The Impact of the Digital Economy on Enterprise Sustainable Development and Its Spatial-Temporal Evolution: An Empirical Analysis Based on Urban Panel Data in China

Zhiqiang Zhou, Wenyan Liu, Pengfei Cheng and Zhenjin Li

Abstract: The digital economy has been a great impetus to the sustainable development of enterprises. This study aims to analyze the impact and mechanism of the digital economy on the sustainable development of enterprises and its mechanism. Therefore, on the basis of measuring the level of urban digital economy and the level of sustainable development of enterprises, this study empirically analyzed the impact of the digital economy on enterprise sustainable development and its mechanism by using panel data of 280 A-share listed companies in cities from 2011 to 2019. The research shows that, first, the digital economy and sustainable development of enterprises have obvious spatial differentiation characteristics. Second, the digital economy can significantly promote the sustainable development of enterprises and play a role through regional innovation and entrepreneurship. In addition, compared with the midwest, the promotion effect of the east is more significant. At the provincial level, the promotion effect is better in the developed eastern provinces, such as Jiangsu, Zhejiang and Guangdong. The digital economy promotion effect is more obvious in the Yangtze River Delta, Beijing-Tianjin-Hebei, and other developed urban agglomerations in the east. Therefore, the government can accelerate the development of the digital economy, active regional innovation, and entrepreneurship activities so as to find a way to promote the sustainable development of enterprises.

Keywords: digital economy; sustainable development of enterprises; regional innovation and entrepreneurship; spatial heterogeneity

1. Introduction

With China’s economy shifting from the stage of high-speed growth to the stage of high-quality development, achieving sustainable economic development has become the direction and core issue of China’s economic development at present and in the future [1]. As the micro foothold of macro economy, the development quality of enterprises directly affects the steady and healthy development of economy [2]. In recent years, various natural disasters, major public health crises, and other emergencies have occurred frequently, which have had a significant impact on the sustainable development of enterprises [3,4]. Especially since the COVID-19 pandemic, the environmental uncertainty has seriously hindered the sustainable development of enterprises and caused a great impact on the smooth operation of the overall economy [5–7]. Therefore, it is urgent to rapidly change the economic development mode quickly and enhance the sustainable development ability of enterprises.

The digital economy is a new economic form emerging with the rapid development of the information and communication technology industry [8]. It is also a new main economic form following the agricultural economy and the industrial economy. During the
13th Five-Year Plan for national economic and social development of the People’s Republic of China, the digital economy has played an increasingly prominent role in leading the economy and society. According to statistics, the added value of core industries in China’s digital economy accounted for 7.8 percent of GDP in 2020 [9]. In addition, according to China’s Digital Economy Development Report (2022), the scale of China’s digital economy reached CNY 45.5 trillion in 2021, a nominal growth of 16.2 percent year on year, accounting for 39.8 percent of GDP [10]. The digital economy has become an important engine to drive economic growth [11].

The wide application of digital technologies such as 5G technology, big data, cloud computing, and artificial intelligence has significantly boosted social productivity [12] and brought new opportunities for the sustainable development of traditional industries [13]. Judging from the existing research results, how the digital economy can empower the sustainable development of enterprises is ultimately reflected in three aspects in the final analysis: the first is the efficiency of resource allocation [14]. The digital economy takes data as the key production factor and the modern information network as the carrier [15]. The effective use of digital technology effectively improves the utilization of resources to reduce the waste of resources [16]. At the same time, the digital economy promotes the extensive application of artificial intelligence technology and robots, which has caused a great impact on the traditional labor force and seriously threatened the status of human resources as the most important resources in enterprises [17]. However, under this background, the quality of the labor force in the digital economy also contributed to the traditional characteristics change, optimized the structure of human capital [18,19], promoted labor resources allocation efficiency, improved labor productivity [20], promoted the marketization disposition process of labor factor, accelerated labor market development [21], and improved the ability of enterprise resource sustainable utilization. The second is the innovation-driven effect [8]. Saving resources, realizing green production, and protecting the natural environment are several important goals to promote sustainable development [22], but in addition, the continuous enhancement of competitiveness is also an important prerequisite to ensure the sustainable development of enterprises [23]. The digital economy is an important driving force for the innovation and development of enterprises, which can significantly improve the technological innovation level and breakthrough innovation capability of enterprises [11,24]. In this way, enterprises can be promoted to respond quickly to the external environment, accelerate the digital transformation of enterprises, and thus improve the sustainable development ability of enterprises. The digital economy is the power source to promote industrial upgrading and structural optimization [25]. As a new factor of production [26], digitization can not only promote the full integration of industrialization and information technology [27] and promote the digital transformation of traditional industries [28] but also promote digital industrialization and industrial digitization. The development and application of digital economy and digital technology constantly give rise to new industries, form new economic growth points, effectively promote the upgrading of industrial structure [29], accelerate the pace of moving towards medium- and high-end industries, and thus provide inexhaustible power for the sustainable development of enterprises.

Through sorting and analyzing the existing research, the researchers found that most of the research is from the perspective of digital economy and macro environmental sustainable development to study the impact of digital economy on industry sustainable development [30,31], sustainable development of regional economy [32–34], and sustainable development of national economic system [35]. However, few scholars have paid attention to the impact of the digital economy on the sustainable development of micro-enterprises [36], and only a few scholars have explored the aspects of business models [37], social responsibility [38], competitiveness [39], and so on. In particular, there is a lack of empirical results exploring the relationship between digital economy and enterprise sustainable development based on the spatio-temporal perspective and prefecture-level scale. The spatio-temporal perspective proposed here refers to testing the relationship
between variables from a temporal perspective and analyzing the evolution trend of variables and their effects from a spatial pattern. In addition, the digital economy measured in this study is based on the city perspective; therefore, the reference to the prefecture-level city scale in the study refers to the relationship between variables examined from the city perspective. For example, similar studies have pointed out that focusing on the spatial and temporal evolution of regional urban tourism ecological security is conducive to promoting sustainable tourism development [40].

On the other hand, some studies have shown that the development of digital economy in China is characterized by significant regional imbalance and distinct spatial pattern differentiation [41]. The development level of digital economy in eastern China is much higher than that in other regions, and the marginal contribution rate to high-quality economic development is higher [42]. The distinct characteristics of the spatial pattern will significantly affect the quality of regional economic development. However, it seems that scholars focus only on the unbalanced development of digital economy on the regional scale and the quality of macroeconomic development caused by the imbalance of spatial development. They did not pay attention to the impact of the development of the urban digital economy on the sustainable development of micro-enterprises and the evolution trend of spatial patterns. However, the influence of the macro environment on the micro-unit is obvious. Therefore, this study believes that an in-depth exploration of the impact of the urban digital economy on the sustainable development of enterprises and its spatio-temporal evolution trend is a useful supplement to the existing research on spatio-temporal characteristics.

Given this, this study integrates the digital economy and the sustainable development of micro-enterprises into a unified analysis framework from the perspective of time and space, based on the prefecture-level city scale. We selected the listed companies in 280 cities from 2011 to 2019 as the research objects and analyzed the current regional pattern of digital economy development and sustainable development of enterprises in China. By constructing a fixed effect model, the impact of the digital economy on the sustainable development of enterprises and the conduction mechanism of regional innovation and entrepreneurship activities were investigated so as to reveal the spatial distribution characteristics and time-space evolution laws of the sustainable development of enterprises, the digital economy, and its promotion effects. On this basis, corresponding policy recommendations are put forward to provide a decision-making reference for giving full play to the dividends of the digital economy and promoting the sustainable development of enterprises. Therefore, the purpose of this study is to: (1) understand the current situation and gap between the urban digital economy and enterprise sustainable development; (2) analyze the impact of the digital economy on enterprise sustainable development and its spatial-temporal heterogeneity; (3) analyze the potential factors affecting the relationship between digital economy and sustainable development of enterprises; and (4) provide suggestions for relevant departments (such as local government, policy-making department, and enterprise managers) to formulate policies and regulations.

The structure of this study is as follows: Section 2 reviews the relevant literature research on digital economy, sustainable development of enterprises, and regional innovation and entrepreneurship and proposes research hypotheses. The third section constructs the test model and introduces the data source. The fourth section reports the measurement results and spatial characteristics of digital economy and enterprise sustainable development. The fifth section gives the corresponding empirical test results and spatial characteristics analysis results. Section 6 discusses the research results in detail, puts forward corresponding policy suggestions, and summarizes the shortcomings of this research.

2. Literature Review and Research Hypothesis

The digital economy is crucial to achieving sustainable development. Although previous studies have covered issues such as digital economy, sustainable development, and innovation and entrepreneurship [16,35], they have not been included in a unified analytical framework, resulting in insufficient details of relevant issues. Therefore, in this
part, the researchers mainly considered two aspects: (1) the relationship between the digital economy and sustainable development of enterprises and (2) the relationship between the digital economy and regional innovation and entrepreneurship.

### 2.1. The Relationship between Digital Economy and Enterprise Sustainable Development

The concept of sustainable development is complex and multi-dimensional. It is not only limited to the sustainable development of environment and resources but also includes the innovation dimension. Innovation is a major driver of sustainable development [43]. Achieving the goal of sustainable development requires both fundamental and systematic innovation [44]. Therefore, the enterprise sustainable development defined in this study is based on the innovation level, where enterprises can continuously gain competitive advantages and achieve sustainable development. Studies have confirmed that the digital economy has a significant role in promoting the sustainable development of ecological environment [45] and green economy [46]. Few scholars have paid attention to the innovative aspect of the concept of sustainable development. However, the rapid development of the digital economy has brought about the momentum of innovation [47], which has been closely linked to the sustainable development of enterprises.

With the characteristics of permeability, externality, and complementarity, the digital economy can be effectively extended to the whole economic system, deeply integrated with the real economy [15]. The aims of this study are as follows: to promote the sustainable development of enterprises by optimizing the allocation of resources, improving the efficiency of production [48], and innovation [11]. From the internal perspective of enterprises, in the context of digital economy, data have replaced labor, land, and resources and have become the key factor to promote economic development [49]. The transformation of enterprises from focusing on the type and quantity of factor input to focusing on the combination mode and quality has effectively alleviated the problem of resource misallocation and improved the efficiency of resource utilization.

Driven by the new generation of information technology, the digital and intelligent level of enterprise production is gradually improved, and the management system is increasingly perfect. This kind of digital power has greatly improved the production efficiency of enterprises [50]. At the same time, the digital economy has accelerated the pace of technological innovation and significantly improved the efficiency of innovation [51]. Technological innovation with digitalization and intelligence as its core features is the key force driving economic growth, the transformation and upgrading of industrial structure, and the sustainable development of enterprises [52,53].

From the outside of enterprises, the rapid development of digital economy promotes the establishment and use of digital platforms. The connectivity of digital platforms for enterprises, suppliers, and consumers [54–56] can effectively reduce the degree of information asymmetry among the three parties [57] so that they can more accurately predict the supply and demand conditions of the product market to make flexible decisions. Secondly, the digital platform can also significantly reduce the search costs, negotiation costs, and transaction costs of buyers and sellers and help enterprises achieve flexible customized production [58] by accurately grasping the choice preferences [59] and personalized needs of consumers. This will help enterprises to form a diversified product structure, develop new markets, and achieve scale effect and scope effect. Based on the above summary and analysis, we believe that the digital economy promotes the sustainable development of enterprises from both internal and external channels. The action path can be decomposed into improving the efficiency of resource allocation, production efficiency, and innovation efficiency of enterprises. Therefore, this study concludes that there is a significant positive relationship between digital economy and corporate sustainability. Based on this, hypothesis 1 is proposed in this paper:

**Hypothesis 1 (H1). Digital economy has a significant positive role in promoting the sustainable development of enterprises.**
2.2. Digital Economy, Regional Innovation and Entrepreneurship, and Sustainable Enterprise Development

Digital economy has obvious cross-temporal characteristics, which can promote the flow of data, information, and other factors in the whole region [60]; and speed up the exchange and dissemination of information [61], strengthen inter-regional innovation and entrepreneurship links and resource sharing [62], break down barriers to innovation and entrepreneurship, optimize the allocation of innovation and entrepreneurship resources, and thus improve regional innovation and entrepreneurship capacity and efficiency.

The digital economy can also significantly enhance the innovation and entrepreneurship capacity of neighboring regions through spillover effects. At the same time, some studies have also confirmed that the development model with innovation and entrepreneurship as the core is the only way for China’s sustained and healthy economic development [63]. Regional innovation has a significant positive amplification effect on business growth [64]. It can influence the knowledge innovation ability and performance of enterprises through the regional innovation network and promote the innovation ability of enterprises through the construction of a regional innovation system to promote the sustainable development of enterprises.

In addition, some scholars have pointed out that mobile payment significantly increases the possibility of family entrepreneurship, which indicates that the impact of digital economy on entrepreneurial activities has been deeply embedded in micro groups. [65]. At the enterprise level, in the context of digital transformation, a large number of entrepreneurs have an impact on the entire ecosystem through spillover effects and then make the innovative spirit flow like a wave [66], thereby driving innovative development and sustainable development of enterprises in the region. Based on this, Hypothesis 2 is proposed in this paper:

Hypothesis 2 (H2). Regional innovation and entrepreneurship activities are important mechanisms for the digital economy to affect the sustainable development of enterprises.

3. Model Design

3.1. The Model

Longitudinal data (panel data) are more and more widely used in social science research. The method that scholars use its characteristics to study causal effect is widely called the fixed-effect model and random-effect model [67]. However, the random effects model is limited to the assumption of potential heterogeneity and zero correlation among the included observed characteristics [68]. By contrast, the fixed-effects model has the advantage. If the data are longitudinal, the fixed-effects model can mitigate the impact of confounding variables on the estimation results even if they are not measured [69–71]. In addition, the fixed-effects model also eliminates the influence of time-invariant reasons and alleviates the omitted variable bias [67]. Therefore, using the fixed-effects model is less prone to bias [72]. Therefore, to test the direct impact of the digital economy on the sustainable development of enterprises, this study selected the fixed-effect model for the empirical test. At the same time, to avoid the omission of variables caused by industry differences and changes over time, industry fixed effects and year fixed effects are added to the model to construct the following two-way fixed-effects model.

\[
\text{sde}_{it} = \alpha_0 + \alpha_1 \text{digital}_{it} + \alpha_2 E_{it} + \alpha_3 C_{it} + \text{year}_t + \text{ind}_t + \epsilon_{it} \quad (1)
\]

Among them, the explained variable \(sde_{it}\) represents TFP of enterprise \(i\) in year \(t\), which is an alternative variable for the sustainable development of enterprise. The explanatory variable \(\text{digital}_{it}\) represents the digital economy index of city \(i\) in year \(t\), \(E_{it}\) represents the control variable at the firm level, \(C_{it}\) represents the control variable at the city level, \(\epsilon_{it}\) represents the random disturbance term, \(\text{year}_t\) represents the year fixed effect, and \(\text{ind}_t\) represents the industry fixed effect.
According to the results discussed above, in addition to the direct effect of digital economy on the sustainable development of enterprises, there may also be an indirect mechanism of action. Therefore, to further analyze the potential influencing factors of the digital economy on the sustainable development of enterprises, this study introduces regional innovation and entrepreneurship as the mechanism variable and draws on the research methods of Zhang [73] to construct the following test model. Formula (2) represents the mechanism test model.

\[ ie_{it} = \beta_0 + \beta_1 \text{digital}_{it} + \beta_2 E_{it} + \beta_3 C_{it} + \text{year}_t + \text{ind}_i + \epsilon_{it} \]  

(2)

where \( ie_{it} \) represents the innovation and entrepreneurship index of city \( i \) in year \( t \), and the remaining variables are the same as Equation (1).

### 3.2. The Variables

The explained variable is enterprise sustainable development (sde). TFP is used as an alternative indicator to measure. The report to the 19th National Congress of the Communist Party of China made it clear that to achieve high-quality economic development, TFP must be increased. The above analysis shows that the realization of sustainable development is an important goal to achieve high-quality economic development. In addition, the research shows that TFP is the main index to measure technological progress [8,74] and reflects the efficiency of technological factors [75]. As analyzed above, sustainable development defined in this study is the sustainable development of enterprises from the perspective of technology and innovation. Therefore, this study takes the total factor productivity of enterprises as an alternative indicator of sustainable development.

Thus far, there are mainly parametric methods [76], non-parametric methods [77], and semi-parametric methods [78,79] to measure TFP. However, considering that non-parametric methods have poor test efficacy and sometimes are not suitable for large samples, most of the existing studies adopt parametric and semi-parametric methods [80]. In addition, considering that the semi-parametric method has obvious advantages over the parametric method when estimating large sample data [81], this study decided to use the semi-parametric method to estimate the annual factor productivity of enterprises. First, the following production function model is established:

\[ Y_{it} = A_{it} L_{it}^{\alpha} K_{it}^{\beta} \]  

(3)

where \( Y \) represents output, \( L \) represents labor input, \( K \) represents capital input, and \( A \) represents TFP. Next, we take the logarithm of the model (3) and convert it into the following linear equation:

\[ y_{it} = \alpha l_{it} + \beta k_{it} + \epsilon_{it} \]  

(4)

where \( y, l, \) and \( k \) are logarithmic forms of \( Y, L, \) and \( K; \epsilon_{it} \) is the residual term. In this case, the log information of TFP is retained in the residual term. If Equation (4) is directly estimated, it will lead to simultaneity bias and sample selection bias, thus misestimating TFP [81]. Therefore, to solve the above problems, Olley and Pakes [79] proposed to add the inverse function of the optimal investment function into the equation, estimate Equation (4) by using the two-step estimation coefficient of labor input and capital input, and obtain the TFP. However, the optimal investment assumption does not take into account the failure of enterprise investment or missing or negative investment value. Therefore, Levinsohn and Petrin [78] are further improved by using more easily obtained intermediate inputs in the data, which effectively solves the problem of missing samples. Therefore, this study mainly refers to the research method of Levinsohn and Petrin [78] to measure the TFP and adopts the research method of Olley and Pakes [79] to conduct the robustness test.

Therefore, Equation (4) is transformed into the following linear equation in logarithmic form:

\[ \ln Y_{it} = \theta_0 + \theta_1 \ln L_{it} + \theta_2 \ln M_{it} + \theta_3 \ln K_{it} + \epsilon_{it} \]  

(5)
Among them, \( Y \) represents the main business income of company \( i \) in year \( t \), \( L \) represents the labor input of company \( i \) in year \( t \), and \( M \) represents company \( i \). The cash paid for purchasing goods and accepting labor services in year \( t \) represents the intermediate input, and \( K \) represents the capital investment of company \( i \) in year \( t \), and \( \varepsilon_{it} \) represents the random interference item.

The core explanatory variable is digital economy (digital). The urban digital economy index is calculated from the two dimensions of Internet development and digital financial inclusion, and the principal component analysis method is used to calculate the digital economy index of 280 cities. The specific evaluation index of the urban digital economy index is shown in Table 1.

Table 1. Urban Digital Economy Development Evaluation Index System.

<table>
<thead>
<tr>
<th>First Indicators</th>
<th>The Secondary Indicators</th>
<th>Measured Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Digital Economy Index</td>
<td>Internet penetration rate</td>
<td>Internet broadband access users/ten thousand</td>
</tr>
<tr>
<td></td>
<td>Number of Internet-related employees</td>
<td>Number of people employed in information transmission, computer services, and software</td>
</tr>
<tr>
<td></td>
<td>Internet-related output</td>
<td>Telecom service income/ten thousand yuan</td>
</tr>
<tr>
<td></td>
<td>Number of mobile Internet users</td>
<td>Number of mobile phone users/10,000 people</td>
</tr>
<tr>
<td></td>
<td>Inclusive development of digital finance</td>
<td>China Digital Financial Inclusion Index</td>
</tr>
</tbody>
</table>

Mechanism variable: regional innovation and entrepreneurship activities (ie). This study takes the prefecture-level regional innovation and entrepreneurship index [82] jointly developed by the National Institute of Development and Longxin Data Research Institute of Peking University as the influence mechanism to explore whether the digital economy can affect the sustainable development of enterprises through regional innovation and entrepreneurship. See Table 2 for the definition and description of variables.

Table 2. Variable definition and description.

<table>
<thead>
<tr>
<th>Variable Types</th>
<th>The Variable Name</th>
<th>Variable Symbol</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explained variable</td>
<td>Sustainable development</td>
<td>sde</td>
<td>See Equation (3).</td>
</tr>
<tr>
<td>Core explanatory variable</td>
<td>Urban Digital Economy Index</td>
<td>digital</td>
<td>Calculated by the model above</td>
</tr>
<tr>
<td>Mechanism of variable</td>
<td>Regional Innovation and Entrepreneurship Index</td>
<td>ie</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The enterprise scale</td>
<td>size</td>
<td>( \ln ) (number of employees)</td>
</tr>
<tr>
<td></td>
<td>Enterprise age</td>
<td>age</td>
<td>( \ln ) (Current year—year of listing)</td>
</tr>
<tr>
<td></td>
<td>Return on total assets</td>
<td>roa</td>
<td>Mean of net profit/total assets at the beginning and end of the period</td>
</tr>
<tr>
<td></td>
<td>Government subsidies</td>
<td>gov</td>
<td>( \ln ) (government subsidy)</td>
</tr>
<tr>
<td></td>
<td>Financial leverage</td>
<td>lev</td>
<td>Total liabilities/total assets ( \ln (1 + \text{board size}) )</td>
</tr>
<tr>
<td></td>
<td>Board size</td>
<td>board</td>
<td></td>
</tr>
<tr>
<td>Control variables</td>
<td>Concentration of ownership</td>
<td>ocon</td>
<td>( \ln (1 + \text{Shareholding ratio of the largest shareholder}) )</td>
</tr>
<tr>
<td></td>
<td>Urban population size</td>
<td>popu</td>
<td>( \ln ) (total urban population)</td>
</tr>
<tr>
<td></td>
<td>The scale of urban economic development</td>
<td>GDP</td>
<td>( \ln ) (GDP)</td>
</tr>
</tbody>
</table>

3.3. Data Sources

Considering the availability and effectiveness of data collection, this paper selects A-share listed companies in 280 cities from 2011 to 2019 as the research object. The indicator data at the enterprise level were obtained from CSMAR, WIND, and the annual report of enterprises. The original data needed for urban digital economy index calculation are from the statistical yearbooks of all provinces. The geographical data in the endogeneity test, that is, the geographical distance between each city and Beijing, were calculated according to the latitude and longitude in the Google map database.
This paper selects and processes data according to the following principles: (1) The data whose industry code is the financial industry were eliminated; (2) ST/PT enterprise data in the sample were removed; (3) the IPO year and before data were excluded; (4) the data of delisted and issued AB cross shares were removed; and (5) the continuous variables in the enterprise data were reduced by 1%. The reasons for this are as follows: (1) the financial table of the financial industry is different from that of other industries, and the test will lead to biased estimation results; (2) ST/PT shares belong to abnormally operated companies, which will affect the estimation results; (3) listing in the current year will lead to insufficient data estimation; (4) the object of this study is A-share listed companies, which should be tested based on unified judgment criteria; (5) we must avoid the influence of extreme values. After the above data processing steps, a total of 22,326 sample observations were obtained. Based on the matching of core explanatory variables and control variables (based on the most complete and least number of data sets, the sample data of explanatory variables, explained variables, and control variables are guaranteed to be complete), 14,217 valid sample observations (all the observed data obtained can participate in the empirical analysis without missing values and extreme values) were finally obtained. All data processing in this paper was calculated by STATA17.0, and the relevant maps were drawn using Arcgis10.7 software.

4. Measurement and Analysis of Digital Economy and Enterprise Sustainable Development

4.1. The Measure Analysis of Digital Economy

4.1.1. Digital Economy Level Descriptive Characteristics

According to the evaluation index system of urban digital economy development (Table 1), the digital economy level of 280 cities was calculated, and the average value of the digital economy level was calculated by region to analyze the time-change trend of the digital economy level by region from 2011 to 2019, as shown in Figure 1. Due to the missing values of Hong Kong, Macao, Taiwan, and Tibet, the remaining 30 provinces were divided according to the economic region scope of China. The eastern provinces include Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, and Hainan. The central provinces include Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western provinces include Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Ningxia, Qinghai, and Xinjiang. The southern provinces include Jiangsu, Anhui, Hubei, Chongqing, Sichuan, Yunnan, Guizhou, Hunan, Jiangxi, Guangxi, Guangdong, Fujian, Zhejiang, Shanghai, and Hainan. The northern provinces include Shandong, Henan, Shanxi, Shaanxi, Gansu, Qinghai, Xinjiang, Hebei, Tianjin, Beijing, Inner Mongolia, Liaoning, Jilin, Heilongjiang, and Ningxia. As can be seen intuitively from Figure 1, the digital economy developed rapidly (with a high slope) from 2011 to 2013. Growth slowed (with a smaller slope) from 2012 to 2015. There were fluctuations from 2015 to 2017, especially in the western region. There was steady growth (slower slope) from 2017 to 2019. Therefore, this study divided Figure 1 into three stages for analysis according to the above conclusions.

In general, the level of digital economy in China and all regions showed a steady rise from 2011 to 2019. From 2011 to 2013, the development speed of digital economy was fast and reached its staging peak in 2013; from 2013 to 2015, the development speed of digital economy slowed down, and the phenomenon of “falling first and then rising” occurred in the eastern and northern regions. From 2015 to 2017, the digital economy fluctuated, especially in the western region, and the level of digital economy peaked in 2016 and then fell back. From 2017 to 2019, the digital economy developed steadily.

From the results of the line chart in the east, center, and west, the level of digital economy in each region has improved to different degrees, but there are still big differences between regions. Specifically, the digital economy index of the eastern region is much higher.
than the national average level, while the central and western regions lag behind the national average level on the whole although they maintain a similar development speed [42].

Figure 1. Regional time change trend of digital economy level.

It is worth noting that since 2011, the average level of digital economy development in the western region has surpassed that in the central region and maintained a stable trend. In particular, in 2016, the development of digital economy in the western region further broke through, and its digital economy level was the same as that in the eastern region. The possible reason is that since the implementation of the western development strategy, the economy of the western region has developed rapidly. In 2016, China made a strategic decision to further promote the development of the western region. This gives great support to the western region from the aspect of policy support. In addition, the western region is also facing major strategic opportunities such as the Belt and Road Initiative, which has undertaken some industrial transfers. This has promoted digital transformation in the region, and has also cultivated a group of representative cities with important influence in the field of digital technology and the digital economy, such as Chongqing, Chengdu, Guiyang and Kunming, etc., all of which make a good demonstration and play a leading role. Therefore, to comprehensively improve the level of digital economy, the key lies in accelerating the construction of digital economy in the central and western regions, upgrading the development level of digital economy in the central and western regions, and realizing the coordinated development of digital economy.

In addition, from the results of the line chart of the north and south, the level of digital economy is shown as: south > north > national average level. Therefore, the development of China’s digital economy shows the characteristics of “strong south and weak north”. The likely reason is that digital talent is a key factor driving the development of the digital economy. According to the report “The Digital Transformation of China’s Economy: Talent and Employment” [83], the distribution of digital talents in China shows a high degree of consistency with the development of the digital economy. The top 10 cities with the largest distribution of digital talents are Shanghai, Beijing, Shenzhen, Guangzhou, Hangzhou, Chengdu, Suzhou, Nanjing, Wuhan, and Xi’an. Beijing and Tianjin, the Yangtze River Delta, and the Pearl River Delta are the clusters with the highest concentration of digital talents. Therefore, the character of “strong south and weak north” regarding the digital talent reserve has a certain impact on the development of digital economy in the north and south of China.
4.1.2. Spatial Evolution Characteristics of the Digital Economy

According to the digital economy level of cities and the average digital economy level of provinces, Arcgis10.7 software (created by the Environmental Systems Institute in California, USA) is used to visualize the spatial distribution characteristics of the digital economy level by using the natural discontinuous point classification method. The results are shown in Figures 2 and 3. The legend in the lower left corner of the map shows the boundary values of the five levels of variable levels and the names of each level (low, medium, high, higher, and extremely high) in that year. The content of the legend in Figures 3–7 has the same meaning as in Figure 2. Due to the similar trend in all years and limited space, this paper only lists the spatial distribution maps of the digital economy index for cities and provinces in 2011 and 2019.

From 2011 to 2019, the digital economy level of China’s cities and provinces improved across the board, but there was still a significant regional gap. The development of China’s digital economy shows a spatial distribution pattern of “strong in the east and weak in the west; strong in the south and weak in the north”. Among them, the cities with the developed digital economy are concentrated on the eastern coast, the Yellow River basin, the Yangtze River basin, and the Pearl River Basin, forming a high-level digital economy distribution belt and forming a developed digital economy core area in the Yangtze River Delta, Pearl River Delta, Beijing-Tianjin-Hebei, and Chengdu-Chongqing urban agglomeration.

From the provinces (municipalities directly under the central government), in 2011–2019, in addition to Heilongjiang, Jilin, Inner Mongolia, Ningxia, Gansu, Yunnan, and Guangxi, in regards to improving the level of the rest of the province of digital economy, Beijing has the highest level in the area; its level of digital economy has been in the leading position, realizing a level crossing with the digital economy in Chongqing and Tianjin. Jiangsu, Zhejiang, Fujian, and Guangdong have developed from a low to medium level, and 14 other provinces have achieved breakthroughs in the digital economy, breaking away from the low-level mode.

**Figure 2.** Spatial distribution of urban digital economy index.
In general, the development of the digital economy in China has significant spatial differentiation characteristics, and there is an obvious imbalance in the eastern, central, and western regions [42]. Specifically, the coastal provinces and megacities in the east are the high-level digital economy regions. In the central and western regions, the developed cities such as Wuhan, Changsha, Chongqing, Chengdu, and Kunming are centered, and the less developed cities are distributed in the periphery, forming an obvious centralized development region of the digital economy. Therefore, based on the spatial evolution law of digital economy, we should strengthen the inter-provincial interaction, accelerate the integrated development of digital economy in the urban agglomeration, drive the development of digital economy in the whole region, and improve the level of digital coordinated development.

4.2. Spatial Evolution Characteristics of Enterprise Sustainable Development

To further understand the spatial relationship between the digital economy and the sustainable development of enterprises, the level of sustainable development of enterprises in cities and provinces was visually analyzed. The results are shown in Figures 4 and 5. Similarly, only the 2011 and 2019 distribution maps are presented because of the similar trend in all years. We find that, over time, the level of sustainable development of enterprises also shows a spatial evolution law of “decreasing from east to west and from south to north”, which is consistent with the development of the digital economy.

At the same time, the sustainable development of enterprises also shows obvious geographical aggregation characteristics. The enterprises with higher development levels are still concentrated in the eastern region, with the Yangtze River, the Yellow River, and the Pearl River basin as the center of the zonal distribution. In addition, the digital economy developed regions and enterprise sustainable development level is a higher area with obvious overlap phenomenon; digital economy and enterprise sustainable development show that the spatial distribution of similar characteristics is not random, but it is necessary for the two relationships’ further spatial analysis to verify the digital economy’s ability to promote the sustainable development of enterprises.
To further understand the spatial relationship between the digital economy and the sustainable development of enterprises, the level of sustainable development of enterprises in cities and provinces was visually analyzed. The results are shown in Figures 4 and 5. Similarly, only the 2011 and 2019 distribution maps are presented because of the similar trend in all years. We find that, over time, the level of sustainable development of enterprises also shows a spatial evolution law of "decreasing from east to west and from south to north", which is consistent with the development of the digital economy.

**Figure 4.** Spatial distribution of sustainable development level of urban enterprises.

**Figure 5.** Spatial distribution of sustainable development level of enterprises in each province.

5. **Empirical Test**

5.1. **Descriptive Statistics of Variables**

Stata17.0 software (created by stata crip in Texas, USA) was used for descriptive statistical analysis of the main variables, and the results are shown in Table 3.
Table 3. Descriptive statistics.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Str</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>sde</td>
<td>22,326</td>
<td>8.129</td>
<td>1.039</td>
<td>4.919</td>
<td>12.367</td>
</tr>
<tr>
<td>digital</td>
<td>19,532</td>
<td>10.302</td>
<td>1.313</td>
<td>5.995</td>
<td>12.803</td>
</tr>
<tr>
<td>ie</td>
<td>15,514</td>
<td>82.734</td>
<td>21.396</td>
<td>0.685</td>
<td>100</td>
</tr>
<tr>
<td>size</td>
<td>22,319</td>
<td>7.657</td>
<td>1.291</td>
<td>1.946</td>
<td>13.223</td>
</tr>
<tr>
<td>age</td>
<td>22,326</td>
<td>1.961</td>
<td>0.932</td>
<td>0</td>
<td>3.367</td>
</tr>
<tr>
<td>lev</td>
<td>22,326</td>
<td>0.430</td>
<td>0.215</td>
<td>0.007</td>
<td>3.919</td>
</tr>
<tr>
<td>roa</td>
<td>22,325</td>
<td>0.037</td>
<td>0.079</td>
<td>-1.872</td>
<td>0.675</td>
</tr>
<tr>
<td>board</td>
<td>17,088</td>
<td>2.243</td>
<td>0.179</td>
<td>0</td>
<td>2.944</td>
</tr>
<tr>
<td>ocon</td>
<td>22,326</td>
<td>3.472</td>
<td>0.456</td>
<td>0.255</td>
<td>4.511</td>
</tr>
<tr>
<td>gov</td>
<td>21,581</td>
<td>16.080</td>
<td>1.847</td>
<td>5.218</td>
<td>23.150</td>
</tr>
<tr>
<td>GDP</td>
<td>19,606</td>
<td>8.867</td>
<td>1.107</td>
<td>4.117</td>
<td>10.550</td>
</tr>
<tr>
<td>popu</td>
<td>19,470</td>
<td>6.428</td>
<td>0.693</td>
<td>2.944</td>
<td>8.136</td>
</tr>
</tbody>
</table>

The results show that the standard deviation of SDE of enterprises is 1.039, the maximum value is 12.367, and the minimum value is 4.919, indicating that there is a considerable gap in the level of sustainable development of enterprises. At the same time, the index of urban digital economy also has the characteristics of “small mean and large standard deviation”, and there are few cities with the high level, which indicates that the development of digital economy among cities is extremely unbalanced and uncoordinated. On the contrary, the regional innovation and entrepreneurship index shows the characteristics of “large mean and relatively small standard deviation”, indicating that the differences between regions are relatively small. From the other control variables, size, age, lev, roa, board, ocon, gov, GDP, and popu have obvious disparity between the minimum and maximum, and this means that the differences between enterprise sample data that the research covers also suggests that this paper has a wide range of selection of sample.

5.2. Benchmark Regression and Robustness Testing

Based on comprehensively considering the time fixed effect and industry fixed effect, the two-way fixed-effect model was used for regression analysis. Meanwhile, the robustness of the benchmark regression results was tested, and the results are shown in Table 4.

Table 4. Benchmark regression and robustness test results.

<table>
<thead>
<tr>
<th></th>
<th>Benchmark Regression</th>
<th>Test for Robustness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>digital</td>
<td>0.010 ***</td>
<td>0.010 ***</td>
</tr>
<tr>
<td></td>
<td>(9.43)</td>
<td>(5.61)</td>
</tr>
<tr>
<td>mdigital</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control variable</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Ind Fe</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year × Ind</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>19,532</td>
<td>14,217</td>
</tr>
</tbody>
</table>

Note: *** p < 0.01, ** p < 0.05, * p < 0.1, absolute values of t-statistics in parentheses.

Model (1) and model (2) show the regression results without and after adding control variables, respectively. The results of model (1) show that, after controlling for year effect and industry effect, there is a significant positive relationship between the digital economy and enterprise sustainable development, which passes the 1% significance level test, indicating that the digital economy can significantly promote enterprise sustainable development [8]. After adding control variables to model (2), the regression results show that the impact of the digital economy on enterprise sustainable development remains...
significant at 1% level, and the goodness of fit is significantly improved, which further proves that the digital economy can significantly improve the level of enterprise sustainable development. Hypothesis 1 of this paper is verified.

To ensure the reliability of the research conclusions, this paper comprehensively uses the replacement of core explanatory variables and the control of fixed effects to conduct further robustness tests, and the results are shown in Table 4. First, in model (3), the same city is classified, and the mean value of digital economy index (MDIGITAL) of each city is calculated, and it is used as the core explanatory variable for regression. The results show that after replacing the core explanatory variables, there is still a significant positive relationship between digital economy and corporate sustainability, and it is significant at the 1% level, which proves the robustness of the results. In addition, the semi-parameter estimation method can effectively avoid the problem of simultaneous selection bias and sample selection bias in the measurement of SDE of enterprises, which ensures the robustness of the research conclusions. Therefore, the models (4) and (5) adopt the OP method [79] to measure the TFP of the enterprise as the explained variable of the robustness test. At the same time, considering the macro environment changes that may be brought about by the development of the digital economy, the industry-year joint fixed effects are added to model (5) for regression. The results all show that the significance of the core explanatory variables is consistent with the benchmark regression results, indicating that the research conclusions of this paper are quite robust.

5.3. Endogenous Test

There may be endogenous problems in this paper that are mutually causal. Therefore, firstly, the differential moment estimation and system moment estimation methods are used to regress the first-order lag term of the explained variable as the instrumental variable. Secondly, the two-stage least squares method was used for further endogeneity tests to exclude the endogeneity problem. To eliminate the influence of heteroscedasticity, logarithms were taken for all the main variables in the regression, and the specific test results are shown in Table 5.

### Table 5. Endogenous test results.

<table>
<thead>
<tr>
<th></th>
<th>Diff-GMM</th>
<th>Sys-GMM</th>
<th>First Stage</th>
<th>Second Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.Insde</td>
<td>0.579 ***</td>
<td>0.722 ***</td>
<td>0.157 ***</td>
<td>0.157 ***</td>
</tr>
<tr>
<td>digital</td>
<td>(11.15)</td>
<td>(22.59)</td>
<td>(3.93)</td>
<td>(5.03)</td>
</tr>
<tr>
<td>bjdis</td>
<td>0.160 ***</td>
<td>0.155 ***</td>
<td>-0.094 ***</td>
<td>-0.094 ***</td>
</tr>
<tr>
<td>control variable</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Ind Fe</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Sargan test</td>
<td>Not over recognized</td>
<td>Not over recognized</td>
<td>9654</td>
<td>12,003</td>
</tr>
<tr>
<td>Observations</td>
<td>9654</td>
<td>12,003</td>
<td>14,217</td>
<td>14,217</td>
</tr>
</tbody>
</table>

Note: *** p < 0.01, absolute values of t-statistics in parentheses.

First of all, model (6) and model (7) take the lag period of the explained variable as the instrumental variable, and the regression results show that the digital economy has a positive effect on the sustainable development of enterprises, and it is significant at the level of 1%. In addition, according to the results of Sargan test, the problem of overidentification is excluded, indicating that the first-order lag term selected as the instrumental variable is completely effective. Meanwhile, the lag period of the explained variable also passes the significance level test, indicating that the sustainable development of enterprises does influence “economic inertia”. The generalized moment estimation method effectively
controls the “dynamic response” of SDE of enterprises, so it is very necessary to use this method for testing.

Secondly, the natural logarithm of the geographical distance from each city to Beijing (BJDIS) was selected as the instrumental variable, and the two-stage least squares method was used to further conduct the endogeneity test to exclude the effect of reverse causality. The reasons for selecting this instrumental variable are as follows: first, according to the result of the visualization analysis above, Beijing is the central city of the national digital economy development, and the digital economy has a good foundation and fast development speed. According to the geographical spillover effect, Beijing has a significant radiation effect on the development of digital economy in neighboring cities, and the radiation effect gradually decreases with the increase of geographical distance on the development of enterprises, which meets the requirement of exclusivity. Therefore, the instrumental variable of geographical distance has a strong correlation with the explanatory variable of this paper. We believe that the closer the city is to Beijing, the greater the radiation impact on its digital economy development and the higher the level of digital economy development. Second, the geographical distance from each city to Beijing is objective, and there is no correlation between it and the explained variables, which can effectively ensure the validity and homogeneity of the instrumental variables.

The test results of model (3) in Table 5 show that after considering the endogeneity problem, the conclusion that the digital economy has a significant role in promoting the sustainable development of enterprises still holds. As can be seen from the regression results of the first stage, the instrumental variables have a good interpretation of the endogenous variables, and the F value of the first stage is significantly greater than 10, which ensures the effectiveness of the selection of instrumental variables and avoids the problem of weak instrumental variables. The second-stage regression results are consistent with the above research conclusions, rejecting the hypothesis of mutual causality between variables, which proves that the research conclusion is robust and also shows that the geographical distance selected as the instrumental variable of the digital economy index is scientific and reasonable.

5.4. Spatial Heterogeneity Analysis

This study divides the panel data into three major regions according to the east, central, and west economic region division criteria for grouping regression. The regression coefficient is visualized to explore the spatial rules of the digital economy on the sustainable development of enterprises. The results show that the impact of the digital economy on the sustainable development of enterprises has obvious spatial differentiation characteristics, and the specific performance is: the positive effect in the eastern region was significant, and the effect was significantly better than that in the central and western regions [8]. The possible reasons are as follows: the eastern region has a superior geographical location, solid digital infrastructure, excellent talent pool, and policy support. Compared with the central and western regions, the eastern region has stronger advantages in the development of the digital economy, and the dividends of the digital economy can be fully released. However, the central and western regions are located inland, the infrastructure construction of the digital economy is weak, and the resource endowment of the developing digital economy is relatively poor. In addition, the “siphon effect” of the eastern region to the central and western regions causes the loss of digital talents, which leads to the lack of power for the development of the digital economy and makes it difficult to effectively promote the sustainable development of enterprises.

To clarify the spatio-temporal evolution of the promotion effect of digital economy, this study further carried out visual analysis on provinces and urban agglomeration. The reason for using urban agglomeration data for regression is that the core explanatory variable in this paper is the urban digital economy index, and there will be a lack of samples from municipalities directly under the central government in the province grouping regression,
This study divides the panel data into three major regions according to the east, central, and western regions. The东部地区具有较强的地理位置优势、坚实的数字基础设施、优秀的人才池以及政策支持。与中西部地区相比，东部地区在促进经济数字经济发展方面具有显著优势，促进建设可持续发展的企业。结果表明，影响数字经济的区域因素显著，东部地区的效果显著优于中西部地区。

The spatial gradient of the regression coefficient of each province. Figure 6.

The spatial gradient of the regression coefficient of each urban agglomeration. Figure 7.

To clarify the spatio-temporal evolution of the promotion effect of digital economy, this study further carried out visual analysis on provinces and urban agglomerations. The results are shown in Figures 6 and 7.

Figures 6 and 7, respectively, show the spatial distribution pattern and evolution law of regression coefficients in provinces and urban agglomerations, reaffirming the previous conclusions. Although the problem of missing values in some provinces leads to blank data in the visualization results, it does not affect the judgment of spatio-temporal laws on the whole.
The results in Figure 6 show that the spatial distribution pattern of regression coefficients is obvious, and the positive coefficients are mainly distributed in the eastern and southern regions. Over time, the regression coefficients in the central and western regions turn from negative to positive, indicating that the promotion effect of the digital economy has been significantly improved. In addition, the results of Figure 7 show that in 2011, the Beijing-Tianjin-Hebei, Central Plains, and Pearl River Delta urban agglomerations were the regions with more significant digital economy promotion effect, while the promotion effect of the other urban agglomerations was at the middle and low level. However, the visualization results in 2019 showed that the promoting effect of the digital economy on sustainable development in the Yangtze River Delta, Beijing-Tianjin-Hebei, and Guanzhong Plain urban agglomerations was significantly improved, indicating that the promoting effect of the digital economy gradually expanded to the north and west. Therefore, regional integration should be implemented to promote the development of the digital economy with higher efficiency and inclusiveness, weaken the gap between regions, and promote the sustainable development of enterprises to a higher level.

5.5. Mechanism Test

To test whether the digital economy can promote the sustainable development of enterprises through regional innovation and entrepreneurship activities, this paper further selects the mechanism test model for regression analysis, and the results are shown in Table 6.

<table>
<thead>
<tr>
<th>Mechanism Inspection</th>
<th>0.019 ***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(3.26)</td>
</tr>
<tr>
<td>control variable</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
</tr>
<tr>
<td>Ind Fe</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>10,977</td>
</tr>
</tbody>
</table>

Note: *** $p < 0.01$ absolute values of t-statistics in parentheses.

The results of the mechanism test show that the digital economy has significantly promoted regional innovation and entrepreneurship. The regression coefficient passed the significance test at 1% level. For every 1% increase in the digital economy index, regional innovation and entrepreneurship level will rise by 0.019%. In addition, the relationship between innovation and entrepreneurship and economic growth has also been confirmed by scholars. They see innovation and entrepreneurship as vital to regional development and growth.

Some scholars point out that regions with thriving creative economies tend to gather creative talents and high-tech industrial clusters [84–86]. When the right employees become an important competitive parameter for enterprises, companies are willing to move to such places where talent is gathered [87], thus contributing to regional clustering and innovation [88]. Collective innovation and entrepreneurship are the key factors to improve regional competitiveness [89,90]. On the other hand, as the micro subject of regional economy, the development quality of enterprises is also affected by the macro-economic environment of the region. Therefore, regions with active regional innovation and entrepreneurship play a positive role in enhancing the competitiveness of enterprises and promoting their sustainable development. The test results verifies Hypothesis 2 of this study. In addition, the transmission effect of regional innovation and entrepreneurship activities has obvious spatial heterogeneity. The positive transmission effect is mainly concentrated in the eastern region where innovation and entrepreneurship are relatively active. For the central and western regions, the masking effect of innovation and entrepreneurship...
is obvious, which is consistent with the visualization results of regional innovation and entrepreneurship in 2011 and 2019 in Figure 8.

![Figure 8. Spatial distribution of regional innovation and entrepreneurship index.](image)

### 6. Conclusions and Policy Implications

In the stage of high-quality economic development, achieving sustainable development is a key task for China at present and for a long time to come. Enterprises, as micro-entities, play an important role in promoting sustainable economic development. Therefore, this study focuses on the impact of the digital economy on corporate sustainability. Based on the panel data of digital economy and listed companies in 280 prefecture-level cities in China from 2011 to 2019, the impact of the digital economy on sustainable development of enterprises and its mechanism of action were studied, and a fixed-effect model was constructed for empirical testing. The main research conclusions are as follows: First, the level of the digital economy and the degree of sustainable development of enterprises have obvious spatial differentiation characteristics of “aggregation”, which is specifically manifested as the spatial pattern of core developed cities as the center and the distribution of less developed cities, showing a change trend of “decreasing from east to west and from south to north”. Second, the digital economy has a direct and significant positive role in promoting sustainable development of enterprises. The conclusion still holds after robustness test and endogeneity test. The results of mechanism test show that digital economy can achieve sustainable enterprise development by promoting regional innovation and entrepreneurship. Thirdly, the impact of digital economy on the sustainable development of enterprises has obvious spatial heterogeneity [8]. In the eastern developed provinces, developed urban agglomerations, and regions with more active innovation and entrepreneurship activities, the sustainable development of enterprises can be better promoted. The effect of the digital economy shows a spatial pattern of “strong in the east and weak in the west; strong in the south and weak in the north”, showing a change trend of “decreasing from east to west and from south to north”.

Based on the above main research conclusions, the following policy recommendations were put forward:

1. Accelerate infrastructure construction for the digital economy and optimize the environment for its development. First, the government should support the development...
of digital infrastructure to consolidate the foundation of the digital economy. In particular, the government needs to increase investment in urban 5G base stations, big data, cloud computing, the Internet of things, industrial Internet, and other information technology infrastructure and platforms and build a new type of intelligent, low-carbon and green infrastructure system. Second, improve the overall level and development efficiency of the digital economy. The government should promote the construction of digital platforms at national, provincial and municipal levels. Promote the optimization and upgrading of the industrial chain, and provide impetus for the realization of industrial digitalization, digital industrialization and the digital transformation of enterprises. Accelerate data centralization and sharing among regional enterprises and promote efficient and coordinated development of the digital economy. Third, cultivate digital talents and speed up the construction of high-quality talents. The government should thoroughly implement the “Foundation Strengthening Plan” for education; establish and improve the school–enterprise cooperation system, talent introduction system, and expert service system; and focus on training talents in computer, communication, and other digital majors and interdisciplinary subjects to fill the talent gap. At the same time, it attracts and receives top high-quality talents and scientists at home and abroad to serve the development of the digital economy and create digital talent advantages.

(2) Attach great importance to the transmission of regional innovation and entrepreneurship, and establish a support system for innovation and entrepreneurship that matches the development level of the digital economy. First, give full play to the innovative and creative effects of the digital economy. The government should deepen the typical demonstration role of leading enterprises in leading regions. Encourage strategic scientific and technological innovation activities in the digital economy. Establish a sound regional information network platform for innovation and entrepreneurship, and realize a development model jointly driven by “digital economy” and “innovation and entrepreneurship” to provide impetus for sustainable development. Second, attach importance to the special role of entrepreneurs. Strengthen regional industry–university–research cooperation and innovation, and encourage cross-border exchanges and collaboration. Establish and improve the talent evaluation and welfare incentive system. The government should give certain support to entrepreneurs from the aspects of finance, taxation, and financial policies to ensure that they can give full play to the spirit of innovation and entrepreneurship so as to promote the sustainable development of enterprises with a higher level and higher efficiency.

(3) Implement differentiated development strategies and achieve balanced development among regions. For the development problems in the eastern, central, and western regions, the government should “take appropriate measures”. First, guide and support the central and western regions to learn from the developed eastern regions, accelerate market-oriented reform, and foster a favorable market environment. Appropriately strengthen fiscal and tax incentives, industrial policies, and financial services support for the development of the digital economy in the central and western regions. Accelerate the improvement of digital economic infrastructure, gradually narrow the gap with the eastern region, and solve the development problem of the digital divide. Second, for the eastern region, the government need to encourage and support faster breakthroughs in key digital technologies and resolve technical difficulties in “bottleneck” and strategic science and technology areas. Encourage enterprises in traditional industries to transform into intelligent and digital enterprises, and strengthen the driving role of digitalization in sustainable development. Strengthen the sense of regional cooperation and give full play to the “goose effect” of cities at the core of digital economic development in eastern China.

This study has certain limitations. First of all, this study is limited to 280 prefecture-level cities because the data of some prefecture-level cities are not published, or the published data are incomplete. In the future, the research can be further extended to more
cities as the area of data disclosure continues to expand. Second, this study studies the typical topic of the influence of macro environment on the micro subject. Based on this study, it can be further extended to how county-level digital economy affects the sustainable development of enterprises and how the digital transformation of enterprises affects the sustainable development of enterprises. Third, the impact of the digital economy on sustainable development must be multi-channel. Previous studies and this study have only explored one possible aspect, and more potential mechanisms are waiting to be explored. Fourth, although the sample data before 2019 were selected in this study considering the impact of the COVID-19 pandemic on enterprise business conditions, as a relatively stable economic form during the COVID-19 pandemic, the promotion effect of the digital economy on the sustainable development of enterprises during the pandemic is worth further analysis in the future.

Author Contributions: Methodology, W.L.; software, W.L.; resources, P.C.; writing—original draft preparation, Z.Z. and W.L.; writing—review and editing, W.L., P.C. and Z.L.; project administration, Z.Z. and P.C. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Not applicable.

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

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