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Landscape Fire and Entrepreneurial Activity: An Empirical Study Based on Satellite Monitoring Data

Ran Du [1], Qiyun Fang [1] and Ke Liu [2,*]

[1] School of Economics, Huazhong University of Science and Technology, Wuhan 430074, China
[2] International Business School, Shaanxi Normal University, Xi'an 710119, China
* Correspondence: liuke7936@snnu.edu.cn

Abstract: Climate change and land-use change are making landscape fires worse, causing them to grow in intensity and spread in range across Earth's ecosystems. Extreme landscape fires can be devastating to people, ecosystems, and sociology. However, most research on landscape fires has not considered their potential impact on the economy, particularly with regard to entrepreneurial activity. Entrepreneurial activity includes the entry of new markets and the creation of new products or services, thereby facilitating the creation and expansion of economic activity. This manuscript empirically analyzes the impact of landscape fires on entrepreneurial activity, based on satellite monitoring data of landscape fires in China from 2014 to 2018. Different wind direction models and instrumental variable methods are used for empirical analysis. The results of the analysis show, first, that an increase in landscape fires in a county can significantly reduce local entrepreneurial activity. We further adopt the wind direction approach and instrumental variable approach to deal with potential endogeneity issues, and the regression results are consistent. Second, compared to eastern or high-economic-development areas, central and western or low-economic-development areas are more susceptible to exogenous landscape fires. Third, landscape fires have a negative impact on entrepreneurial activity through increasing air pollution, damaging human health, increasing risk aversion, and reducing the labor supply. It is important for both the government and the public to fully recognize the potential dangers that landscape fires pose to corporate behavior. This awareness can help reduce the impact of natural disasters such as landscape fires, protect the ecological environment, and provide solid support for corporate investment and regional development.

Keywords: landscape fire; entrepreneurial activity; natural disaster; wind direction realization

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1. Introduction

In the context of global warming, the frequency and intensity of landscape fires are on the rise, resulting in substantial amounts of carbon emissions and air quality deterioration [1–3]. Landscape fire is a term applied to any fire burning in natural and cultural landscapes, e.g., natural and planted forest, shrub, grass, pastures, agricultural lands, and peri-urban areas [4,5]. Manifest in many forms, from extreme wildfires in forests or peatlands to individually small but very numerous agricultural waste burns, landscape fire therefore has local to global-scale effects on both the land and the atmosphere [5]. For example, landscape fires affect all biomes, from forests and savannahs to grasslands and tundra [6]. The term "wildfire" is used when fires are burning unwanted and unplanned [7]. These fires are the main concern, because they usually have destructive effects on the environment and the security of society. A new report, *Spreading like Wildfire: The Rising Threat of Extraordinary Landscape Fires*, by UNEP and GRID-Arendal, finds that climate change, land-use change and land management practices are making landscape fires worse. The report also notes that recent years have seen record-breaking wildfire seasons worldwide. A landscape fire results from a complex interaction of biological, meteorological, physical, and social factors that influence the likelihood of a landscape fire breaking out and its propagation and intensity, duration, and extent. They have the potential to destroy habitats, threaten biodiversity, impair ecosystem services, endanger human well-being, lives, and livelihoods, increase the long-term healthcare burden, and damage enterprise and national-level sustainable economies [8–10]. For example, many of the key ecosystem services affected by landscape fires—such as soil regulation, water regulation, and biodiversity—determine the establishment and development of enterprises in agriculture, forestry, livestock, and fishing. Understanding how landscape fire may influence relationships between ecosystem services and economic development is an important area for new research. One of the primary objectives of this study is to evaluate the economic impact of landscape fires on businesses. This includes an examination of venture capital losses incurred due to operational disruptions, workforce impairment, reduced productivity, increased costs, and potential revenue loss. The study also aims to identify effective risk management strategies and measures that businesses can implement to minimize the impacts of landscape fires. Another objective is to assess the effectiveness of existing regulations and policies related to fire prevention, preparedness, and recovery, with the goal of identifying areas for improvement in these frameworks to better support businesses affected by landscape fires.

The risk of landscape fires in many regions is changing due to changes around the world in factors such as climate, land use practices, and demographics. However, people have less understanding of the damage that landscape fires can cause to economic activities. Landscape fire economics remains a surprisingly understudied topic, especially in newly fire-prone regions of developing countries [11]. According to the *2021 Lancet Countdown China Report*, due to the impact of climate change, the average annual wildfire exposure in China increased by 24.5% from 2016 to 2020 compared to 2001–2005, and the wildfire exposure risk in 20 provinces showed an upward trend[1]. This presents the question of what impact landscape fire disasters will have on sustainable economic development. How can we effectively mitigate the adverse effects of landscape fires on businesses? Exploring these issues will be beneficial in optimizing natural-disaster management policies in various countries and is crucial for achieving green, low-carbon, and sustainable development.

Estimates of the global economic costs of landscape fires in both the short and long term indicate that they are substantial [12]. Many of the key pillars of economic development, including investment in infrastructure to improve food security, convenience of transportation networks, market access for enterprises, health service provision, and access to basic necessities such as adequate shelter, water resources, and energy sources, can be compromised by landscape fire. Extreme landscape fires can damage infrastructure such as power and communication lines, roads, and railways, and can also result in significant clean-up and rebuilding costs after a major landscape fire event [13,14]. They can also force business closures and disrupt supply and transport chains, and further reduce local entrepreneurial activity. This can decrease tax revenues and affect business economic vitality. Additionally, whole businesses and industries can be impacted if workers are laid off and decide to relocate. Destructive landscape fires also pose risks to banks and insurance companies [15]. Therefore, the impacts of landscape fires on industry, innovation, and infrastructure can hinder the achievement of inclusive and sustainable industrialization, particularly for small-scale industrialization in developing countries.

Landscape fires can produce intense, harmful smoke and air pollution that can affect health and cause fatalities. They can also cause feelings of confusion, fear, loss, and risk aversion, all of which can devastate individuals and communities that experience them. Impacts on human physical and psychological health represent an avenue through which landscape fire can indirectly constrain economic sustainability, such as healthy business growth. Many contemporary notions of development view progress in human well-being not simply in terms of increasing personal income or national economic growth, but as the creation of an enabling environment for people to enjoy long, healthy lives that they have reason to value [16]. However, landscape fires release greenhouse gases into the atmosphere, which can impede climate mitigation action and green low-carbon development. Therefore, landscape fires produce fine particle air pollution, which threatens human good health and well-being, ecosystems and sustainable economic development.

Landscape fire can also reduce the supply and income of labor, cause disruption and losses in entrepreneurship, and change the pattern of income distribution, thereby exacerbating domestic and international income inequality issues, particularly among the poor and populations in developing countries. The livelihoods of the poor are hit hardest by climate change and landscape fire. They are the least capable of adjusting and are more heavily reliant on natural resources. This ultimately affects the achievement of longer-term poverty alleviation goals in most countries and is detrimental to long-term economic growth. Landscape fire has significantly reduced local entrepreneurial activity through the above-mentioned channels, which will inevitably lower the overall level of local economic development.

Based on this, we collated the daily landscape-fire point data of each county (district) in China from 2014 to 2018. Using this data, we conducted an empirical analysis of the impact of landscape fire on entrepreneurial activity. Entrepreneurial activity is defined as "the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets" (OECD, 2007). Entrepreneurial activity is a catalyst for economic development as it drives innovation, job creation, productivity gains, wealth creation, and regional development.

The contributions of this study are as follows: first, current research on landscape fires mainly focuses on their spatiotemporal distribution and their impact on human capital and specific industries. This paper, however, examines the impact of natural disaster—landscape fire on entrepreneurial activity from a micro perspective. Our empirical results show that landscape fires have generated huge external costs for enterprises. The present study reveals the importance of preventing and reducing losses from extreme natural disasters such as landscape fires. Second, previous studies have mostly analyzed entrepreneurial behavior based on macro- and micro-factors. From a macro-perspective, factors such as government regulation [17], accessibility of transportation [18], and industrial development [19] are considered. Some scholars have studied the impact of natural disasters such as hurricanes on entrepreneurial activity [20], but few studies have investigated the impact of landscape fire on enterprise decision-making behavior [21]. At the same time, we further analyze the heterogeneous impact of different wind direction patterns and other types of landscape fires, providing new governance perspectives for individuals, enterprises, and local governments. Third, using rich satellite monitoring data on landscape fires and comparable data on new startups, the manuscript focuses on the impact of landscape fire on entrepreneurial activity by increasing air pollution, damaging human health, increasing risk aversion, reducing labor supply, etc. This article delves deeper into the mechanisms of the external effects of landscape fires.

The rest of the paper is organized as follows. Section 2 discusses variable selection and empirical methods; Section 3 analyzes the empirical results; Section 4 analyzes the potential impact mechanisms; and Section 5 presents the conclusions and implications.

2. Theoretical Analysis and Hypothesis

2.1. Effects of Landscape Fire on Entrepreneurial Activity

Exposure to smoke from landscape fires can exert a considerable influence on entrepreneurial activity. Firstly, landscape fires can force business closures and disrupt the supply and transport chains of enterprises [22], thereby directly reducing local entrepreneurial activity. Secondly, landscape-fire smoke contains a mixture of pollutants, including particle pollution and hazardous air pollutants. Landscape-fire smoke exposure may cause temporary illness among individuals, leading to lost work hours and decreased productivity [23], thereby further reducing corporate performance [24]. A less efficient workforce increases production costs for entrepreneurs. This can make it more challenging for them to establish a new enterprise. Especially in a competitive market, businesses need to be efficient to stay competitive. Thirdly, destructive landscape fires also pose risks to banks and insurance companies [15]. The banking and insurance sectors offer vital services to entrepreneurs, including financing, risk management, and protection. If the local banking and insurance industries are damaged, it will directly hinder the ability of entrepreneurs to obtain funds and protection, thereby reducing entrepreneurship.

Hypothesis 1. *An increase in landscape fire can reduce entrepreneurial activity.*

2.2. Mechanism Analysis of Landscape Fires' Impact on Entrepreneurial Activity

Mechanism analysis is conducted using indicators such as air pollution, health, risk aversion, and labor supply. First, the smoke from landscape fires contains a large number of toxic particles such as PM2.5 (PM2.5 refers to particulate matter that is 2.5 μm or less in diameter) and nitrogen oxides. These primary reactants may further react in the air to produce secondary pollutants such as ozone, affecting regional air quality and health [3,23]. Additionally, existing research has also found that air pollution can affect the migration of labor [25], reduce the quality of human capital [26,27], reduce the production efficiency of enterprises [28], and lower the performance level of enterprises [29], thereby affecting local entrepreneurial behavior.

Second, landscape fires can reduce individual health levels. As mentioned earlier, landscape fires' smoke contains a large amount of toxic substances that can enter the lungs and penetrate further into the bloodstream. Therefore, landscape fires not only directly affect the safety of individual life and property, but also affect physical and mental health by producing a large amount of harmful substances. Relevant studies have shown that landscape fires increase the risk of exposure and have a significant impact on all-cause mortality [30], especially by increasing respiratory diseases such as asthma, increasing the number of medical visits and hospitalizations [31], and negatively affecting individual emotional states, which may further affect personal health [32]. Physical health is crucial for labor productivity and enterprise development.

Third, landscape fires can reduce risk-taking tendencies, that is, increase individual risk aversion. The impact of social capital such as risk-taking tendencies on entrepreneurial activity has long been a focus of theoretical attention. The degree of risk preference is a psychological characteristic of the individual, including the individual's expectations and utility-based evaluations of future uncertain events, and thereby affecting the individual's entrepreneurial decision-making choices [33]. Bu and Liao (2022) find that reducing risk aversion is conducive to reducing individual uncertainty about society, improving the individual's adventurous spirit, and thus promoting the establishment of enterprises [34]. Natural disasters such as landscape fires may increase individual uncertainty about the future and reduce individual psychological expectations, thereby increasing individual risk aversion tendencies, which then reduces investment and entrepreneurial behavior.

Fourth, landscape fires can reduce labor supply. As mentioned earlier, landscape fire smoke contains a large number of pollution particles that can damage the health of the labor force, causing loss of work efficiency, absenteeism, and resignation behavior due to illness. Moreover, Borgschulte et al. (2022) found that exposure to landscape fire smoke reduced local labor income, employment, and participation [23]. Furthermore, an increase in landscape fires may also increase individual protective behavior, affecting the level of labor supply, especially for individuals with higher incomes and education levels, who are more likely to engage in avoidance behavior [32]. In addition, research has found that the more labor supply there is in the market, the more it can improve the attractiveness of local investment promotion and thus be conducive to the establishment of new enterprises [35]. Therefore, frequent landscape fires may reduce the labor supply in the region and thus reduce entrepreneurial activity.

Hypothesis 2. *Landscape fires can affect entrepreneurial activity through air pollution.*

Hypothesis 3. *Landscape fires affect entrepreneurial activity by impacting individual health.*

Hypothesis 4. *Landscape fires can affect entrepreneurial activity through risk-taking tendencies.*

Hypothesis 5. *Landscape fires reduce the labor supply in the region and thus reduce entrepreneurial activity.*

3. Data and Methods

3.1. Data Sources and Variable Selection

We collected landscape fire data for China from 2014 to 2018. There are several reasons for this. (1) China's air automatic monitoring stations began publishing air quality data for major Chinese cities in 2014, so this study chose 2014 as the starting year; (2) in November 2018, a new national comprehensive fire rescue team was established to effectively curb disasters such as fire hazards. In order to eliminate policy interference factors, this study chose 2018 as the end year.

3.1.1. The Dependent Variable

This study draws on the research of Kong and Qin [36], and uses the number of new enterprises per 10,000 people in each county from 2014 to 2018 to measure the level of entrepreneurial activity. The data on new enterprises come from the AiQiCha database, which uses the National Enterprise Credit Information Publicity System as its data source. The population data for each county is measured using the resident population data in the statistical yearbook, and missing population data is filled in[2].

3.1.2. Core Explanatory Variable

Economists currently face major challenges in studying the impacts of landscape fire disasters on entrepreneurial activity. Past research has been limited by data statistics and has focused more on the impact of large-scale landscape fires in specific regions and at specific times, with less coverage of the impact of small-scale and more distant fires [31]. Therefore, this study adopts the relatively novel VIIRS high-resolution satellite monitoring data on the NASA website[3] [37–39]. We obtained the number of fire pixels per day from VIIRS, and then aggregated the number of fires per day for each county from 2014 to 2018 to form the "county–year" data. In contrast to traditional landscape fire monitoring datasets, this dataset includes a greater number of nighttime fire points and small fire points, enabling more precise measurement of sporadic or short-duration landscape fire events [40]. In addition, this study draws on the research of Graff Zivin et al. [41] and selects fires within a 40 km radius of the administrative center as the core explanatory variable. Landscape fires are measured by adding 1 to the number of fires and taking the logarithm.

3.1.3. Instrumental Variable

This study uses the ventilation coefficient as an instrumental variable. The ventilation coefficient is the product of wind speed and the height of the boundary layer. Data from 2014 to 2018 on wind speed at 10 m and boundary layer height comes from the ERA-Interim database of the European Centre for Medium-Range Weather Forecasts.

3.1.4. Meteorological Variables

Drawing on the research of Graff Zivin et al. [41], this study selected meteorological control variables, including average precipitation, average temperature, average wind speed, and average air pressure for each county. The original meteorological data came from the China Surface Climate Data Daily Dataset (V3.0). This study followed the design method of Deschênes and Greenstone [42] and used the inverse distance weighting interpolation method (IDW) to interpolate daily meteorological data into grid data to obtain annual meteorological data for each county.

Given the relatively small number of meteorological stations in each region, it was not feasible to obtain the wind direction at a specific location using the inverse distance weighting of multiple monitoring stations [43]. Therefore, based on the availability and applicability of data, the wind direction of each county was measured using the wind direction of the maximum wind speed at each meteorological station, and counties with two or more meteorological stations were excluded[4]. We identified landscape fires in various directions on a daily basis and consolidated the data into an annual county-level format, as previously outlined.

3.1.5. Economic Control Variables

In general, entrepreneurs will comprehensively consider various factors that affect entrepreneurship to obtain the best location choice and investment decision. Therefore, this study selected the following economic control variables: gross domestic product, year-end loan balance, and the proportion of the secondary industry within the GDP [44]. The data came from the *China County Statistical Yearbook*.

3.1.6. Mechanism Variables

(1) Air pollution: This study used PM2.5 to measure the air pollution index, with original data from 2014 to 2018 coming from the daily data of the National Urban Air Quality Real-time Release Platform[5]. Considering that different air pollution may have an impact on entrepreneurship, this study further used the Air Quality Index (AQI) and PM10 (PM 10 describes inhalable particles, with diameters that are generally 10 µm and smaller), NO_2, SO_2, etc. as indicators of air pollution. (2) Health indicators: the data come from the 2015 and 2017 China Household Finance Survey (CHFS) databases. (3) Risk aversion: the data come from the 2015 and 2017 China Household Finance Survey (CHFS) databases. (4) Labor supply: the data come from the *China County Statistical Yearbook*, with the proportion of enterprise employees in the total population at year's end used to measure the local labor supply quantity. The average wage of on-the-job workers was used to measure the local labor income level. Detailed variable definitions are shown in Table 1.

Table 1. Variable definitions and measurement methods. (The data come from the AiQiCha database, the VIIRS high-resolution satellite monitoring database, the ERA-Interim database, the China Surface Climate Data Daily Dataset, the National Urban Air Quality Real-time Release Platform database and the *China County Statistical Yearbook*.)

Variables	Definition
Panel A: Core variables.	
Business	Entrepreneurial activity: The number of new enterprises per capita, i.e., the number of new enterprises/total population of the county, and the logarithm is taken; unit: per 10,000 people.
Entry rate	Enterprise entry rate = Number of enterprises created in year t/Number of enterprises created in year t − 1.
Landscape fire	The number of landscape fire spots within a radius of 40 km from the administrative center, 1 is added to the sum, and the logarithm is taken; unit: pixels.
Panel B: Wind direction types and instrumental variables.	
Upwind	The number of landscape fire spots at a 45-degree angle to the left and right of the upwind, 1 is added to the sum, and the logarithm is taken; unit: pieces.
Downwind	The number of landscape fire spots at a 45-degree angle to the left and right of the downwind, 1 is added to the sum, and the logarithm is taken; unit: pieces.
Ventilation	Average ventilation coefficient = wind speed at 10 m height × boundary layer mixing height.

Table 1. *Cont.*

Variables	Definition
Panel C: Meteorological control variables.	
Precipitation	Average annual precipitation for each county; unit: mm.
Temperature	Average annual temperature for each county; unit: °C.
Wind speed	Average annual wind speed for each county; unit: m/s.
Atmospheric pressure	Average annual air pressure for each county; unit: hPa.
Panel D: Economic control variables.	
GDP	Economic scale: measured by county GDP, the logarithm is taken; unit: RMB 10,000.
Finance	Financial loans: balance of various loans at the end of the year, the logarithm is taken; unit: RMB 10,000.
Structure	Industrial structure: the proportion of the secondary industry in GDP.
Panel E: Mechanism variables.	
PM2.5	Average annual PM2.5 concentration for each county, the logarithm is taken; unit: $\mu g/m^3$.
AQI	Annual comprehensive air quality index for each county, the logarithm is taken.
PM10	Average annual PM10 concentration for each county, the logarithm is taken; unit: $\mu g/m^3$.
NO_2	Average annual nitrogen dioxide concentration for each county, the logarithm is taken; unit: $\mu g/m^3$.
SO_2	Average annual sulfur dioxide concentration for each county, the logarithm is taken; unit: $\mu g/m^3$.
Health	Physical health: "Compared to your peers, how is your current physical condition?" The respondent gives a self-evaluation of their physical condition. The higher the number, the less healthy the body.
Risk aversion	Risk aversion: "If you have a sum of money for investment, which investment project would you prefer?" The respondent's tendency to avoid risk ranges from "high-risk, high-return projects" to "unwilling to take any risks", that is, the higher the value of the selected option, the higher the individual's degree of risk aversion.
Labor supply	Labor supply quantity: the proportion of enterprise employees in the total population at the end of the year, the logarithm is taken.
Labor income	Labor income level: average wage of on-the-job workers, the logarithm is taken; unit: yuan (RMB).

Table 2 provides descriptive statistics. In terms of entrepreneurial activity, an average of 85.49 new businesses are established per 10,000 individuals annually in each county. The number of new business start-ups per year is 1.25 times higher than in the previous year. The findings indicate an upward trend in the average number of new businesses per county. With respect to core explanatory variables, each county experiences an average of 105.25 landscape fires per year.

Table 2. Descriptive statistics. (The Health and Risk Aversion variables come from cross-sectional data in 2015, while the data for other variables are from 2014 to 2018).

	N	Mean	SD	Min	Max
Business	4501	85.49	59.62	0.33	962.39
Entry rate	10,271	1.25	3.53	0.09	330
Landscape fire	9903	105.25	257.32	0	7068
Temperature	10,252	13.76	5.36	−3.37	25.74
Wind speed	10,252	2.09	0.54	0.83	4.97
Precipitation	10,267	982.35	570.65	25.76	3385

Table 2. *Cont.*

	N	Mean	SD	Min	Max
Atmospheric pressure	10,252	934.51	93.79	589.57	1016.89
GDP	10,272	1,975,341.72	2,656,645.44	15,905	38,321,500
Finance	10,189	1,369,259.88	2,716,292.82	276	79,748,831
Structure	10,272	0.42	0.15	0.01	0.93
Ventilation	12,311	1193.78	564.43	207.09	5014.53
PM2.5	10,257	47.22	17.95	9.71	147.77
PM10	10,252	84.52	37.68	21.21	418.77
AQI	10,252	74.41	24.55	27.65	200.40
SO_2	10,252	21.78	13.42	2.65	111.79
NO_2	10,252	29.63	10.15	6.78	66.09
Health	33,408	2.61	0.94	1	5
Risk aversion	33,483	4.07	1.17	1	5
Labor supply	746	170.49	216.91	1.1381	2185.1511
Labor income	1240	53,668.59	13,014.41	28,571	127,692

3.2. Regression Models

To test the impact of landscape fires on entrepreneurial activity, we constructed the following empirical model:

$$Y_{it} = \beta_0 + \beta_1\ Landscape\ fire_{it} + \beta_2\ Control_{it} + \pi_t + \tau_i + \varepsilon_{it} \quad (1)$$

where i represents the county and t represents time. The dependent variable Y represents entrepreneurial activity, the explanatory variable $Landscape\ fire$ represents the number of landscape fires, and $Control$ represents other control variables. τ_i is the individual fixed effect and π_t is the time-fixed effect, which can accurately reflect individual characteristics and time characteristics. Individual fixed effects can be used to control for unobserved time-invariant heterogeneities across entities. Time-fixed effects can be used to control for variables that are constant across entities but vary over time. The purpose of time-fixed effects is to absorb the impact of unobservable homogeneity shocks in the time dimension, that is, time factors shared by all individuals, such as macroeconomic shocks, fiscal and monetary policies, etc. According to the design of this model, β_1 is the estimated coefficient of the core explanatory variable in the manuscript, representing the impact of landscape fires on entrepreneurial activity.

It is challenging to find an appropriate method to distinguish the pollution effects of landscape fire from confounding economic effects. Exposure to landscape fire pollution may be correlated with various unobserved socio-economic factors, behavioral patterns, or other environmental factors that can also influence entrepreneurial activity [45]. Therefore, we compare the difference in entrepreneurial activity impacts between upwind and non-upwind areas. The underlying assumption of this approach is that holding other conditions constant, individuals in upwind and non-upwind areas experience various levels of landscape fire pollution but are symmetrically affected by economic and other factors. The specific analysis is shown in Figure 1.

$$Y_{it} = \alpha_0 + \alpha_1\ Upwind_{it} + \alpha_2\ Control_{it} + \pi_t + \tau_i + \varepsilon_{it} \quad (2)$$

$$Y_{it} = \delta_0 + \delta_1\ Downwind_{it} + \delta_2\ Control_{it} + \pi_t + \tau_i + \varepsilon_{it} \quad (3)$$

$$Y_{it} = \gamma_0 + \gamma_1\ Upwind_{it} + \gamma_2\ Downwind_{it} + \gamma_3\ Control_{it} + \pi_t + \tau_i + \varepsilon_{it} \quad (4)$$

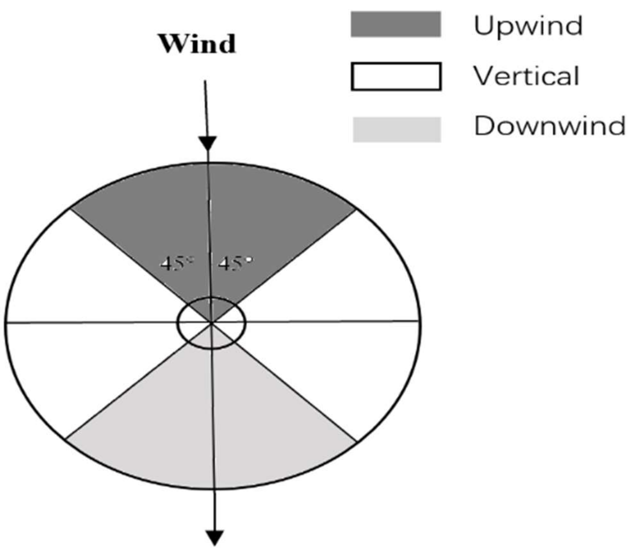

Figure 1. Wind Direction Type Diagram.

Due to the aforementioned differences in impact, we estimate that $|\gamma_1|>|\gamma_2|$ in Formula (4). Additionally, we employ the instrumental variable method to empirically investigate the impact of landscape fire on entrepreneurial activity.

In the mechanism analysis, we use an ordered Probit model for estimation because the health and risk aversion indicators are ordinal data. Control variables are replaced with education level, marital status, age, whether engaged in industrial and commercial production and operation projects, and family income[6]. The ordered Probit model can estimate the corresponding threshold parameters μ_j (j = 1, 2, 3, 4, 5 representing the ordered values of the discrete variable). When the latent variable Y^* falls within the range (μ_{j-1}, μ_j], the health level or risk aversion level of individual i in year t is j, or the conditional probability that Y_{it} is j is:

$$P_r(Y_{i,t} = j|X_{i,t}) = F\left(\mu_j - \beta_0 + \beta_1\ Wildfire_{it} + \beta_2\ X_{it}\right) - F\left(\mu_{j-1} - \beta_0 + \beta_1\ Wildfire_{it} + \beta_2\ X_{it}\right) \quad (5)$$

where $F(\cdot)$ is the cumulative normal distribution function and satisfies: $\sum P_r(y_{i,t} = j) \equiv 1$, $\forall i, t$.

4. Empirical Analysis

4.1. Baseline Results

The empirical results are shown in Table 3. In columns (1) and (2), only meteorological variables are controlled. The coefficients of the landscape fire variable are significantly negative. In columns (3) and (4), both economic and meteorological variables are controlled. A 1% increase in local landscape fires results in a 0.03 percentage point decrease in the number of startups. Landscape fires can force business closures and disrupt the supply and transport chains of enterprises. Additionally, landscape-fire smoke exposure may cause temporary illness among individuals, leading to lost work hours and decreased productivity, thereby further reducing the corporate performance. The empirical results consistently indicate that an increase in landscape fire reduces local entrepreneurial activity, indicating that hypothesis 2 is valid.

Table 3. The impact of landscape fires on entrepreneurial activity.

	(1)	(2)	(3)	(4)
	Business			
Landscape fire	−0.09 ***	−0.03 ***	−0.04 ***	−0.03 ***
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.00	0.00	0.00	0.00
Temperature	0.41 ***	0.21 ***	0.28 ***	0.21 ***
	(0.02)	(0.03)	(0.02)	(0.03)
Wind speed	0.59 ***	0.17 **	0.29 ***	0.18 **
	(0.05)	(0.07)	(0.06)	(0.04)
Precipitation	−0.00 ***	−0.00 ***	−0.00 ***	−0.00 ***
	(0.00)	(0.00)	(0.00)	(0.00)
Atmospheric pressure	−0.02 ***	−0.09 ***	−0.01 ***	−0.01 ***
	(0.00)	(0.00)	(0.00)	(0.00)
GDP			0.73 ***	0.23 ***
			(0.07)	(0.08)
Finance			0.10 **	−0.04
			(0.04)	(0.04)
Structure			−1.37 ***	−0.07
			(0.22)	(0.26)
Constant	15.29 ***	9.26 ***	−0.50	6.32 ***
	(2.03)	(1.28)	(1.78)	(1.88)
County FE	Y	Y	Y	Y
Year FE	N	Y	N	Y
Observations	4394	4394	4384	4384
R^2	0.93	0.94	0.94	0.94

Note: The numbers in parentheses are clustered standard errors at the county level; ***, **, and * mean significant at 1%, 5%, and 10%, respectively. Unless otherwise specified, all subsequent tables are the same as this table.

4.2. Robustness Checks

4.2.1. Adjustment of Clustering Standard Errors

In the benchmark regression, we primarily selected clustered robust standard errors at the county level. Based on this, we further chose clusters at the city level, provincial level, and county-time level in our empirical analysis. As shown in Table 4, column (1) clusters at the city level, column (2) clusters at the provincial level, and column (3) clusters at the district–county–time level. The results demonstrate that replacing different clustered robust standard errors yields results consistent with the benchmark results.

Table 4. Adjustment of clustering standard errors.

	(1)	(2)	(3)
	The City Level	**The Provincial Level**	**The County-Time Level**
	Business		
Landscape fire	−0.03 **	−0.03 **	−0.03 ***
	(0.01)	(0.01)	(0.01)
p-value	0.02	0.04	0.00
climate controls	Y	Y	Y
economic controls	Y	Y	Y
County FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	4384	4384	4384
R^2	0.9412	0.9412	0.9412

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.2.2. Controlling for Different Types of Fixed Effects

Provinces and cities with higher economic levels tend to exhibit greater entrepreneurial activity. Concurrently, residents and governments in these areas may have more stringent environmental protection requirements and may implement policies aimed at preventing and mitigating the impact of landscape fires. This dynamic may introduce endogeneity concerns into the empirical analysis presented in this manuscript. To address this issue, we employ a variety of fixed-effects models to mitigate the influence of potential macro-level systemic changes. As demonstrated in Table 5, after accounting for potential macro-level environmental changes, our conclusions remain consistent with our baseline findings.

Table 5. Controlling for different types of fixed effects.

	(1)	**(2)**	**(3)**	**(4)**
		Business		
Landscape fire	−0.05 ***	−0.04 **	−0.03 ***	−0.03 ***
	(0.01)	(0.02)	(0.01)	(0.01)
p-value	0.00	0.04	0.00	0.00
climate controls	Y	Y	Y	Y
economic controls	Y	Y	Y	Y
Province FE × Year FE	Y			
Province FE	Y		Y	
City FE × Year FE		Y		
City FE		Y		Y
County FE			Y	Y
Year FE			Y	Y
Observations	4425	4245	4384	4384
R^2	0.73	0.81	0.94	0.94

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.2.3. Substituting the Landscape Fire Counts with an Alternative Distance Range

In the baseline regression, this study considers the number of landscape fires within a 40-km radius of the administrative center of each district and county. We further conducted regression analyses for landscape fires within different radial distances from the administrative center. The results consistently indicate that an increase in landscape fire hazards is associated with a decrease in entrepreneurial activity. Figure 2 visually depicts the regression coefficients and 95% confidence intervals of landscape fires at different distances.

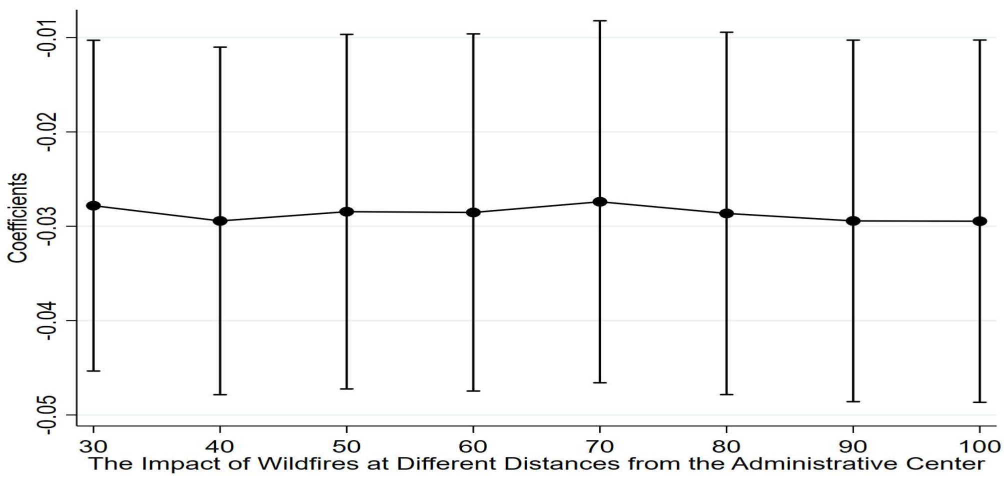

Figure 2. Regression coefficients and confidence intervals of the impact of landscape fires at different distances (km) from the administrative center.

4.2.4. Substitution of the Criteria for Assessing the Central Position of Counties

In the benchmark regression, the administrative center of each county is used to count the number of landscape fires in each county. Drawing on the research design of He, Liu, and Zhou [46], the centroid of each county is used as the central standard for robustness testing. The regression results all indicate that when landscape fire disasters increase, this will reduce entrepreneurial activity. As shown in Figure 3, this article visualizes the regression coefficients and 95% confidence intervals of landscape fires within different radial distances from the centroid.

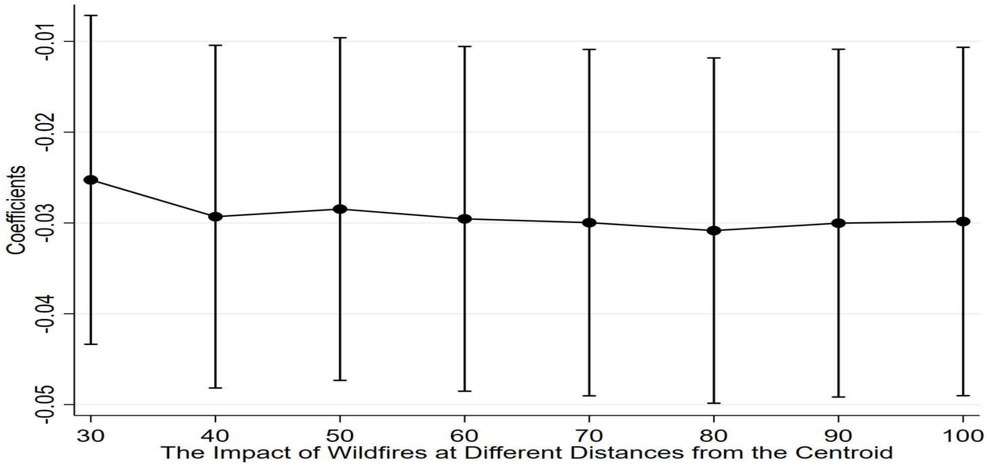

Figure 3. Regression coefficients and confidence intervals of the impacts of landscape fires at different distances (km) from the centroid.

4.2.5. Alteration of the Dependent Variable

In this study, we draw upon the research of Bu and Liao [34] and employ the firm entry rate as a proxy variable for entrepreneurial activity in our robustness analysis. The formula for the entry rate is the number of firms established in year t divided by the number of firms established in year $t-1$.

As demonstrated in Table 6, the empirical results indicate that landscape fires significantly diminish the local business entry rate when entrepreneurial activity is gauged by the business entry rate, thereby corroborating the robustness of our benchmark findings.

Table 6. Robustness test for the alteration of the dependent variable.

	(1)	(2)	(3)	(4)
	The Administrative Center		**The Centroid**	
	Entry Rate			
Landscape fire	−0.03 ***	−0.03 ***	−0.03 ***	−0.03 ***
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.00	0.00	0.00	0.00
Climate controls	Y	Y	Y	Y
Economic controls	N	Y	N	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	9876	9797	9876	9797
R^2	0.25	0.25	0.25	0.25

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.2.6. Analysis of the Impact of Fire Points with Varying Levels of Confidence

This study builds upon the methodology employed by Rangel and Vogl [45] to examine the impact of landscape fire hazards with varying levels of confidence on cognitive performance. Confidence is a metric utilized to quantify the degree of thermal anomalies present in fire points and serves as an indicator of the level of certainty associated with pixels identified as fire points. Algorithmic calculations classify fire points into high, normal, or low confidence levels. This study conducts regression analysis using fire points of different confidence levels in the source data and summarizes the results in Table 7. Fire points at various levels of confidence all have a negative impact on entrepreneurial activity, which is consistent with the basic conclusion.

Table 7. The impact of fire points with different confidence levels.

	(1)	(2)	(3)
	High Confidence Levels	**Normal Confidence Levels**	**Non-Low Confidence Levels**
		Business	
Landscape fire	−0.02 *	−0.03 ***	−0.03 ***
	(0.01)	(0.01)	(0.01)
p-value	0.06	0.00	0.00
Climate controls	Y	Y	Y
Economic controls	Y	Y	Y
County FE	Y	Y	Y
Year FE	Y	Y	Y
Observations	1824	4366	4369
R^2	0.96	0.94	0.94

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.3. Further Tests

4.3.1. Analysis of the Effects of Landscape Fires with Different Wind Directions

In this study, we further examined the effects of landscape fires upwind and downwind at varying wind angles. Table 8 columns (1)–(3) and (4)–(6) are divided by wind direction at 45 and 30°, respectively. As indicated by the empirical results, upwind landscape fires diminish the incidence of local entrepreneurship to a greater extent than do downwind landscape fires. Compared to those downwind, businesses located upwind are more affected by air pollution and other consequences generated by landscape fires, which can reduce workforce health and efficiency, thereby impacting business productivity. Consequently, managers tend to reduce business locations in areas where upwind landscape fires occur. Additionally, the results indicate that the smaller the wind direction angle, the larger the estimated coefficient value. This is similar to the standard pollution dispersion model. A larger angle includes more treated upwind samples and individuals exposed to secondary pollution rather than landscape fire exposure [41].

Table 8. Analysis of the effects of landscape fires with different wind directions.

	(1)	(2)	(3)	(4)	(5)	(6)
		45°			**30°**	
		Business			**Business**	
Upwind	−0.02 **		−0.02 *	−0.03 **		−0.04 **
	(0.0121)		(0.01)	(0.01)		(0.02)
Downwind		−0.01	0.00		0.01	0.02
		(0.01)	(0.01)		(0.01)	(0.01)
p-value	0.05	0.38	0.08	0.02	0.62	0.02
Climate controls	Y	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	1307	1307	1307	1228	1228	1228
R^2	0.96	0.96	0.96	0.96	0.96	0.97

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.3.2. Instrumental Variable Method

In the standard box model of air pollution, the ventilation coefficient is a determinant of the rate of pollution dispersion [47], one representing the product of wind speed and boundary layer mixing height. Wind speed determines horizontal dispersion, while the boundary layer height determines vertical dispersion. A higher ventilation coefficient affects landscape fire intensity and transports pollution particles to further and higher areas [48].

We use the ventilation coefficient as an instrumental variable for landscape fires. Table 9 shows the 2SLS regression results. Columns (1)–(2) show the impact of fire points within a 40 km radius of the administrative center. Columns (3)–(4) show the impact of fire points within a 40 km radius of the centroid. The first-stage F-values are all greater than 10. The second-stage regression results indicate that landscape fires significantly reduce local entrepreneurial activity.

Table 9. Instrumental variable regression.

	(1)	**(2)**	**(3)**	**(4)**
	The Administrative Center		**The Centroid**	
Panel A: The first stage of regression	Landscape fire			
Ventilation	0.97 ***	0.91 ***	1.05 ***	1.00 ***
	(0.23)	(0.23)	(0.21)	(0.21)
Panel B: The second stage regression	Business			
Landscape fire	−0.52 ***	−0.52 ***	−0.48 ***	−0.48 ***
	(0.15)	(0.17)	(0.13)	(0.14)
p-value	0.00	0.00	0.00	0.00
Climate controls	Y	Y	Y	Y
Economic controls	N	Y	N	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	4442	4432	4442	4432
The first stage F-values	17.56	15.58	24.63	22.27
p	0.00	0.00	0.00	0.00

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.3.3. The Persistence Effects of Landscape Fire

To test whether landscape fires have a persistent effect on entrepreneurial behavior, this study included a one-period lag of landscape fires in the baseline regression. The results in Table 10 indicate that, when considering the lagged effect of fires, current landscape fires still significantly reduce local entrepreneurial activity. However, when examining the effect of lagged fires on entrepreneurial activity separately, it is found that lagged landscape fires do not have a significant impact on current entrepreneurial activity. The potential reason for this phenomenon may be that, as fires that occurred in previous periods are farther in the past, the immediate urgency and salience of those events may diminish over time. Additionally, fire incidents in the past can lead to learning and adaptation in terms of prevention, preparedness, and response strategies. Factors such as environmental conditions, firefighting capabilities, and prevention measures may have improved, reducing the likelihood or impact of future fires. Therefore, entrepreneurs may make decisions based on the current understanding of the situation rather than historical events.

Table 10. Persistent effect of landscape fire.

	(1)	(2)	(3)	(4)
	Business			
Landscape fire	−0.02 **	−0.02 **		
	(0.01)	(0.01)		
p-value	0.02	0.02		
Landscape fire$_{t-1}$	−0.01	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.16	0.29	0.153	0.288
Climate controls	Y	Y	Y	Y
Economic controls	N	Y	N	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	3064	3056	3073	3065
R^2	0.96	0.96	0.96	0.96

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.4. Heterogeneity Analysis

4.4.1. Impact of Different Income Levels

The relationship between landscape fire and entrepreneurial activity may be moderated by the varying economic development levels of different counties. In this study, we use the GDP per capita of each county to measure the local economic development level. Furthermore, we employ Landscape fire × perGDP to denote the interaction term between the number of landscape fires and GDP per capita. The results are presented in Table 11. Column (1) indicates the effect of landscape fire on entrepreneurial activity within a 40-km radius from the administrative center, while column (2) indicates the effect of landscape fire on entrepreneurial activity within a 40 km radius from the centroid. The results demonstrate that the higher the level of economic development, the more it reduces the negative impact of landscape fires on entrepreneurial activity. This is because a higher level of economic development is associated with better local health services, greater availability of information on pollution and defensive investments, and increased resilience to the negative effects of pollution [46].

Table 11. Heterogeneous effects of different types of landscape fires.

	(1)	(2)	(3)	(4)
	Administrative Center	Centroid	East	Midwest
	Business			
Landscape fire	−0.32 ***	−0.32 ***	−0.04 ***	0.03
	(0.12)	(0.11)	(0.01)	(0.03)
perGDP	0.88 ***	0.88 ***		
	(0.05)	(0.05)		
Landscape fire × perGDP	0.03 **	0.03 **		
	(0.01)	(0.01)		
East × Landscape fire			0.06 **	
			(0.03)	
Midwest × Landscape fire				−0.06 **
				(0.03)
Climate controls	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	4184	4184	4384	4384
R^2	0.92	0.92	0.94	0.94

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

4.4.2. Analysis of the Effects in Different Regions

Due to variations in resource conditions and development levels, there are more pronounced heterogeneous differences in the frequency of landscape fires and entrepreneurial activity in different regions. In this study, we divide the region into East and Central-West regions based on administrative region division criteria. In addition, we examine the heterogeneous differences of landscape fires affecting entrepreneurial activity in different regions. As indicated in columns (3)–(4) of Table 11, East × Landscape fire represents the interaction term between the dummy variable for the eastern region and landscape fire. Midwest × Landscape fire represents the interaction term between the dummy variable for the midwest region and landscape fire. The results indicate that regional heterogeneity has a significant moderating effect on the outcome.

The eastern region has a relatively high level of economic development, and the public has a relatively stronger awareness of environmental protection. They are more capable and willing to reduce the adverse effects of landscape-fire pollution. In contrast, in the central and western regions, the moderating effect of landscape fire on entrepreneurial activity is negative. Possible reasons are that the central and western regions have relatively abundant forest and grassland resources, landscape fires occur more frequently, and the central and western regions place more emphasis on economic development needs and do not pay enough attention to the prevention of landscape fire pollution sources.

5. Mechanism Analysis

5.1. Air Pollution

Landscape fire smoke contains a substantial quantity of particulate matter and noxious gases, among other pollutants, thereby impacting regional air quality and public health, and diminishing the entrepreneurial activity of local businesses. As demonstrated in columns (1)–(5) of Table 12, with PM2.5, PM10, AQI, SO_2, and NO_2 as explanatory variables, respectively, the study corroborated that landscape fires increase air pollution. Consequently, the recurrent incidence of landscape fires generates a considerable amount of air pollution, which can have significant repercussions on both health and productivity and dissuade businesses from establishing themselves in the area.

Table 12. Analysis of the mechanism of air pollution.

	(1)	(2)	(3)	(4)	(5)
	PM2.5	**PM10**	**AQI**	**SO_2**	**NO_2**
Landscape fire	0.02 *** (0.00)	0.02 *** (0.00)	0.01 *** (0.00)	0.02 *** (0.00)	0.01 ** (0.00)
p-value	0.000	0.000	0.000	0.000	0.036
Climate controls	Y	Y	Y	Y	Y
Economic controls	Y	Y	Y	Y	Y
County FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Observations	9797	9787	9787	9787	9787
R^2	0.92	0.92	0.93	0.88	0.88

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

5.2. Health

Landscape fire smoke contains a large amount of toxic substances that can enter the lungs and further penetrate into the bloodstream. Therefore, landscape fires not only directly affect the safety of individuals' and businesses' lives and property but also produce a large number of harmful substances that affect physical and mental health. As shown in Table 13, columns (1)–(3) use 2015 and 2017 CHFS survey data to study the impact of landscape fires on individual health. Empirical results show that landscape fires increase the level of individual unhealthiness, that is, they reduce individual health status and thus affect individual entrepreneurial behavior.

Table 13. Analysis of the mechanisms of health and risk aversion.

	(1)	(2)	(3)	(4)
	2015		2017	
	Health	Risk Aversion	Health	Risk Aversion
Landscape fire	0.27 ***	0.06 ***	0.02 ***	0.51 ***
	(0.01)	(0.01)	(0.01)	(0.03)
p-value	0.00	0.00	0.00	0.00
Control Variables	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Observations	14,521	14,553	17,288	3287
Pseudo R^2	0.06	0.06	0.07	0.08

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

5.3. Risk Aversion

The frequent occurrence of natural disasters such as landscape fires increases individual uncertainty about the future and reduces personal psychological expectations. This can increase the risk-aversion tendencies of families and individuals, thereby reducing investment and entrepreneurial behavior. As shown in Table 13, columns (2)–(4) use 2015 and 2017 CHFS survey data to study the impact of landscape fires on individual risk aversion. Empirical results show that an increase in landscape fires increases individual risk-aversion tendencies, thereby indirectly affecting individual entrepreneurial enthusiasm and hindering the establishment of new businesses.

5.4. Labor Supply

Landscape fire smoke contains a large number of pollution particles that can damage the health of the workforce. The workforce may lose work efficiency due to illness, absenteeism, and resignation behavior [14], affecting the level of labor supply and hindering the establishment of new businesses. As shown in Table 14 below, columns (1)–(2) show the impact of landscape fires on the quantity of labor supply, and columns (3)–(4) show the impact of landscape fires on labor income. The study found that landscape fires significantly reduce local businesses' employment and wage income, hindering local business development and reducing the probability of individuals choosing to start a business in the area.

Table 14. Analysis of the mechanism of labor supply.

	(1)	(2)	(3)	(4)
	Labor Supply		Labor Income	
Landscape fire	−0.07 **	−0.05 *	−0.01 ***	−0.01 ***
	(0.03)	(0.03)	(0.00)	(−0.00)
	0.03	0.05	0.01	0.01
Climate controls	Y	Y	Y	Y
Economic controls	N	Y	N	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	735	735	1223	1221
R^2	0.94	0.94	0.93	0.93

Note: ***, **, and * mean significant at 1%, 5%, and 10%, respectively.

6. Discussion

Preventing the risk of landscape fires while also improving enterprise creativity is important for improving resource allocation efficiency, enterprise productivity, and green sustainable economic development. Most existing studies have only concentrated on the economic impacts of landscape fire on specific health diseases and human capital, such as infant health [49,50], respiratory and cardiovascular diseases [30,31], and economic costs of health hazards and individual defensive behaviors [32,51–53]. Although some scholars have tried to explore the relationship between landscape fires and economic agents, they mainly focus on specific industries, such as labor force income and employment [23], house price volatility, and regional financial crisis [10,54,55]. Based on the previous research, people have not yet realized the adverse impact of landscape fire on micro-entities, especially the negative impact of landscape fires hundreds of kilometers away from the city. At the same time, businesses do not receive specific guidance on disaster prevention and mitigation. We examine the impact of landscape fire on entrepreneurial activity from the micro-firm perspective.

Moreover, suitable temperature can also affect the sustainability of start-ups that aim to reduce environmental impact or offer green solutions [56]. These start-ups may face more opportunities and challenges as climate change intensifies and public awareness increases. Precipitation can affect the economic productivity of start-ups, especially in regions that are sensitive to rainfall changes. Changes in the number of wet days, extreme daily rainfall, and monthly deviations of rainfall can reduce economic growth rates [57]. Atmospheric pressure can also affect the "environment" of entrepreneurship because changes in pressure can indicate weather patterns and natural disasters [58]. These events can disrupt the supply chains, infrastructure, and markets of entrepreneurs, as well as pose threats to their safety and well-being. Additionally, the larger the scale of the local economy, the more its size generally implies that the local market system and legal system are relatively well-developed, making it more suitable for the survival and development of enterprises [59]. Financial loans can help new companies grow their business [60]. However, excessive financial loans can increase the debt burden and risk of default for the new company, which limits the company's flexibility. Financial institutions can charge high interest rates and fees that reduce the company's profitability.

In the context of global warming, reducing global wildfire risk is a crucial component for achieving the United Nations' 2030 Agenda for Sustainable Development (the commitment to eradicate poverty and achieve sustainable development worldwide by 2030), the objectives of the Sendai Framework for Disaster Risk Reduction 2015–2030 (to substantially reduce disaster risk and losses in lives, livelihoods, health, and productive assets by 2030), and the aims of the United Nations Decade on Ecosystem Restoration 2021–2030 (to prevent, halt, and reverse the degradation of ecosystems worldwide)[7]. Therefore, there is a critical need for a better understanding of landscape-fire behavior. The implementation and maintenance of adaptive land and fire management necessitates a combination of policies, legal frameworks, and incentives that promote appropriate land and fire use [61]. Moreover, the economic goal of landscape fire management is to maximize the land's net value. This means that it is justified as long as the economic benefits of investments in risk reduction outweigh the total cost of prevention and loss.

7. Conclusions

We conducted a systematic investigation into the impact of landscape fires on entrepreneurial activity by selecting 2071 districts and counties in China from 2014 to 2018 for the study of new startups. The study reveals that an increase in the number of local landscape fires significantly diminishes entrepreneurial activity. We further undertook an empirical study based on wind patterns and discovered that upwind landscape fires are more likely to significantly reduce local entrepreneurial activity. Concurrently, the empirical analysis utilizing the instrumental variables method yields the same conclusions as the baseline regression. Additionally, there are heterogeneous effects of landscape fires on entrepreneurial activity at different regional development levels, and for different geographic regions. Finally, we find that the effect of landscape fires on entrepreneurial activity primarily operates through mechanisms such as air pollution, health level, risk aversion level, and labor supply.

This study has significant implications for the formulation of climate response strategies and environmental governance strategies in both developing and developed countries. Incorporating sustainable land use, forest management, and fire management into national development strategies and action plans—including those related to climate change adaptation and mitigation as well as biodiversity conservation—is of particular importance. Therefore, the findings from this study lead to several important policy recommendations. For one thing, leaders should formulate a comprehensive climate change adaptation strategy and ensure top-level design. Policy makers should consider the impacts of climate disasters on businesses, individuals, and the economy as a whole, improve the regulatory system, and include landscape fire monitoring in assessment criteria. Policy development should not only consider fire exposure in specific areas, but also the impact of fire smoke that drifts with the wind to tens or even hundreds of kilometers away. Therefore, when formulating policies, the government should consider the hazards posed by landscape fires in order to reduce the economic costs of smoke exposure. For another thing, relevant supporting measures should be improved. Not only should the construction of relevant legislative systems be improved, but also targeted laws and regulations related to landscape fire pollution should be developed to clarify enforcement requirements and reduce the adverse effects of fire disasters. In terms of specific supervision mechanisms, first and foremost, focus should be placed on monitoring areas where landscape fires occur frequently, in order to prevent gaps in monitoring jurisdiction, especially in areas closer to where fires occur. Secondly, emergency management capabilities should be improved to respond quickly to fire control and extinguishment, establishing an efficient and sound organizational system with strong guarantees as to reducing the degree of fire damage. Finally, public education should be strengthened to raise public awareness of prevention and establish a good interactive prevention and control system between the public and government departments.

Multiple influencing factors can mitigate the adverse effects of landscape fires on entrepreneurial activities, thereby reducing the elasticity of fires' impact. Firstly, landscape fires tend to be localized events, affecting specific regions or areas. While these areas may experience temporary setbacks or disruptions, this may not necessarily deter entrepreneurs from establishing new businesses in other regions that were unaffected. The overall impact on entrepreneurial activity depends on the scale and severity of the disaster, as well as the resilience and recovery efforts of the affected areas. Secondly, while landscape fires can create short-term challenges, they do not necessarily diminish long-term economic prospects in areas that are otherwise attractive for business development. Assessing the impact of landscape fires on entrepreneurial activity can also consider the time frame of the analysis. Finally, over time, societies and businesses have become better equipped to respond to and recover from landscape fires. Governments, organizations, and communities have implemented various measures to mitigate the impact of disasters, such as building resilient infrastructure, developing early warning systems, and implementing disaster response and recovery plans. These efforts contribute to reducing the long-term disruptions and encourage businesses to build in affected areas. In light of the aforementioned aspects, further research can be conducted in the future.

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Data Availability Statement: No new data were created in this study. Data sharing does not apply to this article.

Conflicts of Interest: The authors declare no conflict of interest.

Notes

1 Sourced from the Lancet Countdown website (https://www.lancetcountdown.org/ (accessed on 15 August 2022).

2 Year-end resident population = (Gross Regional Product (RMB 10,000)/Per Capita Gross Regional Product (RMB 10,000))/10,000.

3 Data applied in the study are available from National Aeronautics and Space Administration website (https://firms.modaps.eosdis.nasa.gov/download/ (accessed on 15 July 2022). The data's spatial resolution: VIIRS NOAA-20 375 m. Temporal coverage: 1 January 2014–31 December 2018.

4 For example: Darhan Muminggan United Banner; Abaga Banner; Tiedong District; Huma County; Gulou District; Jiaojiang District; Shizhong District; Taishan City; East District; Qumalai County; Golmud City; Dulan County; Yizhou District; Yiwu County; Qiemo County; and 15 other districts and counties.

5 China Urban Air Quality Real-time Release Platform: http://www.cnemc.cn/sssj/ (accessed on 15 August 2022).

6 Marital status (married): A dummy variable where unmarried is set to 0 and married is set to 1. Education level (education): The actual number of years of education received by the individual. Industrial and commercial production and operation projects (project): Including individual small handicraft business operations, leasing, transportation, business operations, etc. Age (age): The actual age of the individual, taking the logarithm. Total family income (total_income): The total annual income of the family, including labor income, investment income, and transfer income, taking the logarithm.

7 Spreading like Wildfire: The Rising Threat of Extraordinary Landscape Fires. https://www.unep.org/resources/report/spreading-wildfire-rising-threat-extraordinary-landscape-fires (accessed on on 15 August 2022).

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