# Simulation Study of Rural Entrepreneurial Ecosystem under Rural Revitalization Policies

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**Abstract.** China's rural entrepreneurial ecosystem is in the initial stage of development, but the current related studies have not further proposed a systematic assessment system of rural entrepreneurial opportunities to help entrepreneurs and policy makers make decisions, which is not conducive to the development of the rural entrepreneurial ecosystem. The purpose of this paper is to use structure equation modeling and system dynamics approach to analyze the dynamic feedback in the entrepreneurial ecosystem of rural entrepreneurial resources and entrepreneurial environment to assess rural entrepreneurial opportunities. The model is simulated using Vensim software, and the results show that the burden rate of entrepreneurial cost is decreasing and the rate of change of entrepreneurial opportunity support is increasing, which indicates that the overall development of factor market, transportation facilities, informationization and administrative service efficiency in Qingyuan, Guangdong Province, is developing. Finally, it is predicted that this rural entrepreneurial ecosystem has a promising and prosperous future.

**Keywords:** system dynamics, system simulation, structure equation modeling, rural entrepreneurial ecosystem, rural revitalization policies, entrepreneurial opportunity

## 1 Introduction

Active entrepreneurship policies have undoubtedly promoted the development of rural entrepreneurship ecosystems, and Qingyuan City in Guangdong Province is a typical example. Qingyuan under the rural revitalization policies relies on its own industrial base, resource endowment, and ecological environment to bring good economic benefits, the number of rural cooperatives and leading enterprises has steadily increased, and the development of rural characteristic industries has entered a high-speed junction. Qingyuan rural areas use tourism to help fight poverty. The Taoyuan area of Qingyuan formed a rural tourism industry based on lodging, innovative tourism poverty alleviation mode. In recent years, Qingyuan's rural specialty industries have been steadily laid out with promising results, but their development still faces many problems. According to the policies issued by the township government, Agriculture Bureau and Forestry Bureau in Qingyuan, the development of rural characteristic industries is attached great importance in the early stage of policy formulation, especially for tea, leisure agriculture and rural tourism. Guiding policies have been issued according to

ICEMME 2023, November 17-19, Beijing, People's Republic of China

DOI 10.4108/eai.17-11-2023.2342744

different counties respectively. However, as the promoter of policy implementation and the provider of public services, the government supply is insufficient. Qingyuan rural specialty industries are based on planting, with a long cycle, and some townships have outstanding infrastructure construction, which also increases the difficulty of specialty industry development.

According to the theory of entrepreneurial discovery[1], the real entrepreneurial process begins with the entrepreneur's discovery of the entrepreneurial opportunity, how to find potentially valuable opportunities in the complex and changing market environment and then develop and ultimately create a new business. In other words, the process of entrepreneurial opportunity discovery plays a key role in entrepreneurship, and entrepreneurs influence the subsequent series of entrepreneurial activities by discovering and evaluating opportunities in the entrepreneurial environment. Currently, China's rural entrepreneurial ecosystem is in the preliminary stage of development, facing the development dilemma of intertwining multiple subjects, multiple dimensions and multiple fields. However, relevant literature studies mainly focus on the general law of entrepreneurship, entrepreneurial behavior and entrepreneurial policies in rural areas, without further proposing a systematic assessment system of rural entrepreneurial opportunities to help entrepreneurs and policy makers make decisions, which is not conducive to the development of rural entrepreneurial ecosystems.

The purpose of this paper is to analyze the dynamic feedback in the entrepreneurial ecosystem of rural entrepreneurial resources and entrepreneurial environments using structure equation modeling and the system dynamics approach, and to assess the degree of rural entrepreneurial opportunity support by sorting out the relationships and influences among the elements of the rural entrepreneurial ecosystem.

## 2 Rural Entrepreneurial Ecosystem

Ecosystem is derived from the concept of ecology, which refers to a unified whole composed of biological communities and the environment within a certain space in nature. In this whole, organisms and organisms, organisms and the environment through the flow of energy and material cycle mutual influence, mutual constraints, in a certain period of time to achieve a state of dynamic equilibrium. A typical ecosystem should be characterized by openness, dynamics, self-regulation and periodicity. With the deepening of research, ecology has begun to penetrate into other fields, forming new theories by combining with knowledge from other fields.

Roundly[2] proposed that in an entrepreneurial ecosystem, the complex participants are interconnected in a non-linear manner to form a self-organized and adaptive ecosystem that changes with the environment, and that this ecosystem is subject to geo-cultural constraints. Chen[3] further provide a new definition of the concept of entrepreneurial ecosystem, arguing that an entrepreneurial ecosystem is an organizational system formed by multiple entrepreneurial participants (e.g., entrepreneurial firms, research institutes, investment institutions, etc.) that are continuously interacting with each other with energy (including information, resources, etc.), and in accordance with a certain order or law in a certain political, economic, and cultural environment. The academic definition of entrepreneurial ecosystems is most mainstreamed by Stam[4] which states that an entrepreneurial ecosystem

is "a set of interdependent individuals and elements that work together to promote productive entrepreneurship".

Rural entrepreneurship differs significantly from urban entrepreneurship in terms of financial market environment, types of business products, risk resistance and knowledge level. Therefore, the rural entrepreneurship ecosystem still has certain uniqueness relative to the general entrepreneurship ecosystem. Yang[5] constructed an integrated entrepreneurial ecosystem of entrepreneurship, entrepreneurial training, and entrepreneurial capital with returning college students and returning rural migrant workers as the main body under the rural revitalization strategy. And Xie[6] defined rural entrepreneurial ecosystem as the external environment faced by entrepreneurs carrying out entrepreneurial activities in the countryside, which is a synthesis of entrepreneurial environment indicators that shape the support for the orderly development of rural entrepreneurial activities. Zhang and Cui[7] compared and analyzed four classic entrepreneurship models at home and abroad Timmons, Cartner, Wickham, Sahlman, and concluded that Wickham model is the most consistent with the entrepreneurial system of farmers returning to the countryside and constructed a model of the entrepreneurial system of farmers returning to the countryside which focuses on the four elements of entrepreneur, entrepreneurial opportunity, entrepreneurial organization and entrepreneurial resources. Sheng[8] believes that rural entrepreneurial ecosystem usually refers to a dynamic network system composed of rural migrant workers and other entrepreneurial groups as the main body and their interactive and interdependent entrepreneurial ecosystem.

In summary, this paper argues that the rural entrepreneurship ecosystem is an integrated ecosystem composed of rural entrepreneurial subjects and external entrepreneurial environment elements, and the two interact with each other, as shown in **Figure 1**.

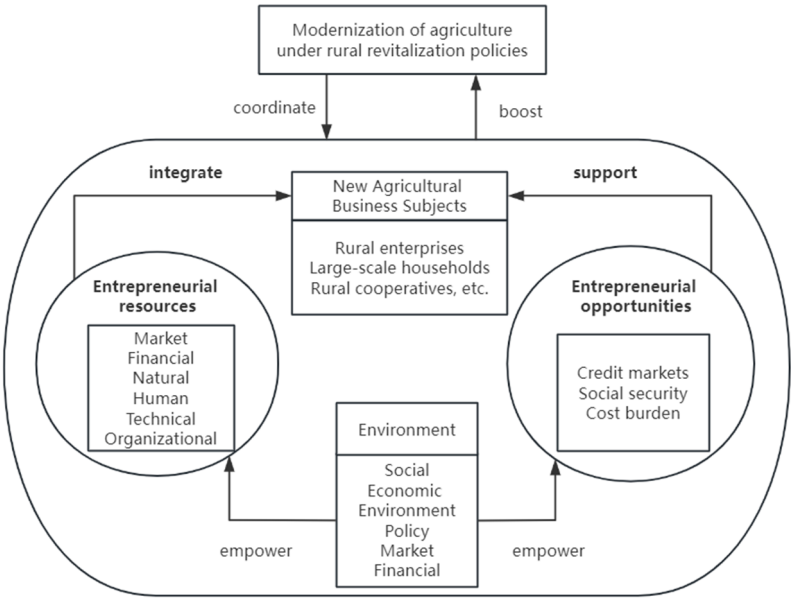


**Fig. 1.** Rural entrepreneurship ecosystem model.

## 3 Path analysis

Before the simulation of system dynamics, this paper carries out the path analysis of the influencing factors of entrepreneurial opportunities, and analyzes the influencing factors and influencing paths of rural entrepreneurial opportunities from a quantitative point of view through the establishment of the structural equation model of rural entrepreneurial opportunities.

The data information is shown in **Table 1**. The time period is 2009-2019, and the data are from various statistical yearbooks such as Qingyuan Statistical Yearbook, China Statistical Yearbook, China Education Statistical Yearbook, China Labor Statistical Yearbook, and various reports such as China Provincial Business Environment Research Report, China Sub-Provincial Enterprise Business Environment Index Report, China Sub-Provincial Marketization Index Report, and the EPS database and other databases. The design of specific parameters in the model established mainly comes from the research results of the previous researchers.

**Table 1.** Model variables.

| Variable | Source |
|---|---|
| entrepreneurial opportunity | Ma, 2020 [10] |
| entrepreneurial cost burden rate | Yang, 2015 [11] |
| factor market development level | China's Provincial Marketization Index Report |
| transportation facilities development level | China Statistical Yearbook |
| informationization level | Huang, 2019 [12] |
| administrative service efficiency level | Lu, 2019 [13] |
| social security level | China Labor Statistical Yearbook |
| credit market factor | Research Report on the Business Environment of China's Provinces |

An important premise of structural equation modeling is that all variables satisfy the assumption of normality. In this paper, we use SPSS data software to conduct multivariate normality test using "skewness and kurtosis test", which shows that the skewness of each univariate variable is generally less than 1, and the kurtosis is within 5, indicating that the univariate variables all follow normal distribution[9].

The results of good model fitting through the reliability test are shown in the **Figure 2**, which shows the correlation path coefficients between the factors influencing entrepreneurial opportunities. Specifically, the level of factor market development, the level of transportation facilities, the level of information technology development and the level of administrative service efficiency have a positive effect on the burden of entrepreneurial costs; the burden of entrepreneurial costs has a negative effect on entrepreneurial opportunities, and the level of social security and the credit market factor have a promotional effect on entrepreneurial opportunities.

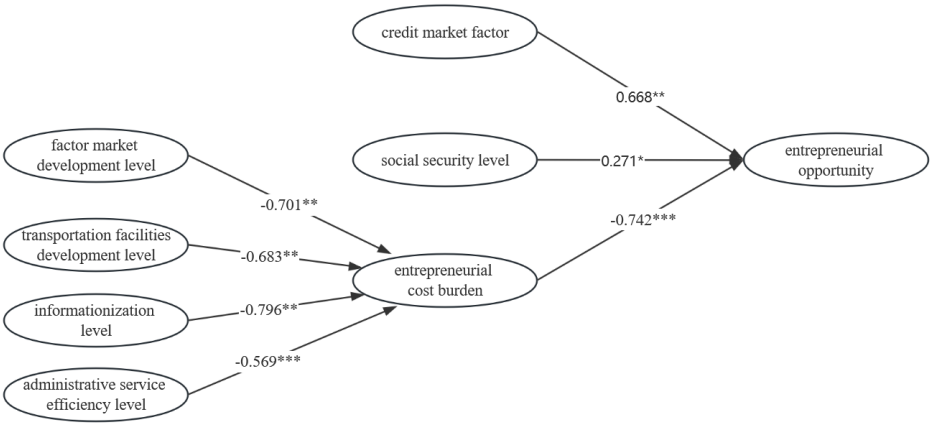


**Fig. 2.** Structural equation modeling path coefficient diagram.

## 4 System dynamics model

System dynamics mainly studies the information feedback system, which starts from the internal organizational structure of the system, information flow, material flow and the resulting feedback structure, constructs a dynamic model of the system, combines quantitative and qualitative methods, applies comprehensive reasoning, and conducts investigation research and policy analysis with the help of computer simulation. In this paper, the components of the rural entrepreneurial ecosystem and the relationship between the variables are modeled and simulated in order to explore the dynamic mechanism of entrepreneurial opportunities in the rural entrepreneurial ecosystem.

### 4.1 Rural entrepreneurship policy subsystem

An important factor in the rural entrepreneurial ecosystem is government support (see **Figure 3**). Government support can support the development of rural entrepreneurial enterprises by increasing the financial, technological and market resources of entrepreneurial enterprises in four areas: direct subsidies for entrepreneurship, investment in agricultural science and technology, entrepreneurial training and entrepreneurial project support. Generally speaking, the stronger the government support is, the more resources are given to the entrepreneurial enterprises, and their innovation and entrepreneurial ability will be enhanced, increasing the entrepreneurial success rate in rural areas. The increase in the entrepreneurial success rate further enhances the level of local economic development, raises government tax revenues, further incentivizes government policy documents to favor investment in entrepreneurial industries, and promotes the increase in the number of returning entrepreneurs. Therefore, the role of rural entrepreneurship financial support in the evolution of the rural entrepreneurship ecosystem is characterized by an upward spiral.

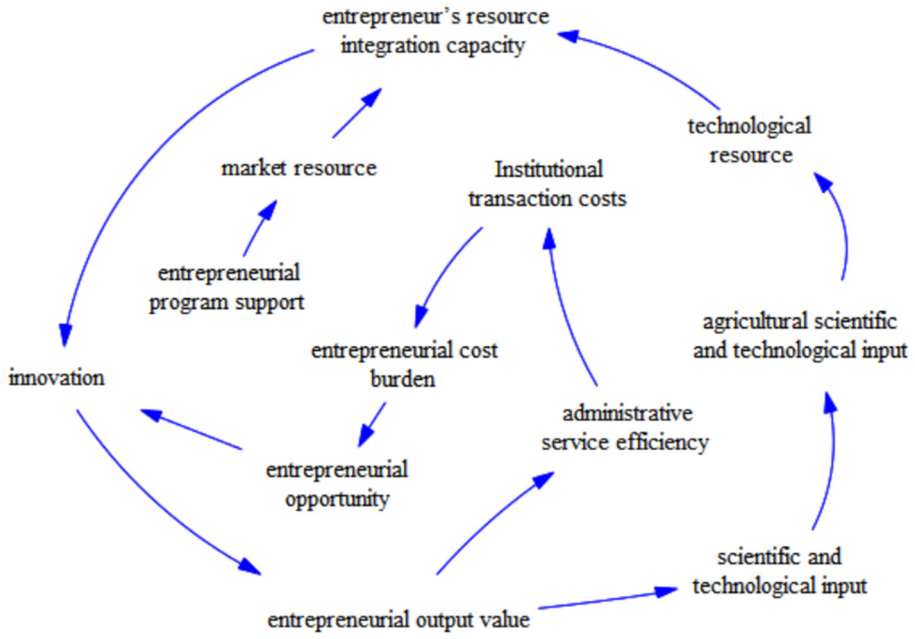


**Fig. 3.** Policy subsystem causal loop.

Positive feedback loop 1: entrepreneurial program support → + market resource → + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + entrepreneurial program support.

Positive feedback loop 2: scientific and technological input → + agricultural scientific and technological input → + technological resource → + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + scientific and technological input.

Positive feedback loop 3: administrative service efficiency → - system transaction costs → + entrepreneurial cost burden→ - entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + administrative service efficiency.

### 4.2 Rural entrepreneurship market subsystem

A good market functioning system (see **Figure 4**) can, on the one hand, promote the rational allocation of resources among market players, encourage competition and improve efficiency. On the other hand, it can create a good business environment and a culture that encourages entrepreneurship, attract the inflow of entrepreneurial talents returning to their hometowns, and break down market entry barriers. Market development, including the development of factor markets, organizational intermediary markets and the development of the market for land transactions, is conducive to improving the natural resources and organizational resources of entrepreneurial subjects, lowering their entrepreneurial costs, so as to improve their innovative power and increase their entrepreneurial output, and further promote the development of the market, forming a good positive cycle.

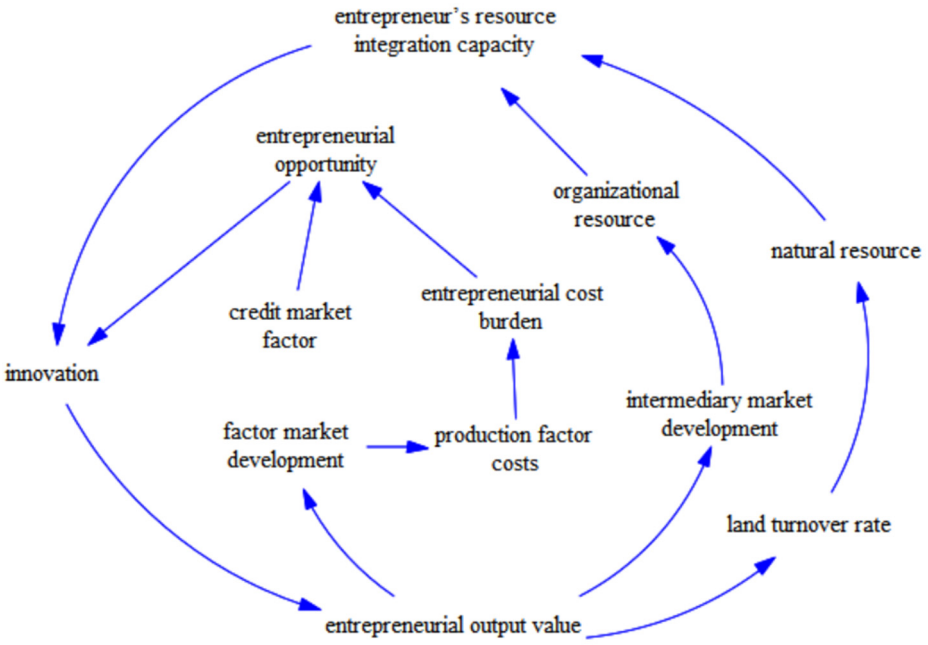


**Fig. 4.** Market subsystem causal loop.

Positive feedback loop 1: land turnover rate → + natural resource→ + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + land turnover rate.

Positive feedback loop 2: intermediary market development → + organizational resource → + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + intermediary market development.

Positive feedback loop 3: factor market development → - production factor costs → + entrepreneurial cost burden → - entrepreneurial opportunity → + innovation → + entrepreneurial output value → + factor market development.

### 4.3 Rural entrepreneurship social subsystem

The level of transportation and logistics as well as Internet for rural entrepreneurship is weaker than that of cities. Rural areas, as the main production base, have a close connection with the main processing and sales, including material transportation, product logistics, Internet e-commerce operation, which is greatly affected by infrastructure development. The development of rural entrepreneurship can not be separated from the development of social culture and education, social infrastructure, which reduces the burden of enterprises by reducing their logistics costs and information service costs. At the same time, social entrepreneurship culture and social education level promote the development of entrepreneurial enterprises by promoting the human resources of entrepreneurial enterprises and improving the competitiveness of enterprises (see **Figure 5**).

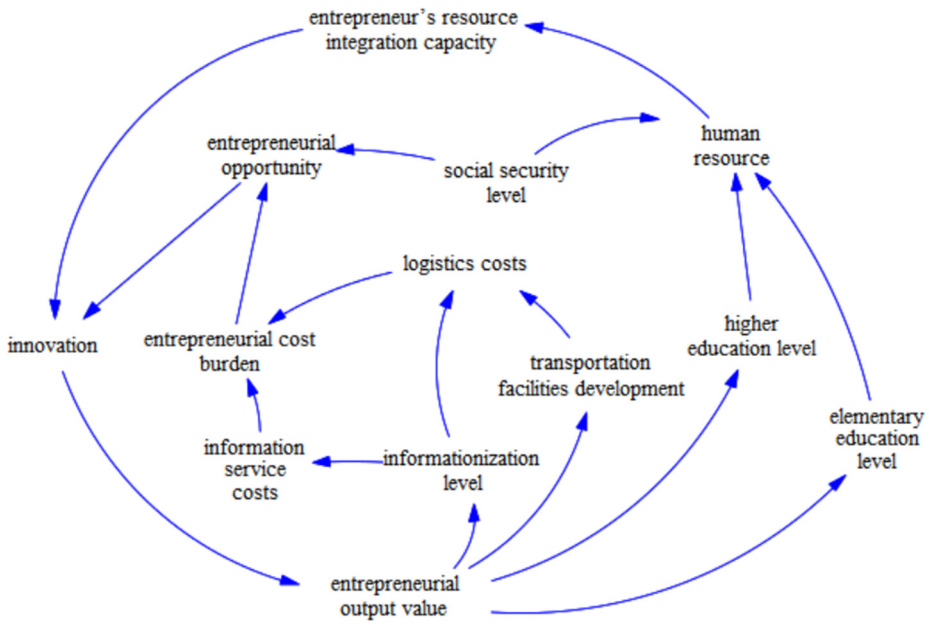


**Fig. 5.** Social subsystem causal loop.

Positive feedback loop 1: elementary education level → + human resource → + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + elementary education level.

Positive feedback loop 2: higher education level→ + human resource → + entrepreneur's resource integration capacity → + innovation → + entrepreneurial output value → + higher education level.

Positive feedback loop 3: transportation facilities development → + logistics costs → + entrepreneurial cost burden → + entrepreneurial opportunity → + innovation → + entrepreneurial output value → + transportation facilities development.

Positive feedback loop 4: informationization level → - information service costs → + entrepreneurial cost burden → - entrepreneurial opportunity → + innovation → + entrepreneurial output value → + informationization level.

### 4.4 Entrepreneurial opportunity system dynamics flowchart

The rural entrepreneurship ecosystem model is characterized by non-linearity, and there are complex quantitative and qualitative relationships between the components within the system. Based on the causal loops of rural entrepreneurship policy, market and social subsystems, a flowchart of rural entrepreneurship ecosystem dynamics based on the degree of entrepreneurial opportunity is constructed (see **Figure 6**).

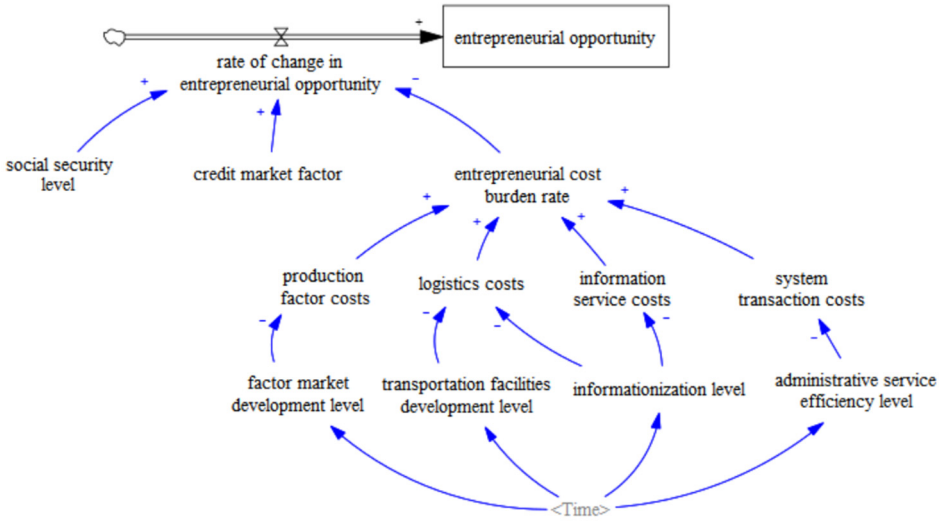


**Fig. 6.** System dynamics flowchart.

### 4.5 Simulation results

In the process of model building using Vensim software, the simulation interval is set up as 2009-2029, and the simulation step is set as 1 year, in which the data for 2009-2019 come from various statistical yearbooks and reports. The remaining period of time is the prediction time of the model set up. The simulation results are shown in **Figure 7** and **Figure 8**.

The degree of entrepreneurial opportunity represents the cost of entrepreneurial resources needed as well as the degree of convenience. Entrepreneurial opportunity is mainly affected by social security level, credit market factor. In terms of the specific values, both the rate of change in entrepreneurial opportunity and the level of entrepreneurial opportunity tend to increase year by year.

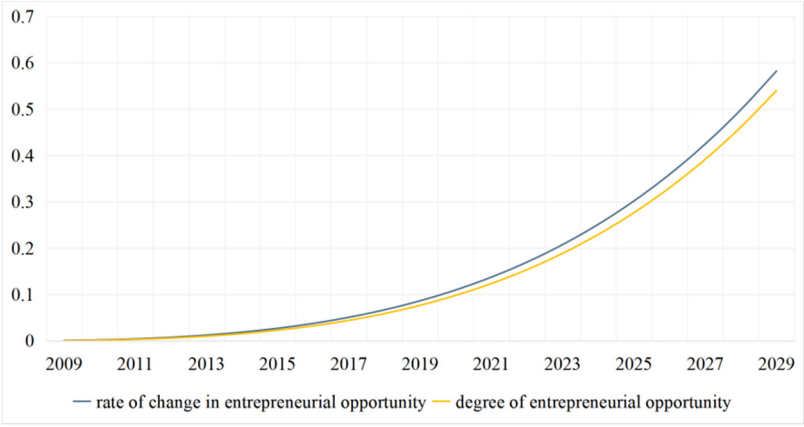


**Fig. 7.** Simulation results of entrepreneurial opportunity.

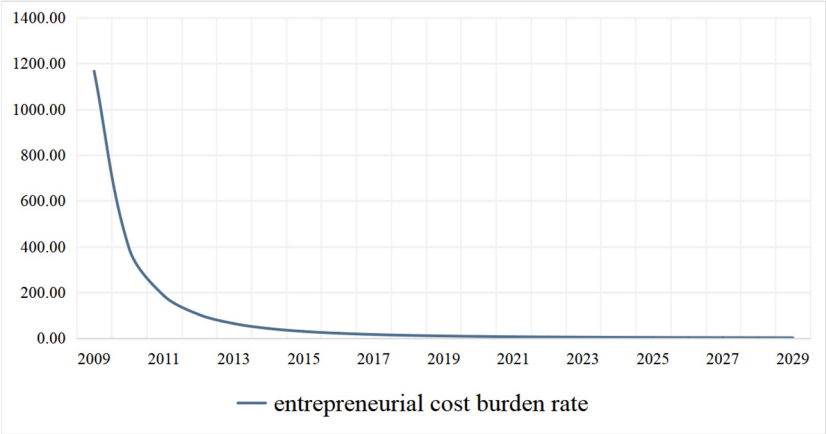


**Fig. 8.** Simulation results of entrepreneurial cost burden rate.

The entrepreneurial cost burden is mainly composed of four major components: production factor costs, logistics costs, information service costs and institutional transaction costs. The system simulation results show that the entrepreneurial cost burden rate is decreasing and the rate of change in entrepreneurial opportunity is increasing. It indicates that the overall factor market, transportation facilities, informationization and administrative service efficiency in Qingyuan are all developing continuously, and it is predicted that efficient and modernized entrepreneurial development projected will be reached by 2029.

## 5 Conclusion

Based on the system dynamics theory, this paper analyzes the dynamic feedback in the entrepreneurial ecosystem of rural entrepreneurial resources and entrepreneurial environment, and evaluates the degree of rural entrepreneurial opportunity support by sorting out the relationship between the elements of the rural entrepreneurial ecosystem and their influence. Using the Vensim software, the rural entrepreneurial ecosystem was simulated and analyzed in Qingyuan, Guangdong Province, and the following conclusions were obtained: rural revitalization policies bring positive impacts to the rural entrepreneurial ecosystem in terms of entrepreneurial resources and entrepreneurial environments, and entrepreneurial environments further affect the entrepreneurial cost burden through entrepreneurial resources, and positively influence the entrepreneurial opportunities.

This paper introduces the theory of entrepreneurial ecosystem, entrepreneurial discovery theory and system dynamics theory into the study of rural entrepreneurship, and systematically and comprehensively constructs a system dynamics model of rural entrepreneurial ecosystem, which is conducive to the improvement of the construction of China's rural revitalization policy system and the promotion of rural entrepreneurship development, and thus promotes the overall development of rural economy and society.

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