

Environmental Tax Reform, Risk-taking and Green Development of Enterprises

Pingping Gan^{1,a,*}, Jingyi Sun^{1,b}

¹*School of Economics and Finance, Xi'an Jiaotong University City College, Xi'an, Shaanxi, 710018, China*

^a2331437382@qq.com, ^b1317686388@qq.com

*Corresponding author

Keywords: Environmental Tax Reform, Risk-taking, Green Development of Enterprises, Sustainable Development

Abstract: As the society continuous develops, the current ecological problems have gradually been paid attention to. Nowadays, resources are not used rationally, and environmental pollution is becoming more and more serious, which cannot be changed through the market. Green development (GD) is a brand-new concept, which takes into account the dual concepts of development and environmental protection, and it can achieve the purpose of sustainable development (SD). At this time, environmental tax, as an important means of regulation, has also been reformed. Through this policy, the pollutant discharge of enterprises is reduced, and production methods are continuously adjusted, thereby the GD of enterprises is promoted. However, in the process of business transformation, the decision-making of managers would also bring more risks to the enterprise. Therefore, this paper analyzed the GD of enterprises and the risk-taking brought by them in the context of environmental tax reform. Through the fuzzy comprehensive evaluation method, the enterprise's risk-taking and GD were studied and analysed. The results showed that under the reform of environmental tax, the enterprise's required risk-taking to achieve GD was 7.75%.

1. Introduction

As the environmental protection (EP) laws and the citizens' awareness improve, enterprises would perform more EP roles. The transition to GD would inevitably have a certain impact on risk-taking, and the quality of corporate environmental management would become one of the important factors affecting its competitiveness and GD. Therefore, this paper analyzed the impact of environmental tax reform on the GD of enterprises through the tax policy theory of environmental tax, combined with the factors of enterprise GD and risk-taking. And it was accorded to the impact on the enterprise to reduce the risk that the enterprise takes as much as possible, so as to promote the GD of the enterprise and realize the SD of the enterprise and the environment.

With the continuous deterioration of the environment, various industries have joined the road of SD, so as to improve the environment and achieve the common SD of the environment and enterprises. Based on green patent data, Chen Z provided preliminary evidence on the impact of

carbon emissions trading scheme pilot policies on green innovation (GI). The results showed that the pilot policy had obvious lag effect in inhibiting the GI of enterprises, and the inhibition effect was more obvious in small-scale enterprises [1]. Based on the self-organization theory, Xu Y clarified the self-organization evolution logic of the green and low-carbon development of coal enterprises. Xu Y analyzed the relationship between GD through the statistical model constructed [2]. Li G aimed to analyze the main internal and external factors that affect researchers' GI behavior, and provided evidence for the mechanism of how internal and external driving factors drive researchers to form GI behavior [3]. By analyzing the existing management problems in the GD of enterprises, Zhou Y had studied the specific strategies required for the GD of enterprises, thereby promoting the GD of enterprises [4]. Through the dynamic incomplete information game theory and its equilibrium analysis, Ma X put forward policy suggestions on how the government should determine the incentive policy in the case of incomplete information [5]. Lha B measured the risk-taking level of enterprises by constructing a GD evaluation standard, and focused on the development strategy of enterprises from the perspective of risk [6]. Bolatbek B put forward targeted suggestions for the low-carbon development of the circulation industry from the two aspects of circulation enterprises and the government in view of the problems existing in the development of the circulation industry [7]. These studies have all described the importance of GD of enterprises.

At present, environmental issues have attracted social attention, and various industries have formulated relevant policies to protect the development of the environment. Boehringer C found that environmental tax reform can effectively protect the environment and promote its GD by evaluating the impact of green tax reform and quantitative evidence based on coupled micro-simulation and computable equilibrium analysis [8]. Da A established a general equilibrium model of the externality of pollution consumption according to the impact of environmental tax reform on distribution and efficiency of green taxation according to different labor tax rates. The results showed that increasing the progressiveness of pollution consumption would affect the unemployment rate and would affect the trade-off relationship between equity and efficiency [9]. Andreoni V studied the contribution of economic factors separately from those provided by tax rates and regulations by using an exponential decomposition technique [10]. To sum up, there have been many studies on EP tax, but few companies have linked environmental tax with risk-taking and the GD of enterprises.

The GD of enterprises can bring positive and positive influence to enterprises. Under the constraints of environmental tax, enterprises actively fulfill their social responsibilities, which can not only reduce risk-taking and improve the reputation of the enterprise, but also promote the long-term development of the enterprise and achieve greater economic benefits. In short, enterprises should uphold the concept of GD, improve their competitiveness and comprehensive strength, so as to reduce risk-taking and win social recognition. Therefore, under the background of environmental tax reform, this paper analyzed the GD of enterprises to continuously improve the risk-taking ability of enterprises, and realize the GD of enterprises and the long-term development of society.

2. Connotation and Influencing Factors of GD of Enterprises

2.1. Connotation of GD of Enterprises

The GD of enterprises includes three aspects: green production, green products and green culture. The GD of an enterprise needs to change the traditional production and operation mode and actively introduce technical green knowledge talents to help the internal production and innovation of the enterprise. Enterprises need to create green and pollution-free products through their own technology to achieve energy-saving and recyclable standards, and promote the GD of the

environment and enterprises [11].

2.2. Factors Influencing the GD of Enterprises

Cost, talent, technology and risk taking are all important factors that affect the GD of enterprises. The cost of GD of enterprises is an important factor to consider in managers' decision-making. Environmental tax reform also affects managers' decision-making systems, as well as enterprises' risk-taking ability. Enterprises can also help enterprises achieve GD by introducing talents and improving their production methods [12].

3. Relationship between Environmental Tax and GD of Enterprises

3.1. Impact of Environmental Tax on Business Costs

The collection of environmental tax is an important measure used to correct the random emission of pollutants by enterprises. With the tax paid by enterprises, it also increases the cost of enterprises. When enterprises transform to GD enterprises, they would also add many new types of equipment. These equipments are mainly used to purify pollution and carry out production testing of enterprises, thereby promoting the GD of enterprises. Due to the reduction and exemption policy of environmental tax, the cost of pollutant discharge for enterprises would also be greatly reduced, which also indirectly affects the decision-making of GD of enterprises [13].

3.2. Impact of EP Tax on the Pollutant Discharge of Enterprises

With the reform of EP tax, enterprises must pay the illegal taxes in a timely manner. If it exceeds the time limit, the enterprise would face more fines and risks. At the same time, the relevant departments can also directly close the illegal enterprises. Companies that fail to pay on time can be punished in accordance with relevant regulations, and companies that evade can also be detained. This also increases the deterrent effect on enterprises, and affects the pollution discharge situation of enterprises to a certain extent. This policy promotes GD by encouraging companies to pay taxes on time and actively conserve resources.

3.3. Impact of EP Tax on the Introduction of Enterprise Talents

Environmental tax is a tax under the policy. Enterprises must pay relevant fees when they cause environmental pollution in the production process, which also increases the risk-taking of enterprises. Therefore, enterprises can improve their production methods by introducing technical talents. This method can help enterprises to achieve green production and green management, and develop some green products that are popular with consumers. It can also reduce the pollution caused by the production process, thereby promoting the process of green transformation of enterprises.

3.4. Impact of EP Tax on Technological Innovation

There are also more and more benefits on tax policy. For innovative enterprises, preferential policies would be increased to encourage enterprises to innovate and reform. Under the circumstance of environmental tax reform, enterprises are no longer willing to discharge pollutants at will, and have begun to introduce some pollutant discharge technologies and purification methods. There are also some companies that have begun to phase out heavily polluting products and carry out technological innovation. By changing the original state of the product, making it a green and

pollution-free product, thereby reducing taxes and corporate risk-taking. Therefore, under the environment of environmental tax reform, enterprises have to change their own production mode and transform into GD without pollution.

4. Relationship Design among Environmental Tax, Risk-taking and Corporate GD

4.1. Relationship between Environmental Tax and GD of Enterprises

The active payment of environmental tax by enterprises refers to a kind of social interactive innovation, and it is also a way for enterprises to repay the society, which promotes enterprises to be contractual and productive. Enterprises actively paying taxes can not only reduce the risk-taking of the enterprise, but also bring a good reputation to the enterprise. It can also promote the optimization of the internal organization of the enterprise and promote the GD of the enterprise. However, under the premise of environmental taxation, while the innovation cost of enterprises increases, the conflict of decision-making among managers is alleviated, and the level of risk-taking of enterprises is also improved. It is also conducive to the improvement of the environment and promotes the common GD of enterprises and the environment. Environmental taxation has a positive effect on the GD of enterprises, as shown in Figure 1.

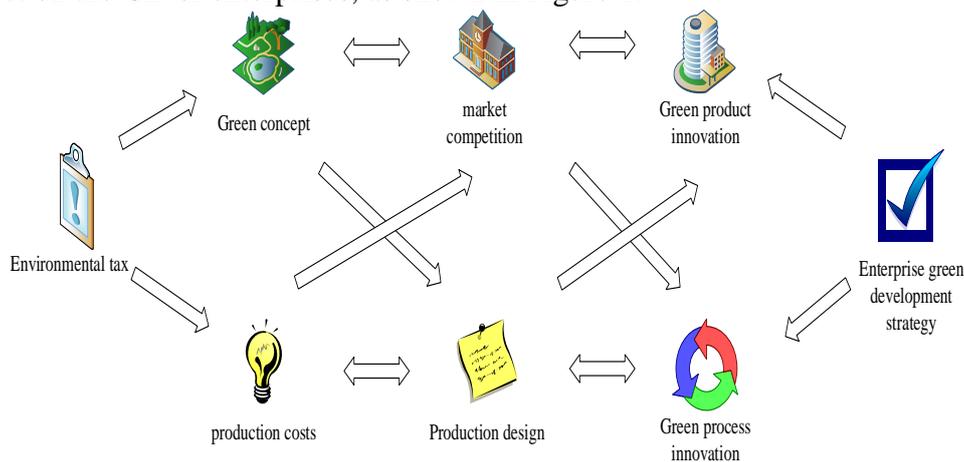


Figure 1: Relationship between environmental taxation and GD of enterprises

4.2. Relationship between Environmental Taxation, Risk-taking and the GD of Enterprises

Under the condition of the same level of risk taking, environmental taxation has a positive impact on the GD of enterprises. Companies that actively pay taxes tend to take risks and actively look for opportunities to innovate in GD. This can bring benefits to enterprises and promote the long-term GD of enterprises. However, if the enterprise refuses to pay tax, the volatility shock caused by the tax policy would cause the unstable development environment of the enterprise. This would make employees less motivated, and enterprises would lose their own competitive advantages, which may seriously affect the GD of enterprises. Environmental tax reform and the GD of enterprises promote each other, and environmental tax can also regulate the relationship between GD of enterprises and risk-taking, as shown in Figure 2.

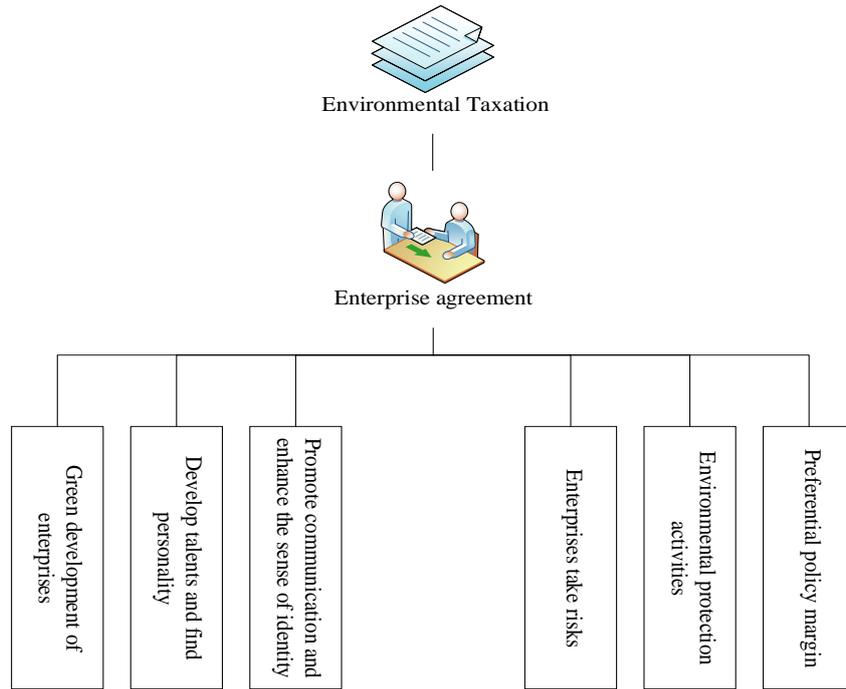


Figure 2: Relationship among environmental tax, risk bearing and GD of enterprises

5. Application of Fuzzy Comprehensive Evaluation Method to Risk-taking in the Relationship between Environmental Taxation and Enterprise GD

To understand the impact of environmental taxation on the GD of enterprises, this paper adopted the fuzzy comprehensive evaluation method to analyze. Fuzzy comprehensive evaluation method is a general evaluation method using data statistics, which converts qualitative evaluation into quantitative evaluation through theory. When adopting this method, this study needs to introduce fuzzy numbers, classification functions, and comprehensive risk assessment respectively.

It is supposed the evaluation function is $f(x)$, P is the fuzzy value of the function, and $f(x)$ is defined on h . If there are $\alpha_i \in [0,1]$, $i = 1,2,\dots,n$, and there is:

$$f(x) = \alpha_i, x = x_i (i = 1,2,\dots,n) \quad (1)$$

$$f(x) = 0, x \in [\alpha_1, \alpha_2, \dots, \alpha_n], x \in P \quad (2)$$

When $i = j$, if there is $\alpha_i = \alpha_j$ and $\sum_{i=1}^m \alpha_i = \alpha \in 1$, then $f(x)$ is a fuzzy function, and the reliability value of $f(x)$ is α_i . It is assumed that α, β are two real numbers, and $\alpha \leq \beta$, then the median $\frac{1}{2}(\alpha + \beta)$ is the center of $[\alpha, \beta]$, which is recorded as:

$$\text{sim}[\alpha, \beta] = \frac{(\alpha + \beta)}{2} \quad (3)$$

The fuzzy value is represented by the expected form as:

$$\partial f(x) = \alpha, x = \frac{1}{\alpha} \left(\text{sim} \sum_{i=1}^m \alpha_i, \beta_i \right) \quad (4)$$

$$\partial f(x) = 0 \quad (5)$$

Then the different values can be obtained. By normalizing the upper and lower, a membership degree between [0, 1] is formed, the basic expression is:

$$p(h_i) = \frac{h - h_{\min}}{h_{\max} - h_{\min}} \quad (6)$$

$$p(h_{i+1}) = \frac{h_{\max} - h_{\min}}{h_{\max} - h_{\min}} \quad (7)$$

On the basis of Formula (7), it is further set that there are n objective indicators, and there are 5 membership levels, which are $p_1^i, p_2^i, p_3^i, p_4^i, p_5^i$. When using Formula (7) to estimate each level, there are the following rules: the maximum demarcation value of p_n^i is $p_{n\max}^i$, which is the minimum demarcation value of p_{n+1}^i , then the mean of the membership interval distance can be set as:

$$d^i = \frac{p_{n+1}^i - p_n^i}{n-1}, n=1,2,3,5 \quad (8)$$

The monitoring limit can then be set as:

$$p_n^i = p_1^i + (n-1)d \quad (9)$$

In order to avoid possible errors, the statistical error calculated by ordinal sorting is:

$$\partial_i = \frac{1}{m} \sum_{i=1}^m \frac{f(x_i) - f(x_{i+1})}{m-1} \quad (10)$$

By processing the observed values, the comprehensive risk coefficient of the enterprise is obtained as:

$$p_i = \frac{p_i}{p_1 + p_2 + \dots + p_n} \quad (11)$$

By combining expectations and coefficients, the fuzzy estimation of the system is obtained as:

$$f(p_i(x)) = p, x = \frac{1}{p} \left(\text{sim} \sum_{i=1}^m p_i, x_i \right) \quad (12)$$

$$f(p_i(x)) = 0 \quad (13)$$

Through the optimal matrix T of enterprise risk and financial risk, the membership level $p_n^i \{i=1,2,\dots,6\}$ and the subjective fuzzy number $F_t (t=1,2,\dots,6)$ can be obtained, then the financial risk function $T(x_i)$ is:

$$T(x_i) = \{TF_i = p_i, i = 1, \dots, 6\} \quad (14)$$

$$T(S) = \sum_{k=1}^m wt = \sum_{k=1}^p \sum_{j=1}^n \sum_{i=1}^m \alpha \beta t(x_i) \quad (15)$$

Through fuzzy transformation, the fuzzy evaluation vector Y can be obtained, and the calculation is as:

$$Y_1 = U_1 + J_1 \quad (16)$$

The fuzzy judgment matrix R for the target layer is constructed, and the calculation is as:

$$R = B - Y \quad (17)$$

Then the risk taking index P of the enterprise can be obtained:

$$P = Y + S \quad (18)$$

Risk assessment indicators can be obtained according to the consistency test:

$$PT = \frac{\sum_{i=1}^m w_i p_i}{\sum_{i=1}^m w_i r_i} \quad (19)$$

Therefore, the calculation expression of the risk score of the target layer is:

$$P = T \times H \quad (20)$$

6. Risk-taking of Environmental Tax Reform for the GD of Enterprises

In order to further understand the impact of environmental tax reform and risk-taking on the GD of enterprises, this paper investigated an enterprise in a certain city. In the form of questionnaires, the enterprise's taxable pollutant discharge, the enterprise's investment in EP, the enterprise's GD plan and the enterprise's risk-taking ability were investigated separately, as depicted in Table 1.

Table 1: The enterprise information

	Enterprise sewage discharge	Enterprises pay taxes	Economic benefits of enterprises
2019	784648.19	142518.56	127538.92
2020	648946.78	75648.45	144567.49
2021	32560.45	15245.46	184756.78

Among them, the specific statistics of the company's pollutant discharge, tax paid and the company's economic benefits are shown in Figure 3.

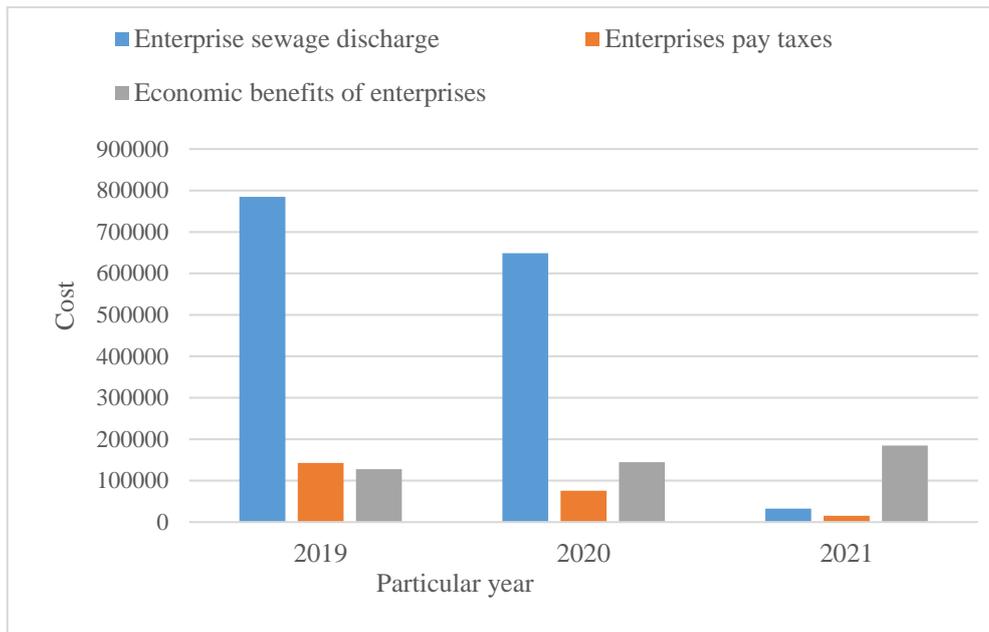


Figure 3: Statistical analysis of the basic situation of enterprises

It can be seen from Figure 3 that the pollutant discharge and tax payment of enterprises are decreasing year by year. This is also because of the environmental tax reform, so that enterprises begin to focus on GD. The improvement of production methods of enterprises and technological innovation of enterprises have reduced the pollution discharge. At the same time, the reduction of pollutant discharge also gradually reduces the tax payment of enterprises.

6.1. Impact of Environmental Taxation on the Cost and Profit of Enterprises

A survey is carried out through the environmental taxes and fees of enterprises. From the perspective of the cost and benefit of corporate pollution control and discharge, environmental tax has little impact on the GD of enterprises. The specific analysis is shown in Figure 4.

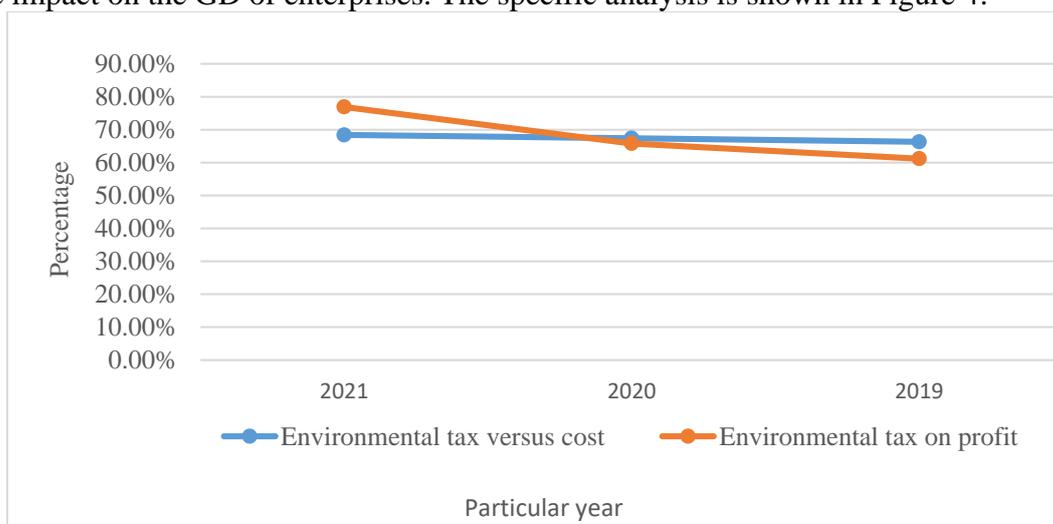


Figure 4: Impact of environmental tax on enterprise costs and profits

The environmental tax has little impact on the cost of the enterprise, but has a great impact on the profit of the enterprise. The cost input required by enterprises to control pollutants is also

decreasing year by year. With the GD of enterprises, less and less pollutants are produced, so the cost is also reduced year by year. At the same time, the economic benefits of enterprises are also increasing year by year with GD.

6.2. Impact of Environmental Taxation on Corporate Risk-taking

From the perspective of EP, the GD of enterprises can not only improve the economic benefits of enterprises, but also reduce the decision-making mistakes of enterprise managers, thereby improving the risk-taking level of enterprises. Environmental taxation can reduce the risk-taking of enterprises and promote the GD of enterprises, as shown in Figure 5.

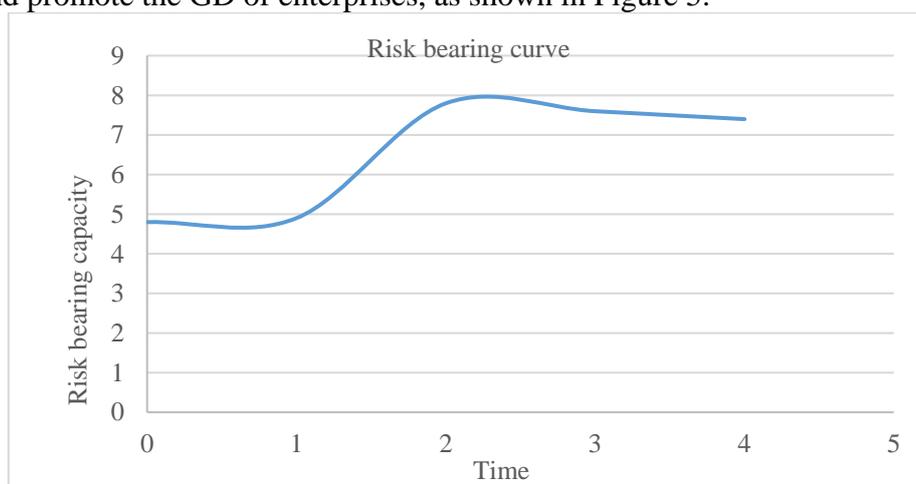


Figure 5: Impact of environmental taxation on enterprise risk-taking

It can be seen from Figure 5 that not only environmental taxation can reduce the risk-taking of enterprises, but the GD of enterprises can also increase the level of risk-taking of enterprises. Environmental tax reform constrains the development of enterprises to make them green. An excellent enterprise is inseparable from the support and constraints of policies, and the support and constraints of policies can also reduce the risk-taking of enterprises. Therefore, the environmental tax reform not only promotes the GD of enterprises, but also improves the risk-taking ability of enterprises.

6.3. Impact of Environmental Tax on Corporate Talent, Technology and GD Strategies

In the survey, it was found that environmental tax had a higher deterrent effect on polluting enterprises, and to a certain extent, it also urged enterprises to introduce talents and technological innovation, and promote the GD of enterprises. In order to further understand the relationship between environmental tax and GD of enterprises, the talent technology and strategy of enterprises were analyzed, as shown in Figure 6.

As can be seen from Figure 6, the reform of the environmental tax would help the government to publicize the benefits of its policies. It helps enterprises to discharge pollutants, relieve pressure, and then promote enterprises to introduce EP talents to carry out green upgrade of enterprise technology. It has an impact on the business planning and development strategy of the enterprise, and further improves the risk-taking level of the enterprise.

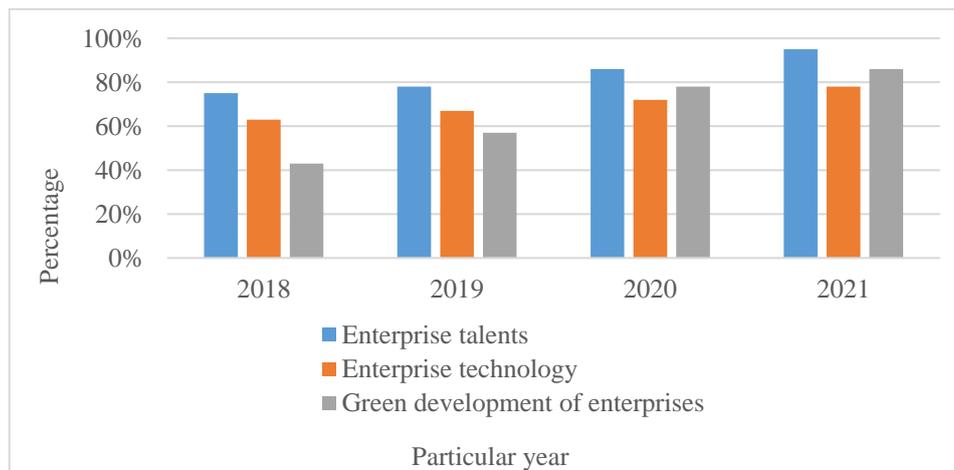


Figure 6: Impact analysis of environmental tax on enterprise talent, technology and GD strategy

7. Conclusions

Under the fuzzy comprehensive evaluation algorithm, this paper analyzed the relationship between environmental tax and enterprise GD and risk taking, and it was found that there was a significant positive correlation between enterprise GD and risk taking. Enterprises actively responded to the call for environmental tax reform, assumed their social responsibilities and formulated relevant systems and policies. This promoted the GD of enterprises and reduces the risk-taking of enterprises. The reform of environmental tax was negatively correlated with risk-taking. Enterprises complying with the rules of environmental tax reform could alleviate the conflict of interests among enterprises to a certain extent. It could also reduce bad decisions by managers, which could better improve the level of risk-taking in the enterprise. For enterprises, environmental tax could alleviate the harm of enterprise risk-taking and promote the GD of enterprises, thereby improving the economic benefits of enterprises. Therefore, the GD of enterprises is inseparable from the implementation of environmental tax, and the two complement each other.

Acknowledgement

This work was supported by Scientific Research Program Funded by Education Department of Shaanxi Provincial Government (Program No.23JK0145).

References

- [1] Chen Z, Zhang X, Chen F. Do carbon emission trading schemes stimulate green innovation in enterprises? Evidence from China. *Technological Forecasting and Social Change*, 2021, 168(2):120744-120750.
- [2] Xu Y, Zhao G, Zhang B. SD Simulation Research on the Green Low-Carbon Development of Coal Enterprises. *Complexity*, 2021, 2021(5):1-14.
- [3] Li G, Wang X, Wu J. How scientific researchers form green innovation behavior: An empirical analysis of China's enterprises. *Technology in Society*, 2019, 56(2):134-146.
- [4] Zhou Y. Research on Enterprise Green Management under the Background of Ecological Civilization Construction. *International Core Journal of Engineering*, 2019, 5(11):130-134.
- [5] Ma X. Incomplete information game for government encouraging enterprises to promote green development ability. *Journal of Liaoning Technical University*, 2017, 36(10):1116-1120.
- [6] Lha B, Lz A, Zz C. Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production*, 2019, 208(5):363-372.
- [7] Bolatbek B, Salimbayeva R, Satbaeva G. Prospects for the Development of Green Business in the Agro Industrial

- Complex. Journal of Advanced Research in Management*, 2018, 9(6):1327-1334.
- [8] Boehringer C, Garcia-Muros X, Gonzalez-Eguino M. Greener and Fairer: A Progressive Environmental Tax Reform for Spain. *Economics of Energy & Environmental Policy*, 2019, 8(2):141-160.
- [9] Da A, Cab C. Environmental tax reform and income distribution with imperfect heterogeneous labour markets. *European Economic Review*, 2019, 116(7):60-82.
- [10] Andreoni V. Environmental taxes: Drivers behind the revenue collected. *Journal of Cleaner Production*, 2019, 221(7):17-26.
- [11] Villena V H, Lu G, Gomez-Mejia L R. Is top management team-supply chain manager interaction the missing link? An analysis of risk-bearing antecedents for supply chain managers. *International Journal of Operations & Production Management*, 2018, 38(8):1640–1663.
- [12] Soulillou J P, Dhler B. No Increase in Colon Cancer Risk Following Induction with Neu5Gc-Bearing Rabbit Anti-T Cell IgG (ATG) in Recipients of Kidney Transplants. *Cancers*, 2018, 10(9):324-328.
- [13] Wu C H. An Empirical Study on Selection, Evaluation, and Management Strategies of Green Suppliers in Manufacturing Enterprises. *Journal of Organizational and End User Computing*, 2022, 34(1): 1-18.