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Dynamic Evaluation of China's Digital Business Environment Development Based on System Dynamics

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Abstract

Problem Definition: We propose a complex ecosystem of digital business environments. It views the digital business environment as comprising the digital economy and the business environment as key endogenous variables, as well as other influencing factors. Consideration of the coupling of the ecosystem and the feedback characteristics of mutual causation, we study the dynamic behaviour of the digital economy and the business environment during the development of the digital business environment, then make predictions and path analyses of the different stages of development of the digital business environment in the future. **Methodology**: Based on system dynamics, we construct a dynamic development model for the coupling of "digital economy-business environment". We use system flow diagrams to simulate the level of development of the digital economy and business environment from 2011 to 2021. **Results**: We show that the strength of the coupling relationship between the key system variables directly affects the transformation of the traditional business environment. At this stage, the degree of coupling between the digital economy and the business environment is relatively weak, as evidenced by the fact that the driving effect of the digital economy on the traditional business environment is not obvious, and the traditional business environment has not been upgraded and transformed in essence. However, relying on the government to lightly push the construction of the digital economy and increase the driving force of the coupling system, the growth rate of the level of the digital economy has been greatly improved, and the degree of coupling of the digital business environment has also been gradually strengthened, which will further promote the construction of high-quality development of the regional economy.

Keywords

Traditional Business Environment, Digital Economy, Digital Business

Environment, Complex Systems, PLS Structural Equation Model

1. Introduction

China has stepped into the era of digital economy, and the importance of data elements to help the transformation of the real economy has become increasingly prominent. In recent years, digital technology reforms have penetrated a wide range of industries and the new Crown Pneumonia epidemic has further driven our digital transformation. At the same time, the domestic real economy was hit hard. A large number of enterprises have begun to try to use digital technology to upgrade their business models and industrial upgrading to adapt to the current way of service consumers need, then the digital economy shows a rapid development situation. While digital eco-type applications in the economic and social fields have shown great vitality, the concept of digital business environment has gained widespread attention in recent years, taking into account the modernisation and transformation of governance capabilities. In November 2020, General Secretary Xi Jinping proposed for the first time at the 27th Informal APEC Leaders' Meeting to optimise the Digital Business Environment and create an open, fair, just and non-discriminatory business environment. In November 2021, the State Council issued the Opinions of the State Council on Carrying Out Pilot Work on Business Environment Innovation, proposing the use of digital technology to optimise the government's market services, such as expanding the business scope of "one network for all", the online approval of municipal projects, and the reform of the whole process of bidding and tendering electronically. The digital economy is the future direction of the global economy. 2021 the "14th Five-Year Plan" for the Development of the Digital Economy of December 2021 puts forward the deep integration of digital technology and the real economy as the main line. Exploring the establishment of a governance approach that is compatible with the sustained and healthy development of the digital economy, it also puts forward new requirements for the innovation of the government's digital governance model, the statistical monitoring of the digital economy, the regulatory system of digital services, and the research and judgement of major issues and risk early warning, among other things. In December 2021, the "14th Five-Year Plan" for the Development of the Digital Economy proposed the deep integration of digital technology with the real economy as the main line. This poses new requirements for exploring the establishment of a governance approach that is compatible with the sustained and healthy development of the digital economy.

The development of the digital business environment is the result of the combined effect of the digital economy and the business environment. It is not a perfect mirror image of traditional offline governance behaviours online, but rather the optimisation, reinvention and subversion of offline by online (Liu &

Xia, 2023). Specifically, a digital economy that empowers the traditional business environment can establish good government-enterprise relations, a transparent legal environment, a convenient approval process and a sound public infrastructure. A good digital business environment can promote enterprise development and innovation, enhance the economic competitiveness of the region's entire industrial chain configuration, and thus promote the high-quality development of the regional economy. In addition, it is not a simple extension of the online application scenario, but an organisational form of the flow of market arrangements for capital investment, employment relationships, production and consumption, etc., as a result of the migration of business activities from the physical to the virtual place (Orbach, 2021). Specifically, a favourable environment for the development of the digital economy requires the assistance of a favourable business environment. The business environment can influence the further development of the digital economy mainly through such elements as government regulation and services, market environment, rule of law safeguards and digital infrastructure development. Overall, the digital business environment is the integration of institutional mechanisms, digital resources, platform construction and other elements involved in the economic activities of the government, enterprises, individuals and other market players in the process of the deep integration of the digital economy and the business environment. The suitability of the integration of these elements directly affects the development of the digital business environment.

In this paper, we study the dynamic behaviour of the complex development of the digital business environment. Considering that the development of the digital business environment cannot be separated from the continuous integration of the digital economy and the business environment, we regard the process of integrating the elements of market players in realising the transformation of the digital business environment as a dynamic system. A simulation model is developed. We aim to answer the following questions: 1) The development of the digital economy and the business environment during the transformation process of the digital business environment. 2) The future dynamic behavioural patterns of the digital business environment. The rest of the paper is organised as follows. Section 2 reviews the related literature. Section 3 describes the steps of model design, and Section 4 performs model checking and simulation. We explore several model extensions in Section 5 and summarise the findings and managerial implications of the paper in Section 6. Among others, Sections 3, 4 and 5 of the paper constitute the whole process of modelling system dynamics, see **Figure 1** (Zhong, Jia, & Qian, 2013).

2. Literature Review

Domestic and foreign scholars have conducted in-depth studies on the digital business environment from different perspectives, such as the definition, connotation, development status, improvement path and the impact of the digital

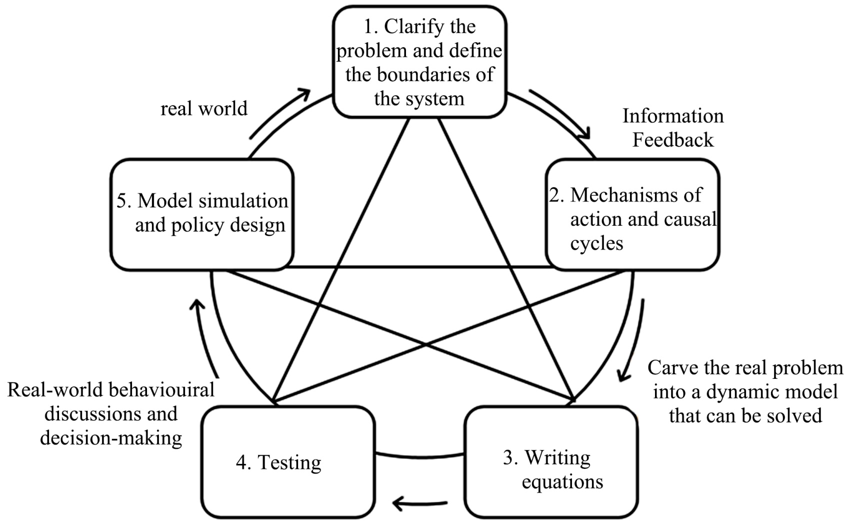

Figure 1. Modelling process of system dynamics.

business environment on regional economic quality development. This article summarizes relevant research from four aspects.

2.1. Definition and Connotation

The concept of digital business environment was first introduced by the World Bank (https://www.worldbank.org/en/businessready/doing-business-legacy), however, the indicators are defined to focus on the digital economy and include five main areas: data privacy and security, network connectivity, logistics, payments, digital market regulation. Tufts University's Ease of Doing Business in Digital 2019 report further elaborates on the concept of digital doing business as "the ease with which digital platforms can enter, operate, prosper and launch their markets", focusing on adapting to the business environment of the currently thriving digital factor market. The definition of the concept of digital doing business is relatively limited. In recent years, scholars have conducted in-depth research on the definition of the digital business environment, the term "Digital Government Governance" was put forward before the "Digital Business Environment". The proposal of digital government governance reflects the transformation of China's social governance concept from the statistical government to digital government. And its real meaning is more about the process in which the government governs the information society space and provides high-quality government services through digital thinking, digital concept, digital strategy, digital resources, digital tools, digital rules (Dai & Bao, 2017). Digital business environment is the concrete governance performance of the business environment enabled by digital government, and the construction of digital government is an important part of the construction of digital business environment. The 2021 G20 Digital Business Environment Evaluation Report (2021) suggests that the Digital Doing Business is not only about digital technology enabling the traditional business environment but also includes a new business environment that is oriented and adapted to the innovative development needs of market players in the digital economy. The definition and connotation are thus generally accepted.

2.2. Research on Existing Levels

In recent years, different evaluation index systems for digital business environment have been established internationally. In 2011, the United Nations Department of Economic and Social Affairs established the E-Government Development Index to measure the level of development of digital technology-enabled public services from three categories of indices: the Online Services Index, the Communications Infrastructure Index and the Human Resources Index. And in 2017, the World Bank established a framework for evaluating the digital business environment with 12 secondary indicators in five areas, including network connectivity, data privacy and security, logistics, payments and the establishment of digital market regulation. At the same time, domestic scholars have conducted in-depth studies on the current development status of China's digital business environment and the path to enhance it. The 2021 G20 Digital Doing Business Evaluation Report (2021) established a global digital business environment evaluation index system with 5 primary indicators, 13 secondary indicators and 39 tertiary indicators, including digital support system, data exploitation and security, digital market access, digital market rules and digital innovation environment. And China ranked ninth.

Research on the evaluation index system of digital business environment based on the existing domestic and international, Zhao and Wang (2022) established a digital business environment evaluation system from two perspectives: digital space construction and digitally empowered business environment elements. It comprehensively rate the digital business environment of each region and province in 2020, and found that the overall spatial characteristics showed the characteristics of "East > National > Central > West". The problem of large development gaps and uncoordinated development between regions is more prominent, such as Zhejiang Province as early as the end of 2019 launched benefit enterprise policy information service platform and enterprise services integrated platform, and the "enterprise code" ecosystem with a chain of "data, enterprise, and data" was born in 2020. At the same time, China's overall digital business environment currently has a low score, and the development level of sub-environments such as the innovation environment and digital talent supply environment is also low (Xu et al., 2022).

2.3. Study on the Development Path

A data-enabled business environment enables instant information communication, accurate government services and effective market risk identification (Zhou, 2022). Liao (2022) constructs a multiple regression model of digital governance capability and business environment to explore the impact of government portals and mobile government scores on business environment. The study finds that digital governance has a positive impact on the business environment. And based on the moderating effect model, it finds that digital governance can effectively reduce bureaucracy. Aiming at the problems of unbalanced development and low degree of development faced by the overall level of China's current digital business environment, Du et al. (2022) conducted a coupled study on the business environment, economic growth, regional innovation development, efficiency and other factors. It views the business environment as a complex ecosystem and finds that technically efficient market-driven, progressively innovative market-driven and government-lightly pushed breakthrough innovative market-driven can generate high total factor productivity. Therefore, establishing a dynamic analysis and path evolution among the business environment, digital economy and government-lightly pushed become an important breakthrough.

System dynamics models can be used to study the dynamic evolution of systems, especially as "laboratories" for large complex social, economic and ecological systems (Zhong, Jia, & Qian, 2013). The early combination of system dynamics and economic management theory was applied to game theory to solve nonlinear problems in life (Zomorodian et al., 2017). It is a scientific research method to establish a system dynamic model to solve the complex dissipative system of Humanities and Social Sciences. For example, Li and Yu (2018) constructed the dynamic system and G-P model of pollution investment, and studied the optimal control problem in the process of formulating pollution control policies. Li et al. (2020) established a dynamical system model of energy consumption and economic growth quality, with numerical simulations of different energy price levels and pollution emission levels. Zhang et al. (2021) established a dynamic system through ordinary differential equation (ODE) to study the coupling mechanism between disease and economic development. Abdolabadi et al. (2023) used a system dynamics model to couple a hydrological model with an economic input-output model.

2.4. The Role of the Digital Business Environment in the High-Quality Development of Regional Economy

Optimizing the digital business environment and improving total factor productivity is an important starting point for achieving high-quality development of the real economy. Shi and Liu (2023) built a systematic GMM model around the relationship between factor supply (resource supply, institutional supply) and high-quality economic development, then found that the better the business environment, the better the impact effect of government venture capital guidance funds on high-quality economic development. To sum up, the impact of the digital business environment on regional economic quality development has gained increasing attention in academic circles.

2.5. Research Innovation

The recent research literature on the digital business environment on regional economic quality development is not mature enough. And previous studies often use regression models to study the relationship among business environment, digital economy and regional economic quality development by using digital economy or business environment as mediating variables. It ignores the causal feedback loops and fails to predict the future development path of digital business environment and economic quality development.

Therefore, based on the above considerations, this paper conducts an in-depth study on the dynamic coupling process of digital economy and business environment, and the operation mechanism of digital business environment and high-quality development of regional economy with the help of system dynamics method. A nonlinear dynamical system model of "digital economy-business environment" is then established. Compared to the existing studies, the main contributions of this paper are: Firstly, the research method is innovative. This paper establishes a coupled system of "digital economy-business environment". The digital business environment is regarded as a complex ecosystem, and different supply and dissipation elements within the system are studied. Combining mathematical statistics and dynamical system methods, we simulate the dynamic development of the digital business environment and depict the dynamic evolution of the system over time. It facilitates decision makers to make corresponding behavioural choices in response to different dynamic evolutions. The second is to forecast the future trend of digital business environment. It provides theoretical references and reasonable development suggestions for the construction of digital business environment and high-quality development of regional economy.

3. Model Design

Consider a complex development model under the dynamic coupling of digital economy and business environment constructed based on system dynamics. The model views the digital business environment as a complex ecosystem consisting of the digital economy and the business environment as the key endogenous variables and other influencing factors. Based on this, the three elements of variables, parameters and functional relationships required for the model are abstracted, and the dynamic development process during the transformation of the new digital business environment is analysed and observed. Therefore, the model design includes the following five steps. First is problem definition. The second is to define the system boundary. The third is to sort out the mechanism and feedback loops of the coupled system. Fourth, abstract the equations for equations for system. Fifth, set the parameters of the equations.

3.1. Problem Definition

Consider a system that enables dynamic interpretation and prediction of the development process of the digital business environment. Specifically, we view the digital business environment as a complex ecosystem that can dynamically evolve over time under the influence of internal and external factors. The key variables of this ecosystem have a certain coupling relationship with each other. The relationship is that when the digital economy changes, the business environment will also change, and such changes in the business environment will also react to the digital economy and make it change. The strength of this coupling relationship directly affects the empowerment of digital technology on the traditional business environment, as well as the adaptation and upgrading of the new business environment needed for the innovation and development of market players in the digital economy. In addition to the coupling relationship of key variables, the factors of this ecosystem are characterised by feedbacks that are mutually causal. For example, if other factors within the system cause a driving effect on the digital economy, this effect will directly or indirectly counteract the cause of the result in order to correct the initial effect of the cause on the result, and the cycle repeats itself.

3.2. System Boundary

The system is composed of digital economy, business environment and other influencing factors. The three types of influencing factors are abstracted and concretised into the concepts of digital economy, business environment, resource supply and constraints, institutional supply and constraints, and coupling factors, and the model boundary diagram is shown in Figure 2. In order to explore the coupling relationship of the system, we first abstract two key variables, i.e., digital economy and business environment. Among them, the digital economy mainly focuses on data elements, digital technologies and digital products that are independent of or not integrated with the business environment on the technical level, such as big data, cloud computing, artificial intelligence, 5G communications, etc. And the digital economy can achieve its own development in the process of promoting the digital transformation of the traditional business environment. The business environment includes but is not limited to the traditional business environment, so the business environment integrated with the digital

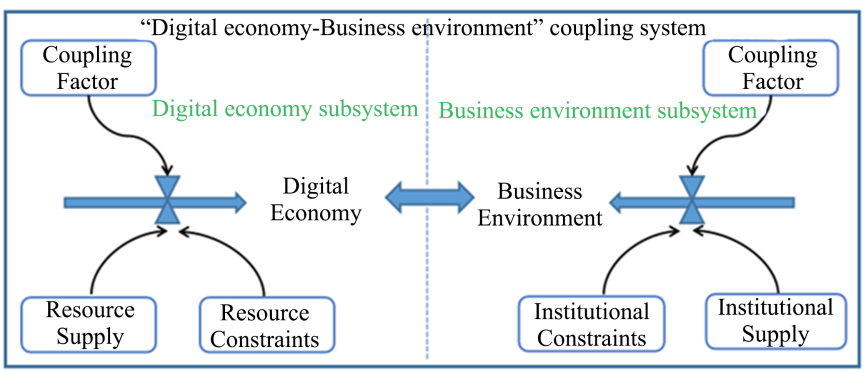

Figure 2. Model boundary chart.

economy is still the business environment we study. The real-life business environment cannot be separated from the empowerment of the digital economy to varying degrees, such as online government platforms, government portals that provide artificial intelligence chatbot functions, and handheld APPs. Secondly, we define three types of factors, namely, power, damping and coupling, from the supply and constraint perspectives respectively. Among them, we abstract the driving force acting on the digital economy and business environment respectively as the power factor of the system, i.e., the supply of digital resources and the supply of governmental systems promote the upgrading of the digital economy and business environment, which are denoted by α_1 and α_2 respectively. On the contrary, the crux of their underdevelopment lies in the deep-rooted institutional mechanism problems constituted by resource constraints and institutional constraints, and we abstract this hindering force acting on the digital economy and the business environment, respectively, as the system's damping factor, denoted by β_1 and β_2, respectively. For example, different regions show differences in resource endowment, population aggregation and educational resources, which bring about imbalances in consumption and innovation, causing the digital economy and factor markets to spread to less developed regions at a slower pace, thus slowing down the optimisation process of the entire digital business environment. Finally, the interaction between the two variables of digital economy and business environment constitutes the coupling factor of the system, and we abstract the degree of migration from physical to virtual places as the coupling factor, denoted by γ_1, and the degree of extension of economic activities, such as the application scenarios of the digital economy and the construction of platforms, as the coupling factor, denoted by γ_2. In summary, the environmental settings of the system can be described by parameters. Therefore, from the supply, constraint and coupling perspectives, we abstract the other factors affecting the coupled system as dynamics factor (α_1, α_2), damping factor (β_1, β_2) and coupling factor (γ_1, γ_2), which can well reflect the systematic nature of the digital business environment, and are of great significance for studying the dynamic behaviour of this system as well as optimizing the system design.

3.3. Causal Loop Diagram

Causal loop diagrams are an important tool for representing the feedback structure of a system, which allows for the rapid formation of the causes of system dynamics, as shown in **Figure 3**. A causal loop diagram contains multiple variables, which are linked by causal chains, which are represented by arrows, and each causal chain has a limit (positive or negative). In this paper, there are 6 causal feedback loops in the "digital economy-business environment" dynamics system. The six causal feedback loops are as follows: 1) digital economy power factor → (+) digital economy → (+) business environment → (+) digital economy, 2) digital economy damping factor → (−) digital economy → (+) business environment → (+) digital economy, 3) digital economy to business environment

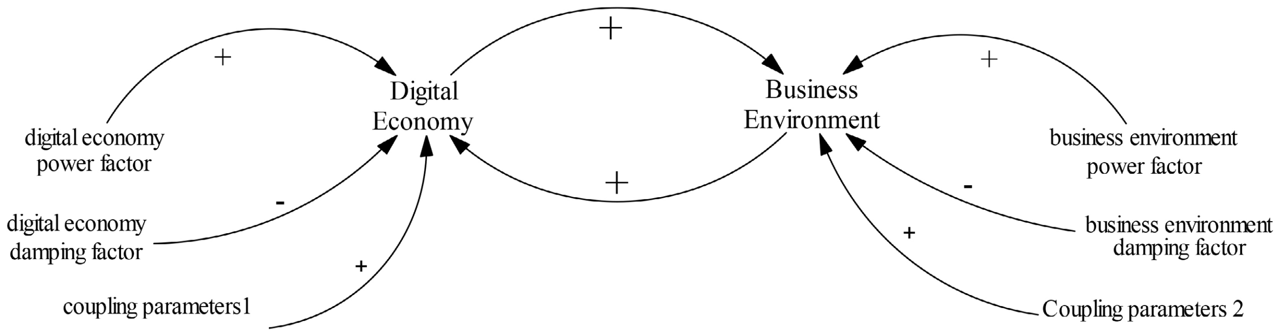

Figure 3. Causal loop of the system.

coupling parameters → (+) digital economy → (+) business environment → (+) digital economy, 4) business environment power factor → (+) business environment → (+) digital economy → (+) business environment, 5) business environment damping factor → (−) business environment → (+) digital economy → (+) business environment, 6) business environment to digital economy Coupling parameters → (+) business environment → (+) business environment → (+) digital economy → (+) business environment.

There is a positive causal chain between two key variables: the digital economy and the business environment. One is reflected in the technological empowerment of the digital economy for the business environment. For example, it can be reflected in the digital government processing, the national integrated online regulatory system, the government APP, and the online government platform, which realises the interconnection of government services and government-citizen interaction, and empowers the whole process of information timeliness, high efficiency, feedback, and analyzability; and secondly, it is manifested in the process of institutional guarantee of the business environment to the digital economy. In the process of continuous development and growth of the digital economy, an open, fair, transparent, stable and predictable business environment is needed to provide more development opportunities and market environment for the digital economy. In other words, the positive causal chain between the two refers to the synergistic effect under which the digital economy and the business environment achieve a unified whole of successful transformation of the digital business environment in the process of continuous and deep integration of change, and achieve the win-win effect of common development.

In addition, the mechanism of the three types of characteristic parameters on the digital business environment system is as follows. First, the driving forces acting on the digital economy and business environment respectively are abstracted as the power factors of the system (α_1, α_2). They are expressed as the driving effect on the development of the digital economy and business environment, specifically when other factors remain constant, if the power factor increases, then the level of development of the digital economy and business environment increases to a higher amount than it should be. Secondly, the hindering forces acting on the digital economy and business environment respectively are abstracted as the damping factors of the system (β_1, β_2). They manifest themselves as an impediment to the development of the digital economy and business environment, specifically if the damping factor increases while other factors remain constant, then the level of development of the digital economy and business environment decreases below the amount it should have been. Third, the interaction between the two variables of digital economy and business environment constitutes the coupling factor of the system (γ_1, γ_2), and the range of values of the coupling factor is determined as $-1 \le \gamma_1, \gamma_2 \le 1$. They are manifested in the degree of suitability of the configuration of the elements of the digital business environment, the configuration of the elements and the process of integration is mainly divided into two stages, respectively, the integration stage of economic activity elements and the integration stage of the digital economy and the business environment. Among them, the stage of integration of factors of economic activity includes the market-based allocation of factors such as production factors and data factors, and the digital transformation of the business environment is immature at this stage, and the range of values of the coupling factor is determined as $-1 \le \gamma_1, \gamma_2 \le 0$. The stage of integration of digital economy and business environment involves the mutual integration of factors such as production factors and data factors, and the digital business environment is deeply developed in this stage, and the range of values of the coupling factor is determined to be $0 \le \gamma_1, \gamma_2 \le 1$.

3.4. Main Equations and Stock Flow Diagram

The fourth part of the framework portrays the mathematical equations required to model the system dynamics. Firstly, based on the scope of the study and the synergy mechanism. We model the rate of change of the digital economy and the business environment to use resources most efficiently to achieve the desired development state as a set of first-order differential equations with positive and negative causal feedback characteristics, denoted by $\dot{D}(t)$, $\dot{B}(t)$. As described in the second and third parts of the modelling, different policy interventions, environmental resources and other factors will have different effects on the optimisation of the digital economy and business environment. That is, positive policies and digital resource supply will make the level of digital economy and business environment increase more rapidly, while negative policies and digital resource constraints will play a hindering role, so power coefficients (α_1, α_2) and damping coefficients (β_1, β_2) are introduced to represent the feedback mechanism produced by different policy interventions and environmental resources and other factors on the system. In addition, the quadratic terms (D^2, B^2) in the equations indicate that the interaction between the elements of the system creates a disproportionate relationship between inputs and outputs, which portrays the nonlinear characteristics of the system of "digital economy-business environment". In addition, in order to better reflect the coupling process of the digital economy and business environment has an interaction mechanism. We add the interaction term (*DB*) and the coupling coefficients (γ_1, γ_2) to the nonlinear equation. Based on the above description and referring to the nonlinear dynamic model of technology convergence established in the literature (Zhu et al., 2020), we give the following system evolution description Equation (1):

$$\begin{cases} \dot{D}(t) = \alpha_1 D - \beta_1 D^2 + \gamma_1 DB \\ \dot{B}(t) = \alpha_2 B - \beta_2 B^2 + \gamma_2 DB \end{cases} \tag{1}$$

$D(t)$ in Equation (1) is the level of digital economy development, and $B(t)$ is the level of business environment development, which represents the development status of digital economy and business environment respectively. The coefficients in Equation (1) are elaborated from two perspectives of supply and constraint. On the one hand, from the perspective of resource supply, α_1 is selected as the power factor of digital economy, which represents the maximum push of digital resource supply when the government independently develops digital economy. For example, it is promoted by absorbing technology contracts, domestic patent application authorisation, and the intensity of research and experimental development funding. We choose α_2 as the power factor of business environment. It represents the maximum driving force of the government to optimize the business environment by relying on the mega-market size, which can be promoted by the establishment of grassroots trade unions of labour dispute mediation committees, the number of participants in the year-end of work injury insurance, and the export of foreign-invested enterprises. On the other hand, from the perspective of resource constraints, β_1 is selected as the damping factor of digital economy. It represents the strength of resource constraints hindering the development of digital economy when the government develops digital economy independently, such as being limited by factors such as unbalanced urban and rural development and educational resources. And β_2 is selected as the damping factor of the business environment, which represents the strength of the hindrance of resource constraints to the optimisation of the business environment, such as the dilemma of slow industrial transformation, urban contraction and resource depletion in some resource cities. Therefore, $\alpha_1 - \beta_1 D(t)$ represents the net growth rate presented when developing the digital economy at the current level, and $\alpha_2 - \beta_2 D(t)$ represents the net growth rate presented when optimising the business environment at the current level.

Secondly, the level variables in the dynamical system are digital economy and business environment, which indicate the cumulative effect of the system from the time dimension. Therefore, the INTEG function is chosen to define the level variables, and INTEG(R, N) indicates the numerical integration of R from N, and N indicates the initial state.

$$\begin{cases} \text{digital economy} = \text{INTEG}\left(\dot{D}(t), 0.075\right) \\ \text{business environment} = \text{INTEG}\left(\dot{B}(t), 0.453\right) \end{cases} \tag{2}$$

Finally, a stock flow diagram (stock flow diagram) is constructed to model the feedback loop over time. In the stock flow diagram, the flow represents the rate variable, which is the derivative of the stock and can be expressed as a differential equation. In this paper flow is the rate of change in the digital economy and business environment, determined as Equation (1). The stock represents a kind of accumulation quantity under continuous time, which characterises the state of the system and is the integral of the flow variable, and the stock in this paper is the level of development of digital economy and business environment, which is determined as Equation (2). In this paper, the flow diagram of the power system is established based on the above analysis so as to simulate the model, as shown in Figure 4 below.

3.5. Parameter Setting

It can be found that the fourth part lacks the quantitative estimation of the abstract parameters such as power and damping in Equation (1). Therefore, the main problem to be solved in the fifth part of the composite model is how to abstract and quantitatively describe the dynamics and damping factors in the coupled system of "digital economy-business environment" based on the measurable data of the provincial panel. Partial least squares-structural equation modelling (PLS-SEM) is a multivariate statistical analysis tool. It can indirectly reflect the latent variables through several measurable variables, so as to verify the causal relationship between different latent variables. We firstly select a number of latent variables and measurable indicators to construct a variable indicator system, which in this paper combines the construction ideas of DPSIR model. Among them, the DPSIR model (Drive-Pressure-State-Impact-Response) indicates the impact of social and economic development and human behaviour on the consumption of resources and ecological environment, and to a certain extent reflects the feedback of human behaviour and its eventual result in the state of the resources and the environment, so that the whole system becomes a cycle (Wang, Sun, & Wu, 2018). Based on the causal loop mechanism of the DPSIR model and the strengths and weaknesses analysis mechanism of the SWOT model, the model is simplified into a "power-damping-response" mechanism, and the PLS-SEM variable indicator system shown in Table A1 (see Appendix) is constructed.

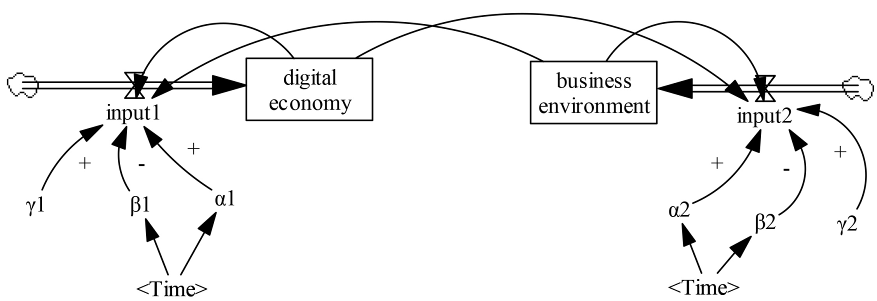

Figure 4. Flow chart of the "digital economy-doing business" dynamic system.

Column 4 in Table A1 shows 21 measurable variables (explicit variables), able to be obtained directly through surveys, containing panel data for 30 provinces from 2011-2021 (some data for Tibet are missing, statistics do not include Hong Kong, Macau and Taiwan). It can be collected and compiled from EPS database, China Marketisation Index database, China Statistical Yearbook, China Torch Statistical Yearbook, China Science and Technology Statistical Yearbook, China Rural Poverty Monitoring Report, Big Data Blue Book: China Big Data Development Report N0.5 et al. and supplemented by linear interpolation for missing values. Column 2 shows five latent variables, which cannot be obtained directly through the survey, but are closely related to the corresponding measurable variables.

Based on the above variable indicator system and theoretical foundation, the following modelling assumptions are proposed for the fourth part of the composite model: the four middle-order latent variables of the PLS-SEM variable indicator system include digital economy dynamics, digital economy damping, business environment dynamics and business environment damping. They have both upward and downward roles, as shown in Figure 5. On the one hand, the upward action portrays the causal relationship between the latent variables and the manifest variables. The causal relationship is that the five latent variables point to their corresponding manifest variables, so the measurement equation of the measurement module takes the form of the following,

$$x = \lambda\xi + \delta,$$

where x is the measurable variable, ξ is the latent variable, λ is the relationship matrix determined by the external loadings of the measurable variable, and δ is the residual term. On the other hand, the integrated level of the coupled system is a higher order manifestation of the integration of the four middle order latent

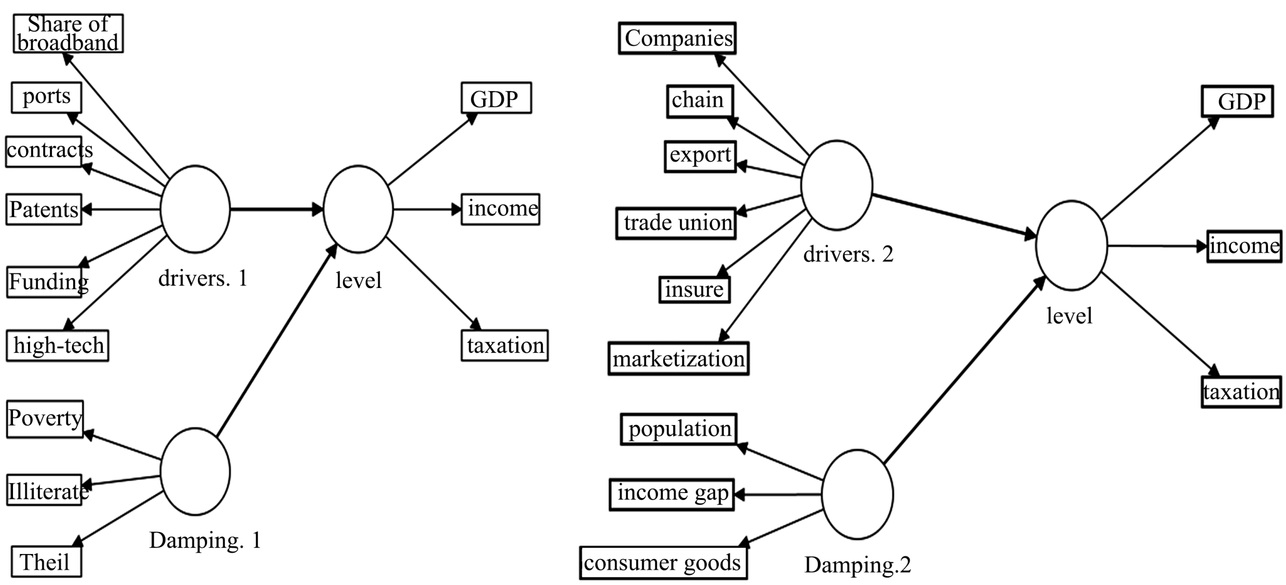

Figure 5. PLS-SEM model A (left) and model B (right).

variables mentioned above, and the upward action describes the hypothetical causal relationship between the latent variables. This causality can be set as the combined level of the coupled system is the result of the combined action of these 4 middle-order latent variables through Model A and Model B. Therefore, the structural model is that these 4 latent variables point to the integrated level latent variables of the coupled system in both Model A and Model B. Therefore, the structural equations of the structural module are in the following form,

$$\eta = \mu_1\xi_1 + \mu_2\xi_2 + \varepsilon_1 \quad \text{and} \quad \eta = \mu_3\xi_3 + \mu_4\xi_4 + \varepsilon_2,$$

where μ_i is the regression coefficient determined by the path coefficient, and is the residual term of the latent variable ξ_i.

The covariates α_1, α_2, β_1, β_2 in this model are constructed using the With Lookup function, See Equation (3). These four parameters are denoted as Digital Economy Power Factor, Business Environment Power Factor, Digital Economy Damping Factor and Business Environment Damping Factor. In order to make the model more accurate, we introduced the time factor and used the PLS-SEM structural equation as in **Figure 5** above to calculate the data from 2011-2021 to obtain the parameters at different times (see Appendix for **Table A2**). The With Lookup function can be customised to establish a non-linear functional relationship between the independent variables and the dependent variable. In addition, γ_1 and γ_2 are the coupling parameters of digital economy to business environment and business environment to digital economy, respectively. They are obtained by comprehensive assessment of the fusion parameters through Python software on the total word frequency of government digital governance text, digital financial inclusion index, marketisation index and other data obtained by crawling and collating digital policy keywords from government work reports of 30 provinces.

$$\begin{cases} \alpha_i = \text{withlookup}\left(t,\left(\left[\left(t_{\min},\alpha_{\min}\right)-\left(t_{\max},\alpha_{\max}\right)\right]\left(t_1,\alpha_1\right)\left(t_2,\alpha_2\right)\cdots\left(t_i,\alpha_i\right)\right)\right) \\ \beta_i = \text{withlookup}\left(t,\left(\left[\left(t_{\min},\beta_{\min}\right)-\left(t_{\max},\beta_{\max}\right)\right]\left(t_1,\beta_1\right)\left(t_2,\beta_2\right)\cdots\left(t_i,\beta_i\right)\right)\right) \end{cases} \quad (3)$$

4. Model Checking and Simulation

4.1. Model Checking

Model testing is a research and testing process to determine the correctness, validity and credibility of a model. Since the concept of digital business environment has only been put forward in recent years, the research on the dynamic assessment of the development level of digital business environment has a certain degree of foresight. In addition, most of the existing researches use traditional mathematical and statistical methods for index evaluation, and the index system constructed is to reach unity. Therefore, considering the prospective nature of the current research content and the immaturity of the research methodology, historical data were not used to conduct thorough behaviour reproduction tests. In this paper, the model is tested from three perspectives: model structure suitability test, model behaviour suitability test, model structure and actual system consistency test, and model behaviour.

4.1.1. Model Structure Suitability Test

The model structure suitability test includes measure consistency test and model boundary appropriateness test. Among them, the consistency test is to check whether the units on the left and right sides of all equations in the model are consistent. Specifically, the units on the left and right sides of Equations (1), (2), and (3) in the model are dimensionless quantities, which cannot be added or entered into dmnl. We test the model through the "unit test" function that comes with the simulation software, which shows that the model passes the test, and the data sources are all real and reliable. In addition, the model boundary appropriateness test is usually to test the endogeneity of the boundary and model variables. Firstly, the model focuses on the complex development laws in the transformation process of the new digital business environment. In this paper, based on case studies, practical research and expert communication and discussion, many factors affecting the transformation of the new digital business environment are identified. At the same time, the main variables are highlighted and non-essential research variables are not included to make the model boundary clear. Secondly, the endogenous variables of this paper, digital economy and business environment, assume the role of key variables in the system. Digital economy and business environment have a close dependence on each other and the feedback characteristics of mutual causality, which meets the requirements of endogeneity of the model variables. Therefore, it can be concluded that the model has passed the consistency test and the model boundary appropriateness test.

4.1.2. Behavioural Fitness Test of the Model

In this paper, parameter sensitivity test and integral error test are adopted to test the appropriateness of model behaviour. The main operation method of parameter sensitivity test is to adjust the important parameter values of the system, simulate the output results of different parameter values corresponding to the test variables with Vensim software respectively, and judge whether the running laws and trends of the influence variables are in line with the objective facts. In this paper, two coupling factors are selected to carry out sensitivity testing, respectively, and the two coupling factors are increased by 10%, 20% and 30%, respectively, to test the parameter sensitivity with the level of the digital economy and the business environment as an example, and the results are shown in Figure 6. The left figure shows that the coupling factor γ_1 gradually increases, i.e., when the convergence of the digital economy to the business environment is enhanced, the level of the digital economy is also continuously improved. The right graph shows that the coupling factor γ_2 gradually increases, i.e., when the degree of convergence of the business environment to the digital economy is enhanced, the level of the business environment is also increasing at any time, which is in line with the market reality.

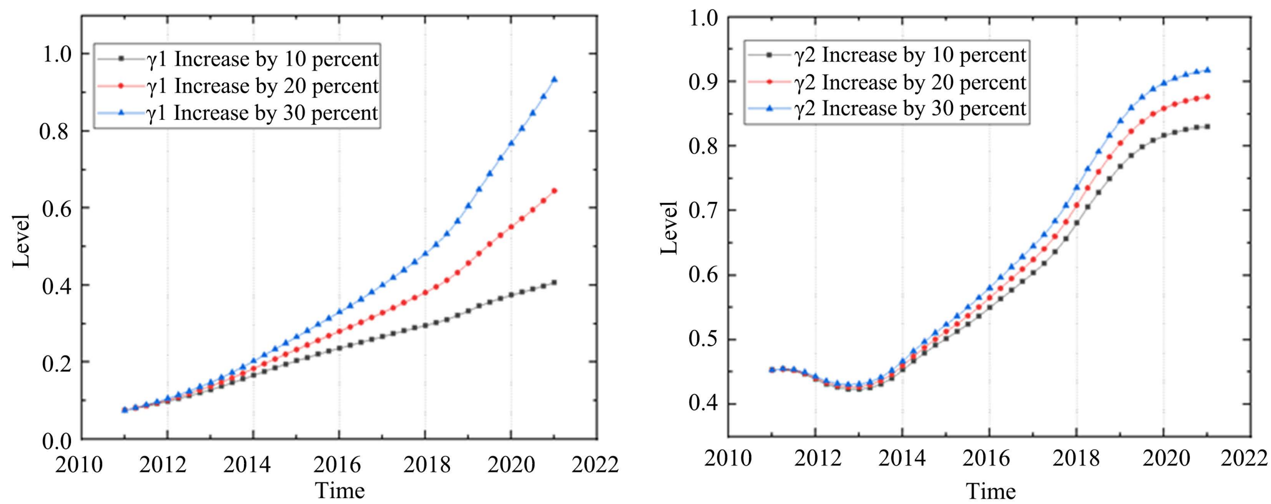

Figure 6. Parameter sensitivity test results.

The main operation method of the integral error test is to simulate the output results of the corresponding test variables under different step settings by changing the simulation step size, using Vensim software, and to determine whether the running laws and trends of the influential variables converge. In this paper, taking the level of digital economy and business environment as an example, the simulation step size is set to 0.25, 0.5, 0.75, 1 for the integral error test, and the results are shown in **Figure 7**. The left and right graphs show the impact of different simulation steps on the digital economy and business environment level, respectively. And it can be seen that the trend of the two main variables still converge after the change of time interval, so it passes the test.

4.1.3. Model Structure and Actual System Consistency Test

The consistency test between the model structure and the actual system includes visual test and parameter estimation test. In order to construct the framework of the dynamic development model, the modelling consists of the following five steps: defining the problem, defining the boundary of the system, sorting out the mechanism of the coupled system and the feedback loops, abstracting the equations for system, and setting the parameters of the equations, which is a complete and reasonable framework for the modelling of the model with no omissions. The modelling framework of the model is complete and reasonable, with no omissions. Therefore, it can be considered that the model can pass the visual test. Next, we consider whether the parameters of the model pass the test. The parameter setting of power factors (α_1 and α_2) and dissipation factors (β_1 and β_2) in the system dynamics model adopts the PLS-SEM method. Specifically, the unmeasurable variables such as digital economy dynamics, digital economy damping, business environment dynamics, business environment damping, business environment damping and the integrated level of the coupled system are described by multiple latent variables. A structural model is constructed based on the partial least squares (PLS) path, and causality is modelled using

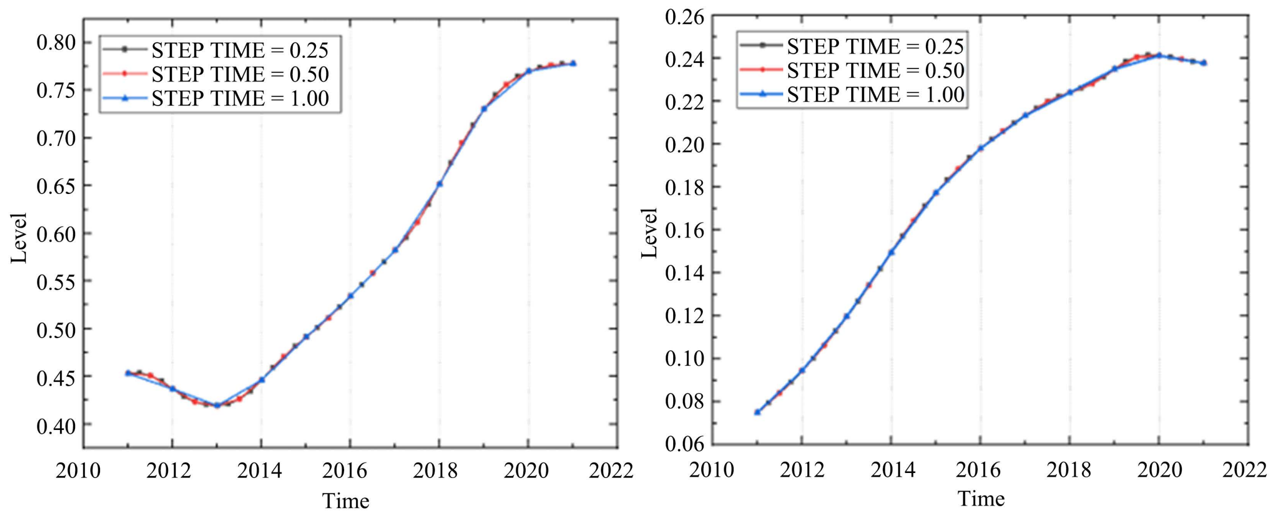

Figure 7. Integral error test results.

multiple iterations, principal component analysis, and multiple regression to estimate the causal parameters among the latent variables. Observational loading coefficients tests were first performed for the PLS-SEM model (see Figure A1 and Figure A2 in the appendix). Most of the factor loading coefficients are above 0.7, among which the factor loading coefficient of the number of grass-roots trade unions establishing labour dispute mediation committees-business environment dynamics is 0.698, i.e., the factor loading coefficients are all above 0.6. This meets the requirements of model construction. Second, the internal consistency test, the main measurement values include Cronbach's alpha, Composite reliability, and AVE value. The test results are collated in Table 1.

As seen in Table 1, the Cronbach's coefficient for the power and damping of the digital economy (Model A) and the business environment (Model B) for both subsystems are above 0.7. And the combined Composite reliability of the latent variables are all greater than 0.8. This can be judged that the internal consistency of the construct can be accepted. On this basis, the average AVE values of the extracted variances of the groups of observed variables corresponding to the six latent variables were tested to be higher than 0.5, indicating that more than 50 per cent of the variance information of the observed variables was effectively utilised and that the construct had good convergent validity. Finally, after testing that the model has good reliability and validity, this paper conducted Bootstrap test for the significance of the coefficients of the structural model, and the results are shown in Table 2. The standard deviation of the four paths of the two structural models are small, the t-test values are all larger and greater than 3.29, and the significance of the path coefficients are all 0, i.e., they are significant at the level of 0. 001. The R2 of the PLS path model is classified into the degrees of better (0.67), medium (0.33), and poorer (0.19). The R2 values of the combined levels of the two structural model coupled systems in this paper are 0.793 and 0.759, respectively, which are higher than 0.67. This indicates that the

Table 1. Measurement model evaluation indicators.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
Damping. 1	0.835	0.9	0.901
drivers. 1	0.902	0.917	0.924
level	0.902	0.902	0.939
Damping. 2	0.736	0.836	0.85
drivers. 2	0.924	0.944	0.94
level	0.902	0.901	0.939

Table 2. Bootstrap test of path coefficients.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values
Damping. 1 → level	−0.321	−0.321	0.023	13.771	0***
Drivers. 1 → level	0.675	0.677	0.026	25.882	0***
Damping. 2 → level	−0.489	−0.49	0.021	23.039	0***
Drivers. 2 → level	0.528	0.529	0.024	22.162	0***

Notes: *, * *, * * * respectively represent 10%, 5% and 1% significance level.

endogenous latent variables can better explain the levels of the motivating and damping factors of the digital economy and business environment. Therefore, the synthesis indicates that the model has a strong explanatory ability, and it can be considered that the model passes the Visual test and parametric test.

4.2. Simulation Results

Using this complex development model of the digital business environment, a flow chart of the "digital economy-business environment" dynamics was created. We simulate the development levels of two key endogenous variables in the model, namely the digital economy and the business environment, for the period 2011-2021. The behaviour of these two dynamics is shown in Table 3.

As can be seen in Figure 8, both the digital economy and Doing Business show an S-shaped growth from 2011-2021, which is generated by the non-linear interaction of the feedback structure of the system. Among them, the digital economy is developing at a faster growth rate in 2011-2014. This is mainly due to the development of new technologies to promote the rapid growth of the digital economy, the digital economy has a strong information sharing and interconnection characteristics, accelerating the development of the digital economy. Moreover, compared with the traditional business environment, the operating costs of the digital economy are relatively low, which makes it easier to develop rapidly. In recent years, the overall development level of the digital economy still

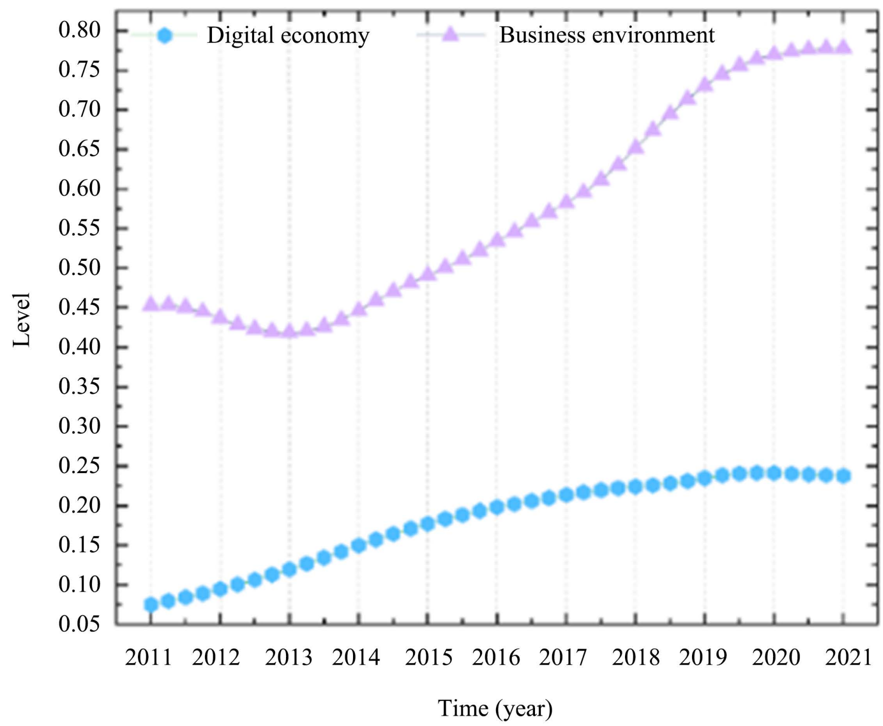

Figure 8. Simulation results of "digital economy-business environment", 2011-2021.

Table 3. Numerical simulation results of digital economy and business environment.

Time (Year)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
business environment	0.453	0.437	0.419	0.446	0.491	0.534	0.582	0.652	0.731	0.770	0.778
Digital economy	0.075	0.094	0.120	0.149	0.177	0.198	0.213	0.224	0.235	0.241	0.238

has a certain gap relative to the traditional business environment. This is mainly due to the fact that digital transformation requires a large amount of upfront investment and technical support, and many projects have not been able to fully transform, or digitised only in local areas, and have not formed an effective coverage. Moreover, the digital economy as a whole lacks a stable legal environment, which is not conducive to long-term development.

5. Behaviour Discussions and Policy Design

On the basis of 4.2, this paper wants to further explore the future dynamic behavioural laws of the digital business environment, including the business environment under the empowerment of the digital economy on the business environment and the digital economy that achieves its own further development in the process of integration. To address these issues, we simulate and predict the level of digital economy and the level of business environment in the coupled system from 2025 to 2035, as shown in Figure 9. This helps to formulate clear

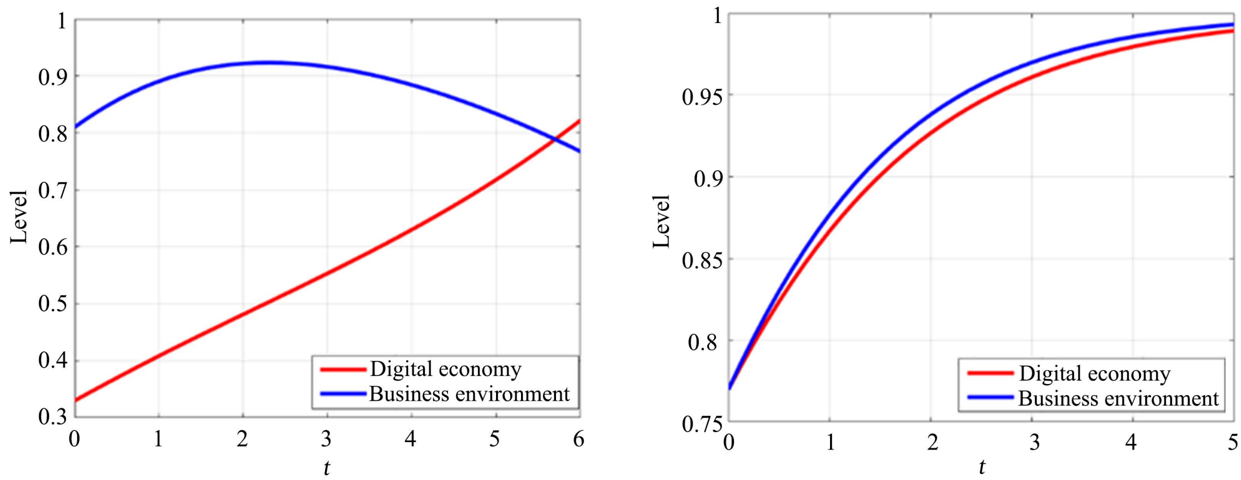

Figure 9. Simulation of the "digital economy-business environment" power system, 2025-2030.

development plans and measures that can confidently face uncertainties in future development. In this paper, we refer to Jianhua Zhu's three-stage theory of dynamic technology integration (Zhu et al., 2020), which divides the life cycle of the coupled system of digital economy and business environment into three stages.

5.1. Growth Stage

The overall level of the digital economy is lower than the level of the traditional business environment. The level of China's digital business environment is in the growth stage, due to the country's increased investment in digital resources, the growth rate of the digital economy is larger, and the country's digital government has made great progress in the application of digital technology. However, the coupling factor at this stage is negative, and the following deficiencies still exist:

1) Digital divide: China's digital penetration rate has continued to increase, but some regions still face problems such as low penetration of digital technology, inconvenient logistics and distribution, and a shortage of human resources. The problem of digital divide still exists, and some residents are unable to enjoy the convenience of digital government.

2) Data security issues: With the development of digital government, the data security risks faced are gradually increasing (Wei, 2020). At present, government legislation and regulatory measures for the protection of personal information and privacy need to be upgraded, and there is a risk of leakage and misuse of sensitive data.

3) Imperfect service standardisation: Due to the different levels of digital government management in different places, there is a lack of uniform standards and norms, resulting in uneven service quality, bringing unnecessary trouble and distress to the masses, and thus leading to poor user experience. The user experience of the current digital government platform has yet to be improved.

The operation of some websites is complicated and the information is not clear and specific enough, leading to poor user experience, which may cause some people to have bad feelings and damage the image of the government.

The system during this period was at the stage of resource integration and the overall level of coupling was weak. In order to better promote the construction of digital government services, we need to further strengthen the development of technical standards, data security protection and service quality supervision. We need to enhance user experience and integrate urban and rural informatisation resources to narrow the digital divide, solidify the foundation of new-generation digital technologies, and focus on the development of digital technologies such as digital infrastructure development, data element enterprises, artificial intelligence, the Internet of Things and cloud computing. Ultimately, this will lead to policy formulation and organisational change in government departments, so that the digital economy can better empower the real economy, and efforts can be made to create a "digitally intelligent" business environment.

5.2. Adaptation Stage

The level of digital economy and the level of business environment basically converge, and the dynamic system of "digital economy-business environment" will show a new trend of change. The growth rate of both digital economy and business environment is slow, the integration factor is non-negative, and the dissipation force of the power system is only the damping factor. In order to avoid the situation where the power factor is equal to the damping factor, the government should focus on the convergence fitness of the digital business environment. The integration fitness of the digital business environment refers to the degree of integration and development of digital technology with the economy and society, as well as the degree of seamlessness between digital scenarios. The digital scene not only makes it easier to handle government affairs, but also provides more market development opportunities for enterprises. At the same time, traditional business environment governance initiatives should be broken to achieve the transformation and upgrading of the business environment. The government should pay attention to improving the laws and regulations related to emerging things, regulating market behaviours and data security, and preventing malignant behaviours such as data leakage, improper competition and copyright abuse. Eventually, a fair and just market order under the rule of law will be constructed, so that the digital business environment can develop benignly.

5.3. Innovation Stage

The level of business environment exceeds the level of digital economy. In this stage, the emerging digital business environment is gradually accepted by the public, the high-quality development of the regional economy has been further developed, and the state has invested funds in the development of the digital economy to match the current material needs of life and the business environment. A higher level of development of the digital economy can be achieved by broadening the access thresholds of digital factor markets. As the digital factor market requires advanced technologies and systems to ensure data security, accuracy and comprehensiveness, the entry threshold of the digital factor market can be broadened while limiting the low level of competition in the market, maintaining the vitality of the market and promoting the healthy and orderly development of the digital factor market. It also focuses on the further development of the digital economy from the perspectives of weak areas, balanced digital economy ecology and digital information consumption level. The "digital economy and business environment" will then enter into a new round of dynamic integration process, which will continue to help the domestic and international double cycle and the high-quality development of China's regional economy.

6. Conclusion

6.1. Summary of Findings

China's "digital economy-business environment" coupling system is in the initial stage. Digital technology, digital talents and digital infrastructure investment are at the stage of resource integration. Currently, most of the digital business environment uses digital government platform to simplify the process of market players to handle daily business, and implement the "one network", "cross-province" and other service modes, but the traditional business model has not produced a large innovation, and the enabling effect of the digital economy on the traditional business environment is not obvious. The enabling effect of digital economy on traditional business environment is not obvious. Combining the simulation results and literature collation, it is found that the level of regional digital economy development from 2011 to 2021 is lower than the level of business environment development. At this stage, the level of digital economy development is not high, and in the digital economy, some large enterprises have more resources and advantages, while small and medium-sized enterprises face greater competitive pressure, which has a certain impact on the fairness and sustainability of the digital economy. At the same time, data security, privacy protection and talent shortages have also become important issues for the development of the digital economy.

In the future, the development of the "digital economy-business environment" coupling system will be favourable. The momentum of digital economy and business environment both increase year by year, and the momentum of digital economy development is higher than the momentum of business environment development. As can be seen from α_1 and α_2 fitted by the PLS-SEM model (**Figure 10**), the digital economy power factor is 0.675 higher than the business environment power factor of 0.528, which verifies that the country is continuously increasing the innovation of the digital economy in this stage, so as to

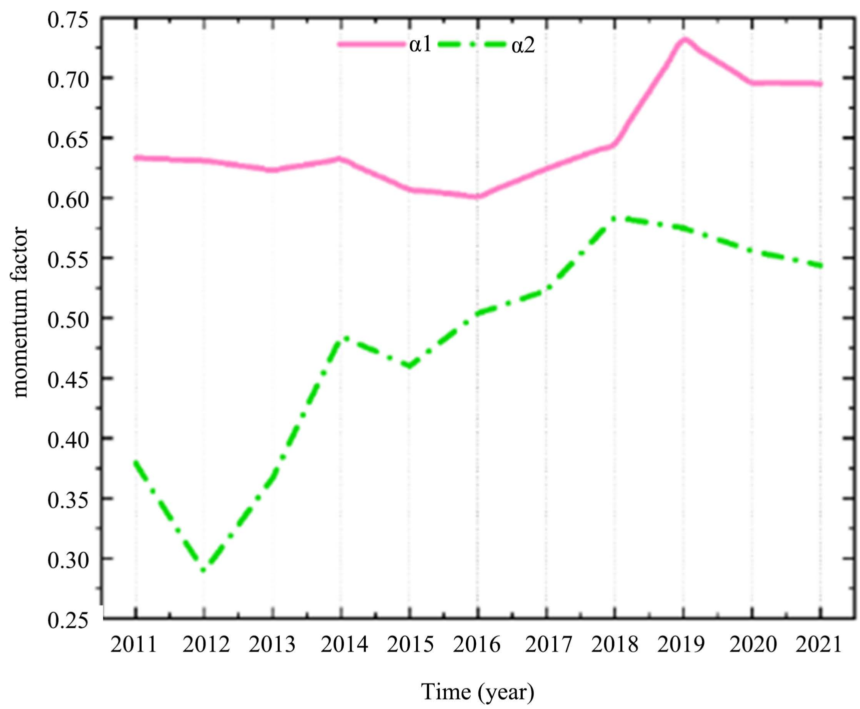

Figure 10. Covariate values, 2011-2021.

make the growth rate of the digital economy higher than that of the business environment, and thus to achieve a better integration of the digital economy-business environment system.

6.2. Managerial and Policy Implications

The above study points out the importance of the development of the digital economy and the modernisation of governance. In the face of the current status quo of the low level of development of the digital economy, the state has upgraded and innovated the digital economy by increasing capital investment, talent training, policy support and other initiatives. Science and technology innovation is the most basic and important driving force for the development of digital economy. Policy support is an important guarantee for the vigorous development of digital economy. The popularisation of knowledge and the needs of the digital economy market sector also promote the rapid development of the digital economy, enabling the level of digital economic development to catch up with the level of development of the business environment. In addition, for the public sector, governance modernisation is another important management issue at this stage. At this stage, the business environment has been steadily improved, as evidenced by the public sector's establishment of specialised agencies for co-ordination and planning and deployment in the areas of e-government, information disclosure on government websites, "Internet+" and artificial intelligence. And most provinces and cities have opened digital platforms such as government apps, government WeChat apps, government microblogs and online government platforms. However, in the process of digital transformation of the government, there is still room for optimisation in terms of policy coverage, website improvement and public penetration. Specifically, the digital ecological policies in the economic and social fields are more perfect compared to the digital government policies, and the development of government portals needs to be further strengthened, such as in terms of the activity of use, the attention of the public, and the smoothness of operation of the official website of government services.

Although the simulation of this complex system is a simplification and abstraction of reality, this study depicts the dynamic evolution process of the digital business environment system over time, which achieves the dynamic evolution and prediction of the development of the digital business environment, and facilitates the decision makers to make corresponding behavioural choices in response to different dynamic evolutions. This is beyond the research scope of the traditional mathematical and statistical methods often used by scholars at this stage. In addition, the simulation of this complex system is a microcosm of reality, i.e., the model and the imitated real system are similar. The business environment we study is the business environment that has not been detached from the empowerment of the digital economy. It is in line with the current stage of digital transformation and governance modernisation in government. We explore both the dynamic behaviour of the business environment in the broader sense achieved in the process of continuous empowerment of the digital economy, and the dynamic behaviour of the digital economy in the process of continuous empowerment and its own development.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendix: Supplementary Data

1) Measurement of digital economy (Model A)

a) Digital economy drivers (Drivers. 1), the government's supply-side perspective to promote the development of the digital economy through policy incentives, economic subsidies, investment in infrastructure development in key areas, so that the factors of innovation form a magnetic effect. This paper calculates six indicators: the number of high-tech industrial enterprises, the number of technology contracts, the number of domestic patent applications, the number of Internet broadband access ports, Research and experimental development (R & D) funding intensity, and the proportion of rural broadband access users/urban broadband access users.

b) Digital economy damping (Damping. 1), the current level of development of digital economy is limited by factors such as urban and rural development and uneven educational resources. And there is a large gap in the level of development between regions, and the overall development of the digital economy level is being resisted. This paper estimates the damping of the digital economy through the incidence of rural poverty, the proportion of illiterate and semi-illiterate people aged 15 and above and the Theil index.

Table A1. Index system of doing business in digital variables.

Number	Potential indicators	symbol	Measurable indicators	symbol	Data sources
1	Digital economy dynamics ξ_1	Drivers. 1	Proportion of rural broadband access users/urban broadband access users X1	Share of broadband	China Statistical Yearbook
2			Number of Internet broadband access ports X2	ports	China Statistical Yearbook
3			Number of technology contracts X3	contracts	China Torch Statistical Yearbook
4			Number of domestic patent applications X4	Patents	China Science and Technology Statistical Yearbook
5			Research and experimental development (R & D) funding intensity X5	Funding	China Science and Technology Statistical Yearbook
6			Number of high-tech industrial enterprisesX6	high-tech	China Statistics Yearbook on High Technology Industry
7	Digital economy damping ξ_2	Damping. 1	Rural poverty X7	Poverty	China Rural Poverty Monitoring Report
8			Proportion of illiterate and semi-illiterate people aged 15 X8	Illiterate	China Statistical Yearbook
9			Theil index X9	Theil	calculate

Continued

10	Business environment dynamics ξ_3	Drivers. 2	Number of all legal companies in the three industries X10	Companies	Statistical Yearbook of China's Tertiary Industry
11			Total number of retail chain stores X11	chain	China Commerce Yearbook
12			Export of foreign-invested enterprises X12	export	China Commerce Yearbook
13			Number of grassroots trade unions establishing labor dispute mediation committee X13	trade union	China Labour Statistical Yearbook
14			Number of workers insured at the end of the year X14	insure	China Labour Statistical Yearbook
15			Market index X15	marketization	China Marketization Index Database
16	Business environment damping ξ_4	Damping. 2	Rural population/Urban population X16	population	China Statistical Yearbook
17			Urban-rural income gap X17	income gap	China Statistical Yearbook
18			Variation of retail sales of social consumer goods X18	Consumer goods	Almanac of China's Finance and Banking
19	Comprehensive level of the coupling system η	Level	Per capita GDP X19	GDP	China Statistical Yearbook
20			Per capita disposable income of all residents X20	income	China Statistical Yearbook
21			Tax revenue X21	taxation	Tax Yearbook of China

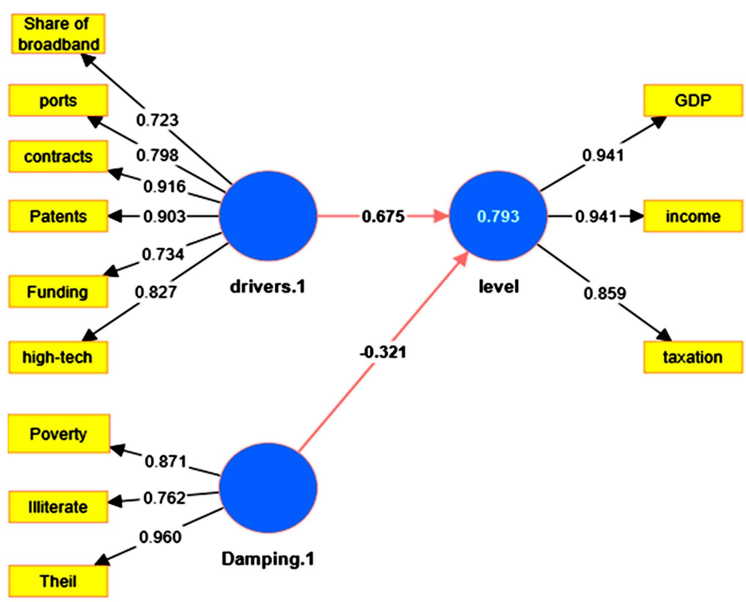

Figure A1. Factor loading coefficients of LPS-SEM model A.

2) Measurement of business environment (Model B)

a) Business environment drivers (Drivers. 2), China has a large market size and a well-developed social security system. From the five aspects of leading economic strength, rich market players, high degree of opening-up, sound social security system and good business relations, six indicators are selected, such as the number of all legal entities in the three industries, the total number of retail chain stores, the export of foreign-invested enterprises, the number of grassroots trade unions establishing labor dispute mediation committees, the number of workers' injury insurance policies at the end of the year and Market index.

b) Business environment damping (Damping. 2), some resource cities are experiencing price increases, job losses and urban population loss due to the plight of slow industrial transformation, urban shrinkage, and resource depletion. Therefore, this paper calculates the damping of business environment through the variation of retail sales of social consumer goods, urban-rural income gap and rural population/urban population.

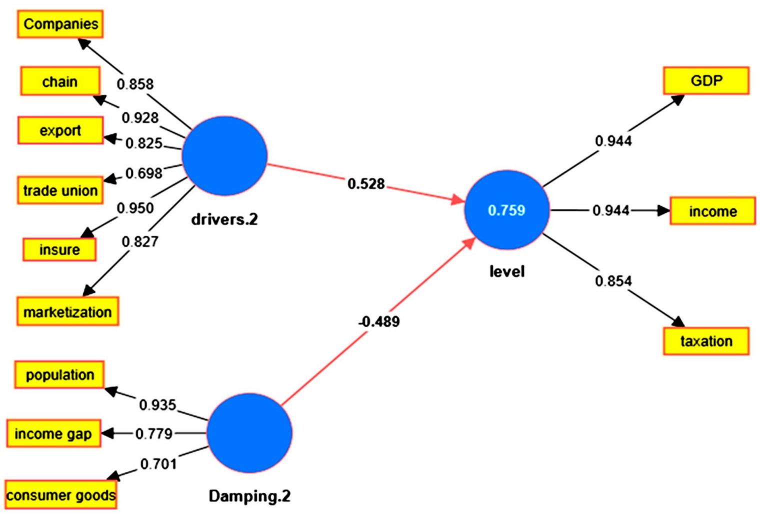

Figure A2. Factor loading coefficients of LPS-SEM model B.

Table A2. Parameter values.

Year	α_1	β_1	α_2	β_2
2011	0.633	0.393	0.379	0.685
2012	0.631	0.398	0.289	0.724
2013	0.623	0.397	0.367	0.691
2014	0.632	0.388	0.485	0.604
2015	0.607	0.394	0.460	0.549
2016	0.601	0.394	0.504	0.535
2017	0.624	0.384	0.523	0.521
2018	0.645	0.367	0.584	0.458
2019	0.731	0.261	0.575	0.460
2020	0.696	0.314	0.556	0.491

3) Measurement of the comprehensive level of the coupling system

A good "digital economy-Business environment" coupling environment can be measured from three perspectives: social development achievements, social welfare achievements and national economic achievements, including three indicators: per capita gross domestic product, per capita disposable income of all residents and tax revenue.