GDP	0.324*** (4.1)	13.596*** (9.9)	0.427*** (4.59)	0.324*** (4.1)	2.606*** (7.24)	0.429*** (5.00)
wage	0.655*** (4.85)	17.457*** (7.43)	0.788*** (5.3)	0.655*** (4.85)	-0.113 (-0.18)	0.651*** (4.89)
cap	-0.138* (-1.74)	-7.032*** (-5.1)	-0.191** (-2.31)	-0.138* (-1.74)	-1.025*** (-2.83)	-0.179** (-2.25)
fiscal	-0.080 (-1.03)	-2.052 (-1.53)	-0.095 (-1.24)	-0.080 (-1.03)	-0.188 (-0.53)	-0.087 (-1.15)
cons	-4.447*** (-3.76)	-176.981*** (-8.62)	-5.792*** (-4.32)	-4.447*** (-3.76)	-3.533*** (0.66)	-4.304*** (-4.7)

Table 4: Regression results with consumer confidence as a mediating variable

Explained variable L	Explained variable s	Explained variable cf	Explained variable s
reg	0.024** (2.54)	0.051** (2.2)	0.019** (2.03)
cf			0.104*** (4.01)
GDP	0.324*** (4.1)	0.599*** (3.16)	0.262*** (3.34)
wage	0.655*** (4.85)	2.647*** (8.18)	0.379** (2.56)
cap	-0.138* (-1.74)	-0.847*** (-4.46)	-0.049 (-0.62)
fiscal	-0.080 (-1.03)	-2.457*** (-13.25)	0.177* (1.79)
cons	-4.447*** (-3.76)	-9.136*** (-3.23)	-3.493*** (-2.98)

Combining the regression results in Table 3 with the above analysis, we can conclude that (1) environmental regulations significantly promote employment; (2) environmental regulations inhibit technological progress; and (3) environmental regulations promote employment by inhibiting

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

technological progress; hypothesis 2 of this paper is confirmed.

Using the same approach, the mediating effect of FDI is confirmed in this paper. As shown in Table 3, the regression coefficients of FDI are significant; and the signs of each regression coefficient are consistent with the requirements of the mediating effect model, so environmental regulation affects employment through the mediating variable of FDI. The empirical results show that: (1) environmental regulation has a significant driving effect on employment; (2) environmental regulation suppresses FDI; (3) environmental regulation drives employment by suppressing FDI; verifying hypothesis 3 of this paper. On the other hand, as more and more emerging markets become more sophisticated and foreign investors have more choices, profit-driven foreign investors reduce their investment in China and shift industries. Table 4 is regression results with consumer confidence as a mediating variable.

The regression results of the intermediate effect model show that (1) environmental regulation has a significant contribution to employment; (2) environmental regulation boosts consumer confidence; (3) environmental regulation promotes employment by boosting consumer confidence; verifying the hypothesis of this paper.3 After the implementation of environmental regulation, consumers expect the future environmental quality to improve, and consumers' confidence in their future personal living standards as well as the country's economic development increases. On the one hand, they improve their mood and increase outdoor activities, which directly increase consumption while driving the development of related industries and promoting employment; on the other hand, they reduce their worries about medical expenses and are more courageous to consume, further promoting employment.

5. Conclusion

Environmental protection and full employment are two important sources of people's sense of well-being, security, and access. This paper constructs the OLS model, FEM model, systematic GMM model, and mediating effect model based on panel data of 31 provinces and cities in China from 2012-2019 to analyze in detail the impact of environmental regulation on employment and its mechanism of action, and the main conclusions are as follows: (1) At this stage, China can achieve the coordinated development of environmental protection and employment, and the "duality paradox "(2) environmental regulations significantly promote employment by suppressing technological progress, weakening FDI, and boosting consumer confidence; (3) there is regional, characteristic, and educational heterogeneity in the effects of environmental regulations on employment, promoting employment in the south and suppressing employment in the north, and promoting employment in tourism-rich provinces and low-education employment groups more than tourism-rich relatively less rich provinces and higher-education employment groups.

References

[1] Bartik T J. The social value of job loss and its effect on the costs of US environmental regulations [J]. Review of Environmental Economics and Policy, 2015, 9(2): 179-197.
[2] Dechezleprêtre A, Sato M. The impacts of environmental regulations on competitiveness [J]. Review of Environmental Economics and Policy, 2017, 11(2): 183-206.
[3] Raff Z, Earnhart D. The effects of Clean Water Act enforcement on environmental employment [J]. Resource and Energy Economics, 2019, 57: 1-17.
[4] Hafstead M A C, Williams III R C, Chen Y. Environmental policy, full-employment models, and employment: A critical analysis[R]. National Bureau of Economic Research, 2018.
[5] Hafstead M A C, Williams III R C. Jobs and environmental regulation [J]. Environmental and Energy Policy and the Economy, 2020, 1(1): 192-240.
[6] Moffa, Kelly-Anne, "Environmental Policy and Employment: The Effect of the Regional Greenhouse Gas Initiative on the Labor Market" (2021). Honors Scholar Theses. 817.
[7] Li, Mengjie, Du, Weijian. Does the double dividend of environmental regulation and employment apply to China at this stage? -- An empirical analysis based on inter-provincial panel data. Economic Science, 2014(4):14-26.
[8] Wang Meixiao. A study on the impact of environmental regulations on employment--an empirical test based on panel data of prefecture-level cities. Contemporary Economics, 2017(35):122-123.
[9] Song D.Y.,Bi D.J.. The impact of environmental regulation on urban employment in China. Urban Issues, 2020(10):29-38.
[10] Chen P, Luo Y. Environmental regulation, economic structure and employment in resource-based cities-a comparative analysis based on resource-based cities and non-resource-based cities. Journal of

ISSN 2616-5902 Vol. 4, Issue 17: 47-53, DOI: 10.25236/AJBM.2022.041707

Chongqing University: Social Science Edition, 2021, 27(3):191-202.
[11] Song Liying, Cui Fan. How environmental regulation affects employment - A reality check based on provincial data in China. Journal of Xiangtan University: Philosophy and Social Science Edition, 2021, 45(1):87-92.
[12] Yan WJ, Guo Shulong. How environmental regulation affects employment in China-an empirical study based on a mediating effects model. Finance and Economics Series, 2016(10):105-112.
[13] Wang Zhuyan, Pan Chao. Can environmental regulation lead to employment growth? --A test based on inter-provincial panel data. Jiangsu Agricultural Science, 2021, 49(9):237-242.
[14] Chen, Yuanyuan. An empirical study on the impact of industry environmental regulation on employment1: An empirical analysis based on 25 industrial industries. Contemporary Economic Science, 2011(3):67-73.
[15] Keynes J M. The general theory of employment, interest, and money [M]. Springer, 2018.
[16] Xu Xianchun,Lei Zekun,Dou Yuanyuan,Liu Shichang. Research on Gap of Balanced Development between North and South of China ——Analysis Based on "China Balanced Development Index" [J].China Industrial Economics, 2021(2):5-22.