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Research on the Impact of Ambidextrous Innovation on Sustainable Entrepreneurial Performance from a Policy-Oriented Perspective

Tao Zhu and Huatao Peng *

School of Management, Wuhan University of Technology, Wuhan 430070, China
* Correspondence: penghuatao@whut.edu.cn

Abstract: Based on the theory of dynamic capability theory, this study takes 671 listed companies in China's ICT industry from 2010 to 2021 as a sample to explore the impact mechanism of policy-oriented ambidextrous innovation on sustainable entrepreneurial performance. The study found that exploratory innovation can promote sustainable entrepreneurial performance, but both government subsidy and environmental tax will weaken the relationship between exploratory innovation and sustainable entrepreneurial performance. Exploitative innovation can promote sustainable entrepreneurial performance, but environmental tax will weaken the relationship between exploitative innovation and sustainable entrepreneurial performance. The main contributions of this study include the following. (1) Unlike previous studies that focus on the impact of ambidextrous innovation on corporate financial performance, this study is forward-looking in pointing out the importance of sustainable entrepreneurial performance, and explores the impact of ambidextrous innovation on sustainable entrepreneurial performance. (2) This study proposes a theoretical framework for government policy analysis, arguing that government policy should not only focus on its support policies (government subsidy), but also on regulatory policies (environmental tax). (3) The conclusions of this study have certain reference significance for enterprises to correctly use government policies, construct appropriate ambidextrous innovation strategies, and improve sustainable entrepreneurial performance.

Keywords: government policy; exploratory innovation; exploitative innovation; sustainable entrepreneurial performance

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1. Introduction

Since 2018, China's economic development has slowed down, and it has turned to a stage of high-quality economic development that focuses on green and low-carbon development. Sustainable development is an inevitable way for China to achieve high-quality economic development. Its core concept is that in the process of economic growth, it is necessary to continuously improve the environment to pursue human well-being [1]. As the basic functional unit of modern society, enterprises shoulder corresponding social and environmental responsibilities in their business behaviors, which play an important role in realizing sustainable development at the macro level [2]. The academic circles call this business behavior "sustainable entrepreneurship", and sustainable entrepreneurship continues the triple bottom line (TBL) of sustainable development, that is, entrepreneurial activities that take into account economic, ecological, and social benefits [3]. Compared with traditional entrepreneurship, sustainable entrepreneurship not only has a beneficial impact on society and the environment [4], but at the same time, as stakeholders gradually pay attention to sustainable development, enterprises' attention to society and the environment may also create better economic benefits [5,6]. Sustainable entrepreneurial behavior has become an important way for enterprises to enhance their competitive advantages and create value [7]. Then, how to transform from the original traditional entrepreneurship to

sustainable entrepreneurship and improve the sustainable entrepreneurship performance of enterprises has become a strategic problem that many Chinese enterprises need to solve.

Innovation is the key to improving the economic performance of enterprises. The issue of how enterprises can match the external environment and promote sustainable entrepreneurship through innovation and reform deserves in-depth discussion [3]. Ambidextrous innovation provides a unique perspective that helps us gain insight into the behaviors and strategies of firms to improve sustainable entrepreneurial performance. Mature enterprises will adopt an ambidextrous innovation strategy, and carry out exploitative innovation and exploratory innovation at the same time [8] in order to coordinate the contradiction between current business and future business trends, and in this way enhance the long-term competitiveness of enterprises [9]. For high-tech companies, only by constantly excavating existing capabilities and continuously creating new capabilities can they contribute to the sustainable development of the enterprise [10]. Based on this, the decision-making of enterprises on exploratory innovation and exploitative innovation may affect the sustainable entrepreneurial performance of enterprises. However, at this stage, there is no research on the relationship between ambidextrous innovation and sustainable entrepreneurial performance, and this issue needs further empirical testing.

Due to the high-risk and high-cost nature of innovation and the importance of sustainable entrepreneurial behavior, government policy needs to take steps to provide reasonable support and necessary regulation. On the one hand, government subsidies are one of the ways to support enterprise innovation and alleviate financing difficulties, and it has an important incentive effect for enterprises to achieve transformation and upgrading [11]. On the other hand, the environmental tax makes full use of the price factor to impose differentiated taxation on enterprises with different pollution levels, forcing enterprises to reduce pollution and helping enterprises achieve double dividends of greenness and innovation [12]. It can be seen that government subsidy and environmental tax are effective means to deal with the challenges of sustainable entrepreneurship for enterprises. However, although government support policies and regulatory policies are critical to the sustainable entrepreneurial performance of ambidextrous innovation practices, little existing research has focused on the combined effects of government subsidies and environmental taxes, and how they work. These questions need to establish a systematic research framework to explore.

Based on the above analysis, we found that in recent years, the academic community has gradually recognized the importance of sustainable entrepreneurship for enterprises and has begun to introduce innovation into the field of sustainable entrepreneurship for research. However, few related studies combine innovation and sustainable entrepreneurship from a policy perspective. The ICT industry is a high-tech industry, which has a strong social radiation effect and plays a key role in promoting high-quality economic development. Therefore, based on dynamic capability theory, this study uses the data of listed companies in China's ICT industry from 2010 to 2021 to explore how ambidextrous innovation affects sustainable entrepreneurial performance and attempts to clarify the moderating effect of government policies.

The framework is as follows: the Section 2 constructs the theoretical framework and proposes research hypotheses; the Section 3 outlines sample selection, data sources, and variable measurement methods; the Section 4 conducts regression analysis; and the Section 5 discusses the research results.

2. Theory and Hypothesis

2.1. Ambidextrous Innovation and Sustainable Entrepreneurial Performance

2.1.1. Exploratory Innovation and Sustainable Entrepreneurial Performance

Exploratory innovation goes beyond the boundaries of existing knowledge, emphasizing learning new knowledge, and creating new technical capabilities. It focuses on market opportunities where existing products cannot meet demand, and ultimately develops new products, opens up new markets, and acquires new customers [13]. In a dynamic environ-

ment, emphasizing the expansion of knowledge and skill helps to achieve economic, social, and environmental benefits [5].

Exploratory innovation acquires heterogeneous and advanced knowledge and skills through diversified learning, increasing the solutions for enterprises to solve complex problems [14]. When faced with a turbulent external environment, sufficient knowledge stock helps companies better capture and analyze changes in social needs and grasp social concerns. Under the influence of exploratory innovation, enterprises can target the blue ocean market [15], strive to provide society with novel and differentiated innovative products that meet their needs [16], and improve the economic and social performance of enterprises with first-mover advantages.

Enterprises with strong innovation and development capabilities often actively explore external knowledge and information resources. For the purpose of technological innovation, enterprises will actively introduce external advanced technology and management of human resources [17], which can not only optimize the allocation of enterprise resources, but also create more employment opportunities for society to a certain extent. Exploratory innovation means changing routines and overcoming inertia. Therefore, in terms of production processes and operating systems, companies will actively explore innovative behaviors that improve resource utilization efficiency and reduce waste. In addition, exploratory innovation can also enhance industrial competitiveness. Exploratory innovation is intense and breakthrough and the exploratory innovation of core enterprises in the industrial chain can drive the transformation and upgrading of the entire industry [18].

In the context of sustainable development, exploratory innovation can not only help companies gain long-term competitive advantages and build a good reputation, but also expand social influence and promote green development through knowledge spillovers. For example, the exploratory innovation of enterprises in environmental protection technologies and products can reduce regional pollution emissions and promote the sustainable development of social infrastructure [19], which has good external benefits. At the same time, consumers have a high willingness to pay for green innovative products and services [20], which has good internal benefits.

To sum up, exploratory innovation can balance the economic, social, and environmental performance of enterprises by identifying opportunities, rebuilding resources, responding to environmental changes, and ultimately promoting the sustainable development of enterprises.

Based on the above analysis, we propose Hypothesis 1a.

Hypothesis 1a. *Exploratory innovation has a positive impact on sustainable entrepreneurial performance.*

2.1.2. Exploitative Innovation and Sustainable Entrepreneurial Performance

Exploitative innovation emphasizes that by improving and perfecting the existing knowledge and capabilities of the enterprise, it can improve the operation efficiency of the enterprise, improve sales efficiency, and increase the current performance [21]. It has the characteristics of low risk, low difficulty, short cycle, and the expected result is usually positive.

Exploitative innovation can improve the utilization rate of existing knowledge [22]. It encourages employees to actively learn and innovate to improve the level of individual knowledge and skills of employees and improve the overall human resource level of the enterprise. Advanced knowledge from competitors can reduce the risk of knowledge utilization by enterprises [23], and knowledge from marketization is beneficial to reduce the risk of product innovation [24], speed up the process of product and technology improvement, and enhance the stability of enterprise operations [25].

Exploitative innovation digs deep into customer needs and continuously improves product quality to establish good customer relationships, thereby ensuring the short-term performance of the enterprise and enhancing the brand image. At this stage, society's

increasing emphasis on green production makes it more urgent for enterprises to explore environmental protection technologies [26]. Exploitative innovation makes full use of various production factors and reduces pollution and energy consumption by continuously improving existing production technologies and production processes.

By updating and iterating products, enterprises can provide better products and services to compete and reduce the uncertainty of market development. In addition, exploitative innovation can also improve resource utilization and transformation efficiency, reduce production costs with economies of scale [25], enhance existing competitive advantages, and achieve further profits in mature markets.

To sum up, exploitative innovation can balance the economic, social, and environmental performance of enterprises through risk response, demand satisfaction, and competitive advantage, and ultimately promotes the sustainable development of enterprises.

Based on the above analysis, we propose Hypothesis 1b.

Hypothesis 1b. *Exploitative innovation has a positive impact on sustainable entrepreneurial performance.*

2.2. The Regulatory Role of Government Policies

2.2.1. The Moderating Effect of Government Subsidies

Government subsidy refers to a kind of financial support provided by the government to enterprises for a specific purpose. As an important source of external funds for enterprises, it is of great significance to the survival and development of enterprises [27].

On the one hand, enterprises that receive government subsidies tend to increase their R&D investment [28]. Government subsidies can share the risks of enterprise innovation, ease the pressure of financing, and reduce the cost of innovation [29], providing financial guarantees for enterprises to carry out exploratory innovation and exploitative innovation, which is conducive to improving the innovation income of enterprises. On the other hand, based on the signal transmission theory, the government subsidy for an enterprise can send a positive signal to the outside world, indicating that the enterprise is recognized by the government [30]. Under the influence of government subsidies, it is easier for enterprises to cooperate with external resources, obtain support from other stakeholders, and expand financing channels [30], thereby having a positive impact on the ambidextrous innovation activities of enterprises, and improving the economic performance of enterprises. Enterprises that receive government subsidies are more likely to engage in government-advocated behaviors, cater to the government, and demonstrate strong social and environmental responsibilities. The government is the key driving force for enterprises to carry out environmental practices, which can promote the improvement of environmental awareness of enterprises [31], and promote enterprise activities to tend to environmental protection policies [32]. In the context of sustainable development, government subsidies guide enterprises to change their previous unreasonable and environmentally harmful production behaviors and pay attention to the research and development of green production technologies [11]. In addition, in order to promote R&D innovation activities and maintain and retain government subsidies, enterprises may attract and hire employees to carry out innovation activities [33], increase employment rate through legitimacy, strengthen ties with the government, and enhance their own image.

Based on the above analysis, we propose Hypothesis 2a and Hypothesis 2b.

Hypothesis 2a. *Government subsidy has a positive moderating effect on the positive impact of exploratory innovation on sustainable entrepreneurial performance.*

Hypothesis 2b. *Government subsidy has a positive moderating effect on the positive impact of exploitative innovation on sustainable entrepreneurial performance.*

2.2.2. The Moderating Effect of Environmental Tax

As an environmental regulatory tool, environmental taxes tax companies based on the severity of their pollution. This move bridges the gap between production costs and social costs, internalizes environmental costs, and solves the problem of negative externalities in economic development.

The environmental tax policy not only improves the environmental protection awareness of enterprises, but also enhances the environmental legitimacy, which means enterprises must make trade-offs, thus giving birth to green technology innovation behaviors. The administrative penalties and tax burdens caused by environmental tax increase the production cost and decrease the profits of enterprises [12]. Under this background, enterprises need to actively save energy and reduce emissions, increase investment in environmental protection, and carry out green production [34].

The environmental tax clarifies the main responsibility of enterprises for green development and environmental protection and puts forward new requirements for enterprise innovation. The innovative compensation effect of environmental tax reflects that environmental tax is beneficial to enterprises to achieve double dividends [35]. On the one hand, green innovation can reduce pollution, implement cleaner production, and improve environmental performance. On the other hand, environmental taxes require companies to pay more attention to their environmental issues, reduce environmental regulation costs by reducing pollution, and enhance corporate competitiveness and economic performance.

In recent years, some scholars have discovered the third dividend brought by environmental taxes. In the process of environmental tax promoting green innovation of enterprises, the increase in labor demand reduces the unemployment rate of society [35]. Human resources are also gradually transferred from high-polluting industries to cleaner production industries, and promoting the optimization and upgrading of the industrial structure. At the same time, enterprises improve production and operation behaviors through ambidextrous innovation to comply with laws and regulations related to environmental supervision, which plays a certain role in improving corporate image.

In general, the process of environmental tax affecting the relationship between ambidextrous innovation and sustainable entrepreneurial performance shows triple dividends for the economy, society, and environment, which help to build an ecologically civilized society and achieve sustainable development.

Based on the above analysis, we propose Hypothesis 3a and Hypothesis 3b.

Hypothesis 3a. *Environmental tax has a positive moderating effect on the positive impact of exploratory innovation on sustainable entrepreneurial performance.*

Hypothesis 3b. *Environmental tax has positive moderating effect on the positive impact of exploitative innovation on sustainable entrepreneurial performance.*

The research framework of this study is shown in Figure 1.

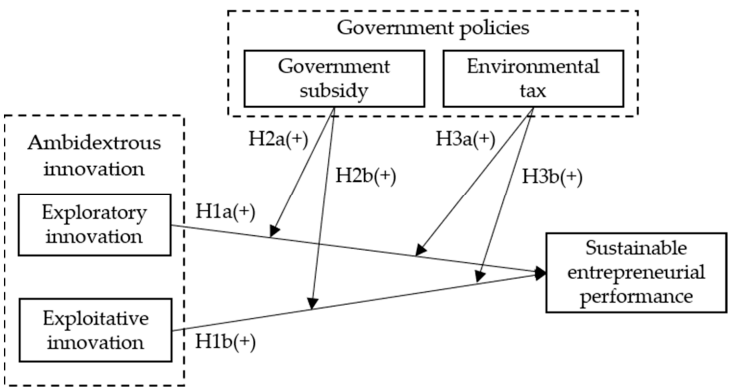

Figure 1. Research framework.

3. Methods

3.1. Sample and Procedure

In order to explore the impact mechanism of ambidextrous innovation on sustainable entrepreneurial performance from the perspective of policy orientation, this study selected companies belonging to the Information Communications Technology (ICT) industry as research samples, mainly based on the following considerations. (1) The industry is important. The sustainable development of society is inseparable from the support of the ICT industry. In recent years, the ICT industry has gradually become an important industry in the national economy. (2) The industry is specific. As a knowledge-intensive industry, the ICT industry has a large demand for innovation, and its innovation activities are characterized by a high level of technology and a fast update speed. Compared with companies in other industries, innovation is crucial to the survival and development of companies in the ICT industry. (3) The industry is strategic. The ICT industry is committed to digital technology innovation, and its innovative output has a strong radiation effect, which can be applied to traditional agriculture, industry, and other fields to improve social production efficiency and promote green environmental protection. Therefore, it has the basic conditions to explore industrial sustainability. (4) Policies are auxiliary. Due to the high-quality development of the national economy and the requirements of enterprises' own innovation and development, the government has issued several policies to assist and supervise enterprises in the ICT industry. Therefore, exploring the innovation of enterprises in the ICT industry plays an important role in balancing the economic, social, and environmental performance of enterprises and promoting the process of sustainable entrepreneurship.

The research samples were screened as follows: (1) Enterprises in the ICT industry that were exported from the CSMAR database. According to the research of Li (2018) et al. [36], the ICT industry includes ICT manufacturing (computer, communication, and other electronic equipment manufacturing) and ICT services (information transmission, software, and information technology services). (2) Due to the unusual operating conditions of companies with ticker symbols ST and ST*, we excluded these companies. (3) Excluded samples of enterprises with a continuous observation period of less than three years. (4) Eliminated enterprise samples with serious missing variable data information to ensure the reliability and stability of the research.

Based on the identified sample companies, the data sources for this study were as follows. (1) The patent data in exploratory innovation and exploitative innovation came from the Chinese Research Data Services (CNRDS) database, and the International Patent Classification (IPC) of the invention application of the listed company was searched in the innovation patent research sub-database. (2) For the collection of green patents, this study combined the "IPC Green Inventory" launched by the World Intellectual Property Organization (WIPO), refined its classification codes, and calculated the number in the CNRDS database. (3) The rest of the data, including operating net interest rate, government subsidies, environmental taxes, and other indicators were all derived from the CSMAR database.

The sample data collection started in 2010. Since the World Intellectual Property Organization (WIPO) launched the "IPC Green Inventory" which can search for green patents online in 2010, this study selected the relevant data of listed companies in China's ICT industry from 2010 to 2021 as a research sample. Finally, this study obtained a sample of 671 ICT industry enterprises, with a total of 5767 sample observations. Since China's "Environmental Protection Tax Law" came into effect on 1 January 2018, the observation period of the environmental tax sample was 2018–2020, and a total of 2590 sample observations (accounting for 44.91%) were obtained. For the final data, this study used Excel for data preprocessing and stata16 for regression analysis.

3.2. Measures

(1) Explained variable

Sustainable entrepreneurial performance. Sustainable entrepreneurial performance needs to be linked to the economic performance, environmental performance, and social performance of the enterprise at the same time [2]. Based on the triple bottom line, we constructed an indicator system that can quantify sustainable entrepreneurial performance.

Economic performance mainly reflects the financial situation of an enterprise. Considering the differences in the development time and scale of different enterprises, we chose the relative indicator of the company's operating net interest rate to measure the economic performance of the company [37]. Social performance represents the social responsibility that an enterprise undertakes, and its focus is the welfare created by the enterprise for its stakeholders. Drawing on the research of Hui and Pan (2010) [38], this study mainly examined the social performance of enterprises from the aspect of employment creation. Considering the availability of data, we used the number of employees as a proxy for social performance. Environmental performance mainly reflects the improvement of environmental damage in the production and operation of enterprises. Based on the research of Yin et al. (2022) [39], this study selected the number of green patents of enterprises to measure environmental performance.

According to the three secondary indicators of economic performance, social performance, and environmental performance obtained by the above method, the entropy method was used to calculate the weights of the three indicators, which were 0.511, 0.038, and 0.451, respectively.

(2) Core explanatory variables

Ambidextrous innovation is exploratory innovation and exploitative innovation. By determining an appropriate ambidextrous innovation strategy, enterprises can give full play to the strengths of the two innovations and avoid their weaknesses [40]. According to the research of scholars Gao et al. (2021) [41], the change in the combination of the top 4 IPC numbers of innovation patents means that a new field of knowledge has emerged for enterprises. The number of patent filings in new areas of knowledge can be used as a proxy for exploratory innovation. At the same time, considering that Podolny and Stuart (1995) [42] proposed the evaluation method of prior invention technology, this study took 5 years as the observation period and determined the patent type according to the first four digits of the patent IPC number during the observation period.

Exploratory innovation. Exploratory innovation means breaking through existing fields of knowledge and creating new knowledge. If the type of patent applied by the enterprise had not appeared in the previous 5 years, it was recorded as an exploratory innovation patent. The sum of all exploratory innovation patents in the current period was used as a proxy for exploratory innovation.

Exploitative innovation. Exploitative innovation represents the use of existing knowledge to improve existing capabilities. If the type of patent applied by the enterprise had appeared in the previous 5 years, it was recorded as an exploitative innovation patent. The sum of all exploitative innovation patents in the current period was used as a proxy indicator for exploitative innovation.

(3) Moderating variables

Government subsidy. The ICT industry is a knowledge- and technology-intensive industry and its growth and development require a lot of R&D investment. As a strategic emerging industry supported by the state, the ICT industry has received relatively high government subsidies in recent years, making great contributions to technological breakthrough and sustainable development of enterprises. Government subsidies are mainly financial appropriations from the government, which exist in the non-operating income in the notes to the financial statements of enterprises. Compared with the previous method of measuring government subsidies with a single binary variable (enterprises have government subsidies = 1, otherwise = 0), the amount of government subsidies can directly reflect

the strength of the central and local governments to support the development of enterprises. The study of Li et al. (2021) [43] measured government subsidies by the natural logarithm of government subsidies received by enterprises each year. In our research, considering that the government subsidy amount of some enterprises is 0, we took the logarithm of the government subsidy plus 1 as an alternative indicator.

Environmental tax. Environmental taxes levied on enterprises generally have broad and narrow connotations. The broad environmental tax covers the four major systems of resource tax, energy tax, transportation tax, and pollution discharge tax. The narrow environmental tax generally refers to pollution tax, which is replaced by the pollutant discharge fee of enterprises. China officially implemented the environmental tax system on 1 January 2018. During the sample observation period, Chinese enterprises did not directly disclose the amount of environmental tax levied, and some enterprises only used the pollutant discharge fee as a substitute for environmental tax levied, which could not accurately display the environmental tax situation of enterprises. Therefore, in view of the current situation of imperfect direct data on corporate environmental taxes in the Chinese context, this study drew on the environmental tax burden standards of various provinces and cities in China in the research of Jin et al. (2020) [44], and then combined the location of the sample companies to observe whether the sample companies were affected by environmental taxes. Since 2018, if the environmental protection tax burden standard of the company's location had changed, it was 1, otherwise, it was 0.

(4) Control variables

In this study, the indicators of the company's basic characteristics and financial performance were selected as control variables. In terms of the basic characteristics of the company, this study selected the age of the company (Fage), the size of the company (Size), and the nature of equity (Equity) as control variables. Fage and Size reflect the resource and capability base of enterprises to innovate. Long-established and large-scale enterprises may have more mature innovation systems and innovation funds. There are differences in the willingness to innovate between state-owned enterprises and non-state-owned enterprises, which may affect the performance of sustainable entrepreneurship. In terms of the company's financial performance, this study selected the debt-to-asset ratio (Lev), return on assets (Roa), and operating income growth rate (Growth) as control variables. Lev and Roa reflect the company's operating conditions, and Growth reflects the company's ability to grow and develop. These indicators may affect the company's future innovation willingness. In addition, considering the impact of the macro environment and industry on sustainable entrepreneurship, this study also identified Year and Industry variables as dummy variables.

The definitions and measurement methods of the variables in this study are shown in Table 1.

Table 1. The description of variable.

Variable	Name	Symbol	Notes
Explained variable	Sustainable entrepreneurial performance	SEP	0.511 × operating net interest rate + 0.038 × number of employees + 0.451 × number of green patents
Core explanatory variables	Exploratory innovation	Explor	The sum of the number of patents that have not appeared in the previous 5 years for the current patent type
	Exploitative innovation	Exploi	The sum of the number of patents that have appeared in the previous 5 years for the current patent type
Moderating variables	Government subsidy	GS	ln (current government subsidies + 1)
	Environmental tax	EX	The standard of environmental protection tax burden at the location of the enterprise has changed = 1, and there has been no change = 0

Table 1. *Cont.*

Variable	Name	Symbol	Notes
Control variables	Firm age	Fage	ln (year of current year-year of establishment of the company)
	Firm size	Size	ln (total assets)
	Equity nature	Equity	State-owned enterprise = 1, non-state-owned enterprise = 0
	Debt-to-asset ratio	Lev	Total liabilities/Total assets × 100%
	Return on assets	Roa	Net profit/Total assets × 100%
	Operating income growth rate	Growth	(Operating income for the current period-operating income for the previous period)/operating income for the previous period × 100%
Dummy variables	Year dummies	Year	The sample interval is 2010–2021, with a total of 12 years dummy variables
	Industry dummies	Industry	According to the industry code classification of China Securities Regulatory Commission, there are 13 industry dummy variables in this paper

3.3. Empirical Model

In order to explore the impact of exploratory innovation on sustainable entrepreneurial performance, this study established regression Model (1) to test.

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Explor_{i,t} + \beta_2 \sum Control_{i,\,t} + \sum Year + \sum Industry + \varepsilon_{i,\,t} \quad (1)$$

In order to explore the impact of exploitative innovation on sustainable entrepreneurial performance, this study established regression Model (2) to test.

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Exploi_{i,t} + \beta_2 \sum Control_{i,\,t} + \sum Year + \sum Industry + \varepsilon_{i,\,t} \quad (2)$$

In order to explore the impact mechanism of ambidextrous innovation on sustainable entrepreneurial performance from the perspective of government subsidy, this study established a regression Model (3) to test the moderating effect of government subsidy on the relationship between exploratory innovation and sustainable entrepreneurial performance, and established a regression Model (4) to test the moderating effect of government subsidy on the relationship between exploitative innovation and sustainable entrepreneurial performance.

In order to explore the impact mechanism of ambidextrous innovation on sustainable entrepreneurial performance from the perspective of environmental tax, this study established a regression Model (5) to test the moderating effect of environmental tax on the relationship between exploratory innovation and sustainable entrepreneurial performance, and established a regression Model (6) to test the moderating effect of environmental tax on the relationship between exploitative innovation and sustainable entrepreneurial performance.

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Explor_{i,t} + \beta_2 GS_{i,t} + \beta_3 \times Explor_{i,t} \times GS_{i,t} + \beta_4 \sum Control_{i,\,t} + \sum Year_{i,t} + \sum Industry_{i,t} + \varepsilon_{i,\,t} \quad (3)$$

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Exploi_{i,t} + \beta_2 GS_{i,t} + \beta_3 \times Exploi_{i,t} \times GS_{i,t} + \beta_4 \sum Control_{i,\,t} + \sum Year_{i,t} + \sum Industry_{i,t} + \varepsilon_{i,\,t} \quad (4)$$

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Explor_{i,t} + \beta_2 ET_{i,t} + \beta_3 \times Explor_{i,t} \times ET_{i,t} + \beta_4 \sum Control_{i,\,t} + \sum Year_{i,t} + \sum Industry_{i,t} + \varepsilon_{i,\,t} \quad (5)$$

$$SEP_{i,\,t} = \beta_0 + \beta_1 \times Exploi_{i,t} + \beta_2 ET_{i,t} + \beta_3 \times Exploi_{i,t} \times ET_{i,t} + \beta_4 \sum Control_{i,\,t} + \sum Year_{i,t} + \sum Industry_{i,t} + \varepsilon_{i,\,t} \quad (6)$$

In the setting of the model, Model (1) and Model (2) test H1 and H2, respectively, that is, whether exploratory innovation and exploitative innovation have a positive impact on sustainable entrepreneurial performance. According to H1 and H2, the coefficients β1 of the core explanatory variables *Explor* and *Exploi* are expected to be significantly positive. In Models (3) and (4), each interaction term is the product of exploratory innovation and government subsidy, and the product of exploitative innovation and government subsidy. According to H3a and H3b, the interaction variable coefficients β3 in Models (3) and (4)

are expected to be significantly positive. In Models (5) and (6), each interaction term is the product of exploratory innovation and environmental tax, and the product of exploitative innovation and environmental tax. According to H4a and H4b, the interaction variable coefficients β3 in Models (5) and (6) are expected to be significantly positive.

4. Results

4.1. Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation analysis are shown in Table 2. The results showed that exploratory innovation was positively correlated with sustainable entrepreneurial performance (r = 0.045, $p < 0.01$), and exploitative innovation was positively correlated with sustainable entrepreneurial performance (r = 0.025, $p < 0.1$). In addition, the absolute value of the correlation coefficient of each variable was lower than 0.5, so the research model design is more reasonable.

Table 2. Descriptive statistics and correlation analysis.

	SEP	Explor	Exploi	GS	ET	Fage	Size	Equity	Lev	Roa	Growth
SEP	1										
Explor	0.045 ***	1									
Exploi	0.025 *	0.137 ***	1								
GS	−0.035 ***	0.000	0.009	1							
ET	−0.008	0.023	0.027	0.062 ***	1						
Fage	0.022 *	0.014	0.052 ***	−0.261 ***	−0.011	1					
Size	0.139 ***	0.133 ***	0.272 ***	−0.019	0.028	0.233 ***	1				
Equity	0.082 ***	0.024 *	0.065 ***	0.113 ***	0.051 ***	0.202 ***	0.295 ***	1			
Lev	0.026 **	0.019	0.056 ***	−0.083 ***	0.017	0.170 ***	0.119 ***	0.121 ***	1		
Roa	0.011	0.021	0.013	0.073 ***	−0.041 **	−0.112 ***	0.021	0.002	−0.520 ***	1	
Growth	−0.002	−0.004	−0.003	0.018	0.051 ***	0.0150	0.015	−0.010	0.016	0.002	1
Min	−162.174	0	0	0	0	0.693	16.758	0	1.103	−399.44	−2858.916
Max	119,974.6	750	5254	21.586	1	3.714	27.146	1	1049.529	86.31	450,001.6
Mean	195.218	2.688	31.437	9.964	0.392	2.725	21.651	0.232	36.374	3.219	189.695
Sd	2787.449	16.127	220.691	7.629	0.488	0.410	1.193	0.422	34.359	15.221	6742.193

***, **, * indicate significance at the levels of 1%, 5%, and 10% respectively.

The minimum, maximum, mean, and standard deviation of sustainable entrepreneurial performance were −162.174, 119,974.6, 195.218, and 2787.449, respectively, which shows that there is a large gap in sustainable entrepreneurial performance among enterprises in the ICT industry, and the sustainable entrepreneurial performance of some enterprises has great deficiencies, so the statistics show that it is of great significance to explore the issue of sustainable entrepreneurship. The means of exploratory innovation and exploitative innovation were 2.688 and 31.437, respectively, which shows that ICT industry enterprises attach great importance to ambidextrous innovation, but more emphasis on exploitative innovation. The minimum, maximum, mean, and standard deviation of government subsidies were 0, 21.586, 9.964, and 7.629, respectively, indicating that enterprises in the ICT industry receive more government subsidies, and government subsidies play an important role in their innovation activities. The minimum, maximum, mean, and standard deviation of the environmental tax were 0, 1, 0.392, and 0.488, respectively, which indicates that since the implementation of the environmental tax in 2018, a certain number of enterprises have been regulated by the environmental tax. The average growth rate of operating income was 189.695, which shows that the ICT industry enterprises have developed rapidly in recent years and their operating conditions are good.

4.2. Results

Before conducting the empirical analysis, this study carried out the following work. (1) In order to eliminate the influence of extreme values, this study carried out two-sided 5% winsorizing for each continuous variable. (2) Variance inflation factor (VIF) diagnosis was performed on the variables in the model, and the results showed that all VIFs were less than 2, and there was no multicollinearity problem. (3) Based on the results of Hausman's test, this study selected the fixed-effects model of company and year for regression analysis.

The regression results of the effect of ambidextrous innovation on sustainable entrepreneurial performance and its moderating effect are shown in Table 3. Among them, Model (1) tests hypothesis H1, Model (2) tests hypothesis H2, Models (3) and (4) test H3a and H3b, and Models (5) and (6) test H4a and H4b.

Table 3. Results of regression.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Explor	0.405 ***		0.818 ***		2.646 ***	
	(3.35)		(3.71)		(4.26)	
Exploi		0.430 ***		0.582 ***		2.113 ***
		(3.88)		(3.80)		(3.47)
GS			−0.008	−0.011		
			(−0.69)	(−0.91)		
Explor × GS			−0.631 **			
			(−2.25)			
Exploi × GS				−0.195		
				(−1.40)		
ET					−0.020	−0.017
					(−0.32)	(−0.27)
Explor × ET					−1.580 *	
					(−1.87)	
Exploi × ET						−1.291 *
						(−1.67)
Fage	0.061	0.068	0.060	0.070	0.367	0.181
	(0.75)	(0.84)	(0.74)	(0.85)	(0.84)	(0.42)
Size	0.152 ***	0.152 ***	0.152 ***	0.154 ***	0.193 ***	0.190 ***
	(7.04)	(7.06)	(7.07)	(7.12)	(3.24)	(3.20)
Equity	0.012	0.013	0.012	0.013	−0.019	−0.016
	(0.68)	(0.71)	(0.71)	(0.74)	(−0.63)	(−0.54)
LEV	0.046 ***	0.044 ***	0.046 ***	0.043 ***	0.056	0.051
	(2.85)	(2.71)	(2.87)	(2.69)	(1.56)	(1.42)
ROA	0.008	0.007	0.007	0.006	−0.001	0.004
	(0.54)	(0.47)	(0.52)	(0.46)	(−0.05)	(0.18)
Growth	−0.010	−0.010	−0.010	−0.009	−0.000	0.001
	(−0.86)	(−0.85)	(−0.85)	(−0.83)	(−0.02)	(0.06)
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
Constant	−0.091	−0.094	−0.085	−0.087	−0.241	−0.117
	(−1.03)	(−1.07)	(−0.96)	(−0.98)	(−0.80)	(−0.39)
Observations	5767	5767	5767	5767	2590	2590
R-squared	0.0671	0.0678	0.0682	0.0684	0.0288	0.0254

***, **, * indicate significance at the levels of 1%, 5%, and 10% respectively, with the t value in brackets.

First, this study analyzed the relationship between exploratory innovation and sustainable entrepreneurial performance. In Model (1), the regression coefficient of exploratory innovation was significantly positive ($\beta = 0.405$, $p < 0.01$), which indicates that there is a significant positive correlation between exploratory innovation and sustainable entrepreneurial performance. H1 passes. In Model (2), the regression coefficient of exploitative innovation was significantly positive ($\beta = 0.430$, $p < 0.01$), which indicates that there is a significant positive correlation between exploitative innovation and sustainable entrepreneurial performance. H2 passes.

Then, this study examined the moderating effects of government subsidy and environmental tax. In Model (3), the regression coefficient of the interaction term between government subsidy and exploratory innovation was significantly positive ($\beta = -0.631$, $p < 0.05$), indicating that government subsidy has a significant negative moderating effect on the positive correlation between exploratory innovation and sustainable entrepreneurial performance. H3a partially passed. In Model (4), the regression coefficient of the interaction term between government subsidy and exploitative innovation was not significant, indicat-

ing that government subsidy has no moderating effect on the positive relationship between exploitative innovation and sustainable entrepreneurial performance. H3b does not pass. In Model (5), the regression coefficient of the interaction term between environmental tax and exploratory innovation was significantly positive ($\beta = -1.580$, $p < 0.1$), indicating that environmental tax has a significant negative moderating effect on the positive correlation between exploratory innovation and sustainable entrepreneurial performance. H4a partially passes. In Model (6), the regression coefficient of the interaction term between environmental tax and exploitative innovation was significantly positive ($\beta = -1.291$, $p < 0.1$), indicating that environmental tax has a significant negative moderating effect on the positive correlation between exploitative innovation and sustainable entrepreneurial performance. H4a partially passes.

In addition, we also found that the size of the firm had a significant and positive impact on sustainable entrepreneurship performance, which means that the larger the scale and the more total assets, the stronger the awareness of sustainable entrepreneurship and the ability of balancing economic, social, and environmental performance.

To sum up, exploratory innovation promotes the improvement of sustainable entrepreneurial performance of enterprises, while government subsidies and environmental taxes weaken this positive relationship. Exploitative innovation promotes the improvement of sustainable entrepreneurial performance of enterprises. Government subsidies have no impact on this relationship, but environmental taxes weaken this positive relationship.

4.3. Robustness Test

In this study, the following robustness tests were carried out to ensure the reliability of the conclusions. First, this study used generalized matrix estimation (GMM) to re-examine the relationship between exploratory innovation and sustainable entrepreneurial performance, and the relationship between exploitative innovation and sustainable entrepreneurial performance. The benchmark regression results were consistent with the previous article. Second, we replaced the explanatory variables. Drawing on the research of Liu et al. (2022) [25], this study introduced the ratio of enterprise R&D investment to total assets to measure exploratory innovation, and the ratio of capitalized R&D investment to total assets to measure exploitative innovation. Regression was performed again, and the result of the regression was consistent with the previous one. Third, the sample observation period was narrowed. When testing the moderating effect of environmental taxes, the observation period of the sample was 2018–2021. The regression results at this time showed that the regression coefficient of exploratory innovation was significantly positive ($\beta = 2.646$, $p < 0.01$), and the regression coefficient of exploitative innovation was significantly positive ($\beta = 2.113$, $p < 0.01$). The conclusions of the benchmark regression were the same as before.

Therefore, the conclusions of this study are robust.

5. Discussion

5.1. Conclusions

Under the current background of sustainable development, enterprises rely more on innovation to obtain competitive advantages. How to use innovation to build enterprises' sustainable entrepreneurial advantages and improve their sustainable entrepreneurial performance has become an important issue to be solved urgently. Based on the panel data of 671 listed companies in China's ICT industry from 2010 to 2021, this study used the dynamic capability theory to empirically analyze the impact mechanism of ambidextrous innovation on the sustainable entrepreneurial performance of enterprises from the perspective of policy orientation. This led to the following conclusions:

(1) Exploratory innovation has a positive impact on sustainable entrepreneurial performance, and exploitative innovation has a positive impact on sustainable entrepreneurial performance. This matches our hypothesis. Many studies have found that ambidextrous innovation is conducive to improving the financial performance of enterprises.

As enterprises carry out ambidextrous innovation, the accumulation of knowledge and technical experience of enterprises continues to increase, the competitive advantage is improved, and the financial performance is also continuously improved. Combining the needs of stakeholders for enterprises to take into account social and environmental benefits [45,46], this study found that ambidextrous innovation in enterprises can not only fully introduce R&D human capital and create new social value, but also improve resource utilization, develop green products, and continuously reduce the pollution to the environment. Therefore, exploratory innovation and exploitative innovation can continuously balance economic, social, and environmental performance, thereby improving the sustainable entrepreneurial performance of enterprises.

(2) Government subsidies have a negative moderating effect on the positive impact of exploratory innovation on sustainable entrepreneurial performance but have no moderating effect on the positive impact of exploitative innovation on sustainable entrepreneurial performance. This is different from our assumption. On the one hand, government subsidies weaken the positive impact of exploratory innovation on sustainable entrepreneurial performance. ICT industry enterprises are often faced with the requirements of a high level of core technology and rapid technological iteration. They rely more on government subsidies for exploratory innovation activities to alleviate the serious financing constraints faced by exploratory innovation. However, the acquisition of government subsidies requires application costs, and the maintenance of the latter relationship also needs to consume certain enterprise resources. In order to maintain and retain government subsidies, companies may take measures such as investing in social welfare projects to maintain government relations. This kind of behavior may be beneficial to improve social performance [30], but it takes up too many enterprise resources, making it impossible for enterprises to develop economic and environmental performance in coordination. On the other hand, exploitative innovation has no moderating effect, and government subsidies have less impact on exploitative innovation than on exploratory innovation, which seems to be like the research conclusion of Bi et al. (2017) [47]. Due to the low risk of exploitative innovation itself, enterprises are more motivated to invest in it without government subsidies. At the same time, exploitative innovation is mainly affected by the market mechanism and has external characteristics, so the government does not need to subsidize it.

(3) Environmental tax has a negative moderating effect on the positive impact of exploratory innovation on sustainable entrepreneurial performance and has a negative moderating effect on the positive impact of exploitative innovation on sustainable entrepreneurial performance. This is contrary to our assumption. First, the environmental tax increases the compliance pressure of enterprises and intensifies internal financing constraints. The environmental tax does promote green innovation investment of enterprises through the "pressure effect" and "incentive effect", but the "cost theory" theory of environmental supervision tools increases the production cost of enterprises and occupies resources such as capital and human resources required for other innovation activities. Secondly, in the various dimensions of the evaluation system of sustainable entrepreneurial performance, economic performance accounts for the largest proportion, so the positive impact of ambidextrous innovation on sustainable entrepreneurial performance is more reflected in economic performance. Environmental taxes are helpful to improve environmental performance, but to a certain extent are not conducive to the improvement of economic performance. This is more consistent with the view of Wang et al. (2020) [48], that is, environmental tax has a better effect on environmental protection than R&D innovation. Therefore, environmental taxes play a negative moderating role in the relationship between ambidextrous innovation and sustainable entrepreneurial performance.

5.2. Theoretical Implications

This study has theoretical contributions to understanding the relationship between policy orientation, ambidextrous innovation, and sustainable entrepreneurial performance.

First, this study expands the research on the mechanism of ambidextrous innovation on enterprise performance from the perspective of sustainable entrepreneurial performance. Previous studies have mostly focused on a single financial performance [49,50], but this study integrates economic, social, and environmental performance, systematically interprets the impact of ambidextrous innovation on sustainable entrepreneurial performance, and further expands the research on the relationship between ambidextrous innovation and performance of enterprises. By drawing on diversified and measurable indicators of economic, social, and environmental performance, this study sets up an evaluation system of sustainable entrepreneurship performance indicators consisting of three secondary indicators: operating net interest rate, number of employees, and number of green patents. This has a certain enlightenment effect on quantitative research related to sustainable entrepreneurial performance.

Second, based on the perspective of policy orientation, this research organically couple's government policies (government subsidies and environmental taxes), ambidextrous innovation, and sustainable entrepreneurial performance, which makes up for the limitations of current theoretical research on the relationship between ambidextrous innovation and sustainable entrepreneurial performance. Based on the background of sustainable entrepreneurship, this study proposes a theoretical framework for policy analysis, arguing that government policies should not only focus on the support part (government subsidies), but also on the regulatory part (environmental tax). This study provides a unique theoretical perspective for understanding the role of ambidextrous innovation and sustainable entrepreneurial performance, and further reveals the complex role of government policies in the implementation of ambidextrous innovation in enterprises in the stage of high-quality economic development. First, this study further interprets the differential effect of government subsidies on ambidextrous innovation and points out the inhibitory effect of government subsidies on exploratory innovation positively affecting sustainable entrepreneurial performance. Secondly, the "crowding-out effect" of environmental tax forms a resource contradiction between the ambidextrous innovation and sustainable entrepreneurial activities of enterprises, which provides a new basis for the research on the influencing factors of sustainable entrepreneurial performance. In general, this study is helpful to enrich the research on ambidextrous innovation of enterprises and the boundary conditions of innovation and sustainable entrepreneurship using government policies, and further deepen the understanding of the research on the impact mechanism of ambidextrous innovation and sustainable entrepreneurship of enterprises under the guidance of policy.

5.3. Managerial Implications

This research also has certain practical significance.

First, enterprises should attach great importance to ambidextrous innovation strategies to sustainable entrepreneurial performance, optimize the allocation of innovation resources, and formulate scientific and reasonable ambidextrous innovation decisions. In the process of innovation, enterprises need to pay attention to communication with stakeholders and pay attention to the rights and interests of stakeholders. At the same time, it actively integrates the green concept into the ambidextrous innovation strategy, improves the production technology and production process, and reduces pollution to the environment. It is also necessary to create an innovative and sustainable cultural atmosphere within the enterprise and encourage employees to consciously pay attention to and maintain social and environmental responsibilities. Second, enterprises need to fully recognize the role of government policies in the ambidextrous innovation and sustainable entrepreneurship of enterprises. Enterprises should strive to identify the social requirements and expectations for sustainable entrepreneurship, maintain a good image, establish and improve commu-

nication channels with the government, and obtain appropriate policy support through reasonable channels. In addition, enterprises also need to accept the relevant costs arising from government policies with a correct attitude, take the initiative to improve innovative behaviors, and promote the development of sustainable entrepreneurship. Third, for policymakers, it is necessary to realize that the standards of government subsidies and environmental tax policies for enterprises should be targeted and differentiated to better guide enterprises to rationally utilize innovation resources and engage in innovative behaviors correctly. In addition, the formation of social/environmentally friendly enterprises is not achieved overnight and requires a long-term process from consciousness to behavioral habits. The government should pay attention to the implementation process, stages, and effects of government subsidies and environmental tax policies, to prevent enterprises from wrongly responding to government policies and hindering the improvement of sustainable entrepreneurial performance.

5.4. Research Limitations and Prospects

This study leaves some gaps and raises some issues that need to be addressed in future research.

First, the generalizability of our findings may be affected by the nature of the ICT industry and the timing of data collection. Future research can select samples from different industries and different observation periods to explore the possible impact of ambidextrous innovation on sustainable entrepreneurial performance. Second, the performance of sustainable entrepreneurship is measured by systematic indicators integrating economic performance (operating net interest rate), social performance (number of employees), and environmental performance (number of green patents), and the results may be one-sided. Future research could delve deeper into how firms' sustainable entrepreneurial performance is measured. Third, for government policies, we only observed government subsidies and environmental taxes, which are still incomplete. Not only did we not pay attention to the impact of other government policies (such as environmental assessment) on the relationship between ambidextrous innovation and sustainable entrepreneurial performance, but also differentiating effects between different types of government subsidies (e.g., R&D and non-R&D subsidies) and environmental taxes (e.g., sewage charges and other fees). Future research needs to focus on these factors and conduct a more detailed analysis.

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