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Does Spillover Effects of Internet Improve the High-tech Industries Innovation?

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Abstract: In the information age, Internet plays an increasingly important role in social development. Studying the Internet and its effect on innovation are of great practical meaning to China at the present stage. Taking the high-tech industry as the research object, based on the panel data of 30 provincial provinces in China between 2009 and 2016, this paper establishs the spatial panel econometric model from two aspects: geography and economy, to estimate the impact of the Internet spillover on the high-tech industries innovation in China. Our results show that: Both geographic and economic distance affect the spatial correlation of innovation and the influence of geography is greater. The spillover effect of Internet exists significantly and its positive impact on innovation of different regions with similar economy is greater than that with the similar geographical position.

Keywords: Panel data; Internet spillover; innovation; spatial econometric model; China.

1. INTRODUCTION

China vigorously implements innovation-driven development strategy in recent years. As the initiation to promote innovation, Internet has also developed rapidly. The number of Internet users in China reached 806 million by June 2018. Premier Li Keqiang pointed out that the Internet is a new tool for mass entrepreneurship and innovation when he attended the first World Internet Congress in 2014. In the report on the work of the government in 2015, the “Internet+”was first put forward. Using information and communication technology and Internet platform, the Internet will be deeply integrated with various traditional industries and create new ways of development. On March 2018, the Premier proposed “Speed-up and Fee-Reduction”at the two sessions. The specific contents are as follows: reducing international long-distance charges and Internet access fees for small and medium-sized enterprises, canceling domestic long-distance and roaming charges, reducing mobile network traffic fees by at least 30%. This proposal has aroused widespread concern in China and marks a key step in the construction of digital China. In the new era, the reduction of fees makes the diffusion resistance of the Internet smaller and the increase of speed makes the confidence of all-round development more sufficient and the impact of the Internet on China's innovation and economic growth deeper. The spillover effect of Internet has played a vital role. The Internet spillover is that, in the process of working, learning and socializing through the Internet, some information or ideas will be unintentionally acquired. These unintentionally acquired knowledge merges with existing knowledge, which can inspire individuals or organizations to introduce new elements, reorganize the original elements and have a positive impact on innovation and economic development. Therefore it is of great practical significance to study the spillover effect of the Internet and the relationship between its development and innovation for narrowing the digital divide between regions, eliminating the unbalanced development among regions and leading our country to the road of information development.

2. LITERATURE REVIEW

Scholars from home and abroad have conducted multi-angle and multi-method research on the Internet. According to the research object and data, these studies can be divided into three categories: One is to study the impact of the Internet on economic growth. Li and Jing [1] use dual-direction fixed effect model to empirically analyze the relationship between Internet diffusion and economic growth, which finds that the Internet has a positive effect on China's economic growth and more and more prominent since 2007. Zhang and Li [2] take Internet development as economic factors into their economic models and find that Internet penetration rate and infrastructure construction level can significantly affect economic development. He, Lai and Liao [3] establish the endogenous economic growth model to find that the level of economic development is positively correlated with the added value of the Internet industry. Liu and Chen [4] use spatial econometric model to process 9-year panel data and find that a 1% increase in Internet penetration increases the real per capita GDP by 0.742% and the proportion of tertiary industry by 0.067%. One is the factors that affect the popularity of the Internet. Li and Shiu [5] using data from 31 provinces in China for 7 years find that income level has an important impact on the Internet popularization in the region. Cultural level and telecommunications infrastructure have an important impact on the Internet popularization in the underdeveloped western regions. BillÓn and Ezcurra et al [6] found that the gap in Internet size among regions is larger than the gap in GDP per capita, but there is a positive spatial dependence on their distribution. That is to say, the Internet size of physical neighboring regions is similar. Pick and Nishida [7] find that Internet access in one region is affected by other neighboring regions due to the existence of spatial diffusion effect. Moreno and Paci [8] find that this effect is the most obvious in the local area and the area from 250 km to 500 km apart. The last category is the impact of the Internet on the industry or sector. Litan [9] analyzes the impact of the Internet on various industries and find that the Internet can promote productivity growth, save costs and improve the living standards of residents. Stevenson [10] finds that the Internet has brought more symmetrical information to the labor market, increases employment of the unemployed and job-hopping opportunities of the employees and promotes the flow of the labor market. Shi [11] finds that the Internet, as an information platform, can reduce trade costs, optimize the allocation structure of resources and improve the export value of Chinese enterprises.

By compiling relevant literature was found, most scholars take the popularity of the Internet as their research object when they study the Internet and its impact on the economy and innovation. A considerable part of the research focuses on the factors affecting Internet diffusion and the relationship between Internet and economic growth. There are few articles about the spillover effect of the Internet. Does the Internet spillover exist? If it exists, will it affect the innovation of high-tech industries? If will, how does this spillover affect? In response to these questions, this paper gives a method to measure the spillover effect of the Internet after reading a large number of relevant literature and theoretical basis. Spatial econometric model is used to estimate the impact of spillover effect on innovation in provincial high-tech industries from the perspectives of geographic and economic factors, which can get some useful conclusions to provide reference for industrial policy.

3. METHODOLOGY

Based on the literature review in the previous section and the existing doubts, this paper use the spatial econometric model to expand the knowledge production function to explore the spillover effect of the Internet and its impact on the innovation of high-tech industries on the basis of knowledge production function and spatial panel econometric model.

3.1 Knowledge production function

Griliches [12] puts forward the concept of knowledge production function for the first time and studys the relationship between R&D input and output under the overall framework of production function. With the continuous improvement of later scholars, classical knowledge production function has become an important theoretical tool for knowledge production and technological innovation research. It has been widely used by domestic and foreign scholars in innovation, knowledge (technology) spillover and so on [13-14]. Knowledge production function considers that R&D expenditure and human input are the main inputs in knowledge production process. This input can generate new knowledge. Its basic form is as follows:

$$Q_i = AK_i^{\alpha} L_i^{\beta} \varepsilon_i \tag{1}$$

Where Q is innovative output (new knowledge), K is R&D funding, L is input of human resources, A is constant. α and β are respectively the output elasticity coefficients of K and L, which are random interferences to measure other unobserved impacts on innovation output.

3.2 Spatial panel data econometric model

Because regional innovation and its elements are spatially interdependent, this paper uses spatial econometric model to discuss the relationship between innovation and Internet spillover. Spatial econometric models include spatial lag model (SLM) and spatial error model (SEM). LMLAG and LMERR tests can determine the choice of the two models [15]: If LMLAG is

more significant than LMERR and R-LMLAG is significant, R-LMERR is not significant in statistics, the appropriate model is the spatial lag model. On the contrary, if LMERR is more significant than LMLAG, R-LMERR is significant and R-LMLAG is not significant in statistics, the appropriate model is the spatial error model.
Spatial lag model (SLM):

$$Y_t = \rho W Y_t + \beta X_t + \varepsilon_t \tag{2}$$

Spatial error model (SEM):

$$Y_t = \beta X_t + \varepsilon_t + \mu \tag{3}$$

$$\varepsilon_t = \lambda * W * \varepsilon_t + \varphi_t \tag{4}$$

Where Y_t is a vector consisting of the observations of the dependent variables of each spatial unit in the period t, W is a nonnegative spatial weight matrix and the elements on the diagonal line is 0, WY_t is a first-order lag variable in space, X_t is the matrix of observed values of exogenous variables, ρ is a spatial autoregressive parameter with values ranging from - 1 to 1, $\mu = (\mu_1, \ldots, \mu_n)^T$, $\varepsilon_t = (\varepsilon_{1t}, \ldots \varepsilon_{nt})^T$ are random interference vector, λ is a spatial autocorrelation coefficient with values ranging from - 1 to 1, φ_t is a independent identical distribution, $E(\varphi_t) = 0$, $E(\varphi_t \varphi_t^T) = \sigma^2 I_n$, I_n is a unit matrix.

3.3 Model specification

After defining the basic types and selection criteria of spatial panel model, this paper establishes a bilinear model based on knowledge production function.

$$\ln Y_{it} = \rho_0 + \rho_1 \ln T_{it} + \rho_2 \ln H_{it} + \rho_3 \ln SI_{it} + \varepsilon_{it} \tag{5}$$

Where ρ_i is a regression parameter, ε is a random error term.

Hausman test supports the fixed effect model, and the spatial error model (SEM) is selected according to the results of spatial correlation, Lagrange multiplier and robustness test. We obtain the following equation:

$$\ln Y_{it} = \rho_0 + \rho_1 \ln T_{it} + \rho_2 \ln H_{it} + \rho_3 \ln SI_{it} + \varepsilon_{it} \tag{6}$$

$$\varepsilon_{it} = \lambda \times W \times \varepsilon_{it} + \phi_{it} \tag{7}$$

4. VARIABLE DESCRIBTION

4.1 Data collection

Based on the spatial error model constructed in the previous section, this paper takes 30 provincial administrative regions in mainland China (Tibet is omitted due to the lack of data) from 2009 to 2016 as the research object. The original data is from the Internet development report published by CNNIC, China High-tech Industry Statistical Yearbook (2010-2017), China Statistical Yearbook (2010-2017) and China Science and Technology Statistical Yearbook (2010-2017). The following is the specific description of variables used in the analysis.

Innovation level (Y): Because patent offices lag behind in examining, approving and authorizing patents, which can not reflect the innovation level in each region timely. This paper chooses the patent applications in high-tech industries to represent the innovation level in high-tech industries [16].

R&D stock (T): The perpetual inventory method is employed to estimate capital stock in China from 2009 to 2016 referring to Zhang [14].

$$T_{it} = RD_{it} + (1-\delta) * T_{it-1} \tag{8}$$

Where T_{it} is the R&D stock of province i in year t, RD_{it} is the real R&D appropriation expenditure of province i in year t, which is approximately substituted by internal expenditure based on 2009. Depreciation rate of R&D capital (δ) is 15%. The growth rate of R&D capital stock is assumed to be equal to the growth rate of R&D funds, when estimating R&D stock at the beginning of the period. The formula is as follows:

$$T_{i0} = RD_{i0} / (g + \delta) \tag{9}$$

Where T_{i0} is the capital stock in based period, RD_{i0} is the real R&D appropriation expenditure of province i in based period, g is the average growth rate of real R&D expenditure during the period of investigation, δ is the depreciation rate.

R&D personnel input (H): This paper uses full-time equivalence of R&D personnel to measure it.

Internet spillover effect (SI): It is measured by the the combined impact of the ability to absorb new knowledge, Internet access and relative spatial location.

4.2 Measuring the spillover effects of the internet

Spillover effect is an activity carried out by an organization. It can not only achieve the expected effect but also affect the main body outside the organization. That is to say, the external benefits of an activity are not available to the organization. In recent years, with the rapid development of the Internet and vigorous promotion of the “Internet+”, Internet has penetrated into all aspects of people's lives. In the process of searching and browsing the web pages, people will invisibly get some information or ideas. These unintentionally acquired knowledge collides and merges with the existing knowledge and enables enterprises or organizations to get inspiration from introducing new elements and reorganizing the original elements. That is innovation.

Each province is not only the recipient of knowledge, but also the producer of knowledge. The provincial absorptive capacity of new knowledge is a crucial factor for knowledge spillover between provinces [17]. Girma [18] and Kokko [19] find that companies with weak absorptive ability have some limitations in using new knowledge by studing specific enterprises. That is to say, regions as knowledge recipients must have sufficient strength to profit from spilled knowledge. According to this conclusion, Paunov and Rollo [20] focuse on the role of labor productivity and patent number in the absorptive ability and find that enterprises with higher productivity than the average benefit more from the Internet than those with lower productivity, while the number of patents they receive has no significant difference in the benefits. Therefore, this paper use provincial labor productivity to measure the absorptive ability.

The emergence of the Internet does not necessarily reduce or even eliminate the impact of geographical distance [21]. It’s obvious that the Internet has strong spatial autocorrelation and network effect [5]. Internet promotes knowledge spillover, but its distribution changes the relative importance of geographical distance in production and its spillover channels become more complex. Areas with rapid development can attract initial investment in Internet infrastructure. A lot of initial investment can enable the region to rapidly expand Internet access, thus attracting more Internet service providers. Increased competition among service providers further improve Internet access, thereby enhancing regional innovation and promoting regional economic growth. We assume that regions with the same level of economic development are most likely to benefit from the spillover effect of the Internet. Based on the above discussion, the spillover channel of the Internet (W in Formula 7) is not only the geographical proximity between spatial organizational units, but also the level of regional economic development. Therefore, the next section establishes the spatial weight matrix from geographic and economic perspectives. The spillover effect of Internet [22] is as follows:

$$SI_{it} = \sum_{j=1}^{n} W_j L N_j \tag{10}$$

Where N is the Internet access, which is measured by the number of netizens. According to CNNIC, netizens are Chinese citizens who have used the Internet for the past six months and over. L is the output of unit labor input, which is a comprehensive economic index reflecting the ability of workers to create usage value in a certain period.

4.3 Spatial weight matrix

Spatial weight matrix represents the degree of interdependence and correlation between spatial units. In order to master the spatial factors and spillover mechanism of the Internet more accurately, this paper establishes spatial weight matrix from the perspective of geograph and economy.

1. Spatial weight matrix based on geographic distance

Although the Internet makes communication among people over long distances no longer a problem, geographical proximity still plays an important role in knowledge spillover in the Internet era. Therefore, this paper uses the following inverse distance weight matrix to represent geographical factors.

$$w_{ij} = \begin{cases} \dfrac{1}{d_{ij}^{2}} & i \neq j \\ 0 & i = j \end{cases} \tag{11}$$

Where d_{ij} is the distance between geographical centers of two regions. The inverse distance weight matrix reflectss that the spatial effect decays faster with the increase of distance.

2. Spatial weight matrix based on economic distance

Internet spillover and its impact on innovation are complex systematic activities, which is bound to be affected by factors besides geographical proximity. Spatial weight matrix should be constructed from different angles to fully reveal the impact. This paper uses the nested weight matrix [23] to represent the influence of economic distance.

$$W = W_d \times diag(\overline{X}_1/\overline{X}, \overline{X}_2/\overline{X}, \ldots, \overline{X}_n/\overline{X}) \tag{12}$$

Where W_d is the geographic distance matrix, $\overline{X}_i$ is the mean value of the economic variable X of the spatial section element i in the period from t_0 to t_1, the formula is : $\overline{X}_i = \sum_{t_0}^{t_1} X_{it}/(t_1 - t_0 + 1)$. $\overline{X}$ is the mean value of economic variables of all spatial section elements in the period from t_0 to t_1, the formula is : $\overline{X} = \sum_{i=1}^{n}\sum_{t_0}^{t_1} X_{it}/(t_1 - t_0 + 1)$

The economic variable in this paper is the stock of material capital, which is accounted by the following formula:

$$K_{it} = I_{it} + (1-\delta) \times K_{it-1} \tag{1}$$

Where K_{it} is the capital stock of area i in period t, δ is the depreciation rate with a value of 9.6%. I_{it} denotes the real fixed asset investment of area i in the period t with the value of 2009 as the basis period. The method of computation is to reduce the nominal fixed assets investment by using the fixed assets investment price index of different regions.

5. PATTERNS OF INNOVATION LEVEL IN CHINA

Taking 2009, 2013 and 2016 as time points, this paper uses ArcGIS 10.2 to visualize the spatial distribution of high-tech industries innovation in China. In order to facilitate comparison, the same dividing point is adopted for three years in this paper. The innovation level of 30 provinces is divided into five grades according to the number of patent applications for per million people [24]: low level (0-5), middle-low level (5-10), medium level (10-50), middle-high (50-100) and high level (>100).

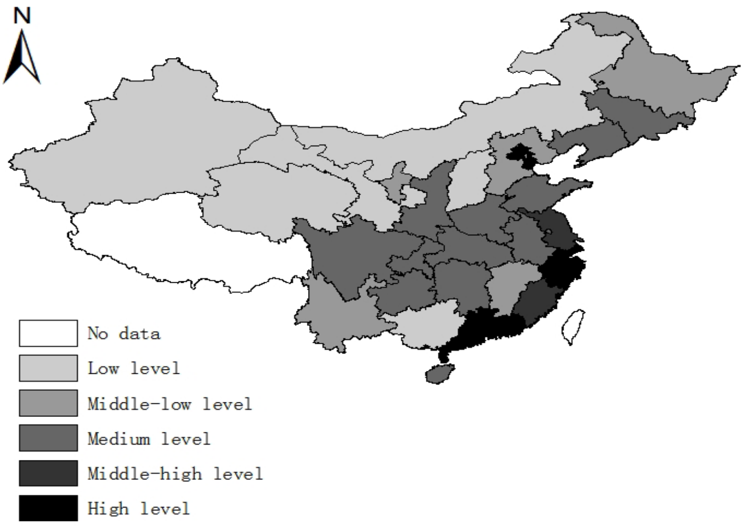

Figure 1. Spatial distribution of high-tech industries innovation in 2009.

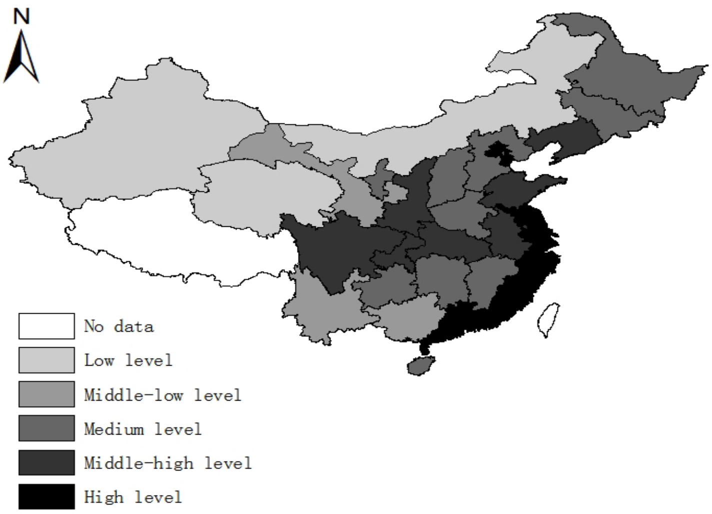

Figure 2. Spatial distribution of high-tech industries innovation in 2013.

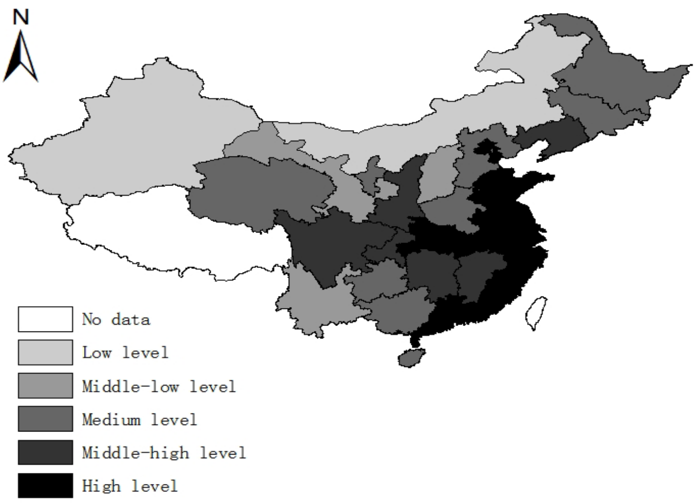

Figure 3. Spatial distribution of high-tech industries innovation in 2016.

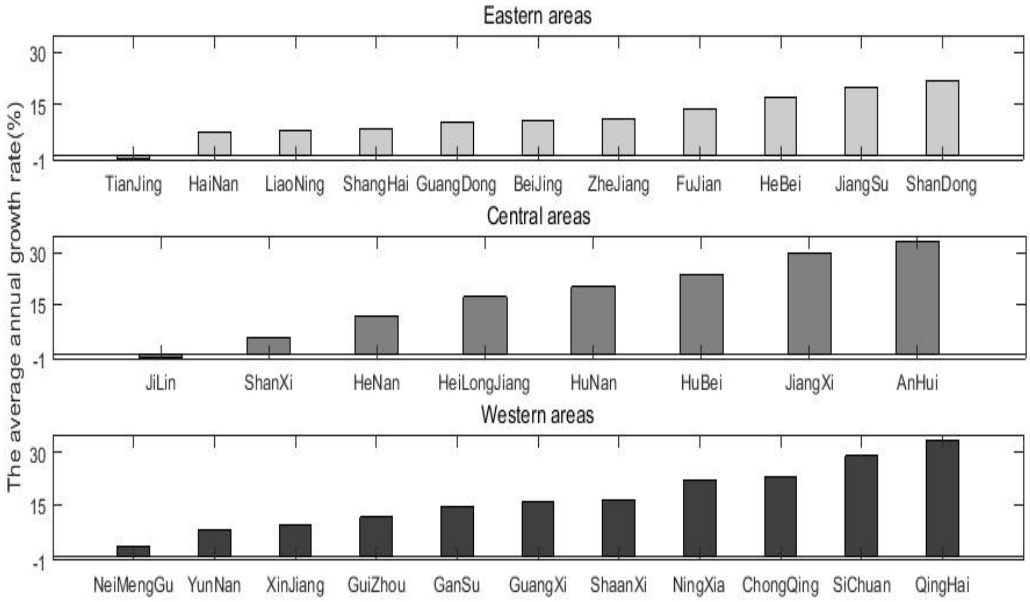

Figure 4. Average annual growth rate of high-tech industries innovation in China from 2009 to 2016.

Referring to the statistical calibre of the National Bureau of Statistics, this paper divides whole country into three regions: eastern, central and western areas. Figure 1 shows that the innovation level in most western regions is relatively low. In the middle, it begins to rise gradually in 2009. Middle and low level areas are gathered in the central and western regions respectively. High level regions are located on the eastern coast. The gap of innovation level among the eastern, central and western regions has begun to increase. Figure 2 shows the rapid development of innovation in the provinces near the eastern and central dividing line in 2013. Shaanxi Province and its adjacent provinces have become a member of the middle-high level areas. Eastern region has formed a high level innovation belt composed of Guangdong, Fujian and other coastal provinces. Figure 3 shows that the high-level innovation belt gradually extends to the central regionS in 2016. The number of high level areas increases from 4 to 9, while the number of low level areas decreases from 6 to 2. Innovation level in the west improves greatly. The gap between the innovation level in central and western regions begins to narrow. On the whole, the innovation level of most provinces in China has improved significantly. Compared with 2009, the spillover effects of innovation in the eastern and central regions has been continuously strengthened, and the innovation level has been greatly improved. The number of areas above medium level (including medium level) increases significantly.

As can be seen from Figure 4, although the innovation level of each province in the central and eastern region decreases slightly in the period of 2009-2016, it dosen't affect the overall level to develop in a positive direction. The average annual growth rate in the central and western regions is faster than that in the eastern region, and the innovation level continues to rise. This is inseparable from the state's efforts to fully develop and support the development of western regions and implement the policy of "one belt and one road". Although the present situation of innovation development in the west is positive, due to its special geographical location and the limitation of the capabilities of resource aggregation, in order to avoid the Matthew Effect: “the strong are always strong, the weak are always weak”, it still has certain theoretical and practical significance to study the relationship between regional innovation and Internet.

6. THE IMPACT OF INTERNET SPILLOVER ON INNOVATION

Table 1 shows the estimation of the spatial error model. The spatial weight matrix of model 1 and model 2 are geographic distance matrix and economic distance matrix respectively. (1)-(4) means no fixed effect, fixed region, fixed time, fixed region and time respectively.

Table 1. Parameter estimates for the SEM model.

Variables	No fixed effect	Fixed region	Fixed time	Fixed region and time
	(1)	(2)	(3)	(4)
Model1: Geographic matrix				
C	5.947*** (17.564)			
T	0.303*** (4.276)	0.318*** (4.262)	0.307*** (4.235)	0.324*** (4.285)
H	0.739*** (9.475)	0.721*** (8.659)	0.734*** (8.738)	0.713*** (8.042)
SI	0.036 (0.777)	0.065 (1.306)	0.061 (1.173)	0.099* (1.807)
λ	0.567*** (7.877)	0.604*** (8.884)	0.503*** (6.423)	0.614*** (9.192)
R^2	0.934	0.941	0.940	0.949
$sigma^2$	0.198	0.194	0.203	0.271
logL	-153.948	-147.908	-151.047	-145.156
Model2: Economic matrix				
C	5.550*** (13.998)			
T	0.353*** (5.072)	0.377*** (5.135)	0.358*** (5.011)	0.384*** (5.113)
H	0.680*** (8.757)	0.654*** (7.887)	0.672*** (7.955)	0.642*** (7.123)
SI	0.049 (1.240)	0.073* (1.699)	0.080* (1.759)	0.117** (2.402)
λ	0.481*** (6.162)	0.515*** (6.934)	0.357*** (3.956)	0.462*** (5.760)
R^2	0.935	0.942	0.940	0.948
$sigma^2$	0.219	0.217	0.221	0.215
logL	-162.374	-147.140	-157.338	-139.673

Note: “*”, “**” and “***” are significant at the level of 10%, 5% and 1% respectively.

The explanatory variable coefficients basically pass the significance test when both time and region are fixed. R2 and Log-likelihood values are the highest. According to the correlation test, there are structural differences in high-tech innovation. Ignoring these differences will lead to the deviation of estimation results. The estimation (4) takes the region and time differences into account at the same time, which can avoid deviation and reflect the actual situation more accurately. So the estimation (4) is discussed in the following part.

1. Geographical correlation of high-tech industries innovation is stronger than economic correlation

The spatial correlation coefficients of two models are credible by means of statistical testing, which shows that there are significant spatial correlation among innovation activities in high-tech industries. Geographic distance has more positive impact on spatial correlation of innovation than economic distance. The transport costs between adjacent areas are relatively low, which is helpful to the dissemination and utilization of tacit knowledge and the rational allocation of resource elements, thus promoting the formation of spatial agglomeration of innovation activities.

2. Internet spillover effects significantly exist and promote innovation

Internet spillover coefficients are significantly positive, which indicates that Internet has a significant spillover effect and a positive impact on the high-tech industries innovation. Knowledge can be replicated and disseminated at low cost. The emergence and rapid development of Internet has broken the space barrier, and enables all kinds of knowledge and technology to be disseminated in the industry without the influence of geographical distance. The natural leakage of knowledge, which is spillover, is formed. The spillover effect of Internet can give enterprises the inspiration to add and recombine new elements, and the innovation among many market players continue to produce spillover effect. The accumulation of this kind of innovation can promote the innovation of the whole market and help the industries upgrade.

3. The promotion of Internet spillover based on economic distance is greater than geographic distance

Internet spillover coefficient based on economic distance (0.117) is larger than geographical distance (0.099), which indicates that the promotion of Internet spillover in regions with similar economy is greater than that with similar geographic location. Although Internet makes long-distance communication no longer a problem, it is limited to explicit knowledge. Geographical distance is a very important factor in the process of knowledge dissemination. Transport costs between geographical adjacent areas are relatively low for Internet providers, which is conducive to the dissemination and utilization of tacit knowledge that the Internet cannot convey in time. In addition, it can also rely on the existing Internet infrastructure to make the diffusion of Internet access between adjacent areas easier and cheaper. The development of Internet is an activity that requires a lot of capital and manpower investment. It is not enough to rely solely on the efforts of individual enterprises and cities. Cross-enterprise and cross-regional cooperation has gradually become a trend. In the process of cooperation, economic linkages play a greater role than geographical relevance.

7. CONCLUSIONS

Based on knowledge production function, this paper establishes a spatial panel econometric model using panel data from 2009 to 2016 to verify the existence of Internet spillover effect and analyze its impact on high-tech industries innovation from both geographical and economic perspectives. Our results show that: 1. Geographical correlation of high-tech industries innovation is stronger than economic correlation. 2. Internet spillover effects significantly exist and promote innovation. 3. The promotion of Internet spillover based on economic distance is greater than geographic distance.

The regional economy development in China is rather uneven. The central government has implemented the strategy of western development and the “one belt and one way” policy. To a certain extent, the economic gap among eastern, central and western regions has narrowed, but it still exists. Due to the low level of economy, backward areas is restricted to a certain extent in attracting investment in Internet construction, and the competitiveness of peripheral products about Internet is weak. It can not produce a better pulling effect on the economy. There are also some obstacles in the process of introducing and absorbing advanced technology and innovation diffusion in backward areas. That is to say, the backward areas can not absorb advanced technology sufficiently and effectively. On the contrary, regional innovation activities with similar economic level are relatively close. Due to the demand for scientific and technological innovation in their own development, regions with relatively high level of development will invest more energy in informatization. They can attract more investment in Internet infrastructure. A large amount of investment makes these provinces rapidly expand the use of Internet and attract more Internet service providers, and the intense competition among these service providers can improve Internet access. The implementation of “Internet+” can attract large numbers of talent. These areas also have advantages in advanced knowledge and technology exchange, which can promote the spread and overflow of advanced knowledge information and make innovation agglomerate in these areas.

Based on the above analysis, the following suggestions are given:

Making full use of the advantages of geographical proximity and striving to narrow the economic gap

Innovation in the developed eastern region has formed a “hill” of high-high agglomeration, while innovation in the relatively backward central and western regions is in a “depression” of low-low agglomeration. Considering the important role of geographic and economic linkages in the process that Internet promotes the innovation of high-tech industry, the provincial government should strengthen the information flow between neighboring regions, actively carry out cooperation, attract foreign talents through various welfare policies, give corresponding support in work and life and share knowledge resources such as information, technology and talents to avoid the “digital divide”. In addition, relevant government departments should also vigorously improve the economic environment of innovative production in various provinces and narrow the economic gap. Because a good environment can stimulate innovation, among which incentive system and platform are the key factors. Only by giving sufficient attention to innovation and strongly encouraging independent innovation can we go further and better on the road of building an innovative country.

Vigorously developing the Internet and comprehensively promoting the implementation of the “Internet +” policy

The historical existence and excessive expansion of the development gap between the eastern and western regions has become a long-standing problem that has plagued the healthy development of China's economy. China has also taken reducing the gap between the eastern and western regions as an important national policy. China has also made it an important national policy to reduce the gap between the eastern and western regions. In order to achieve this goal, the central government has invested a lot of energy and funds in the west and also given more support to the western regions in infrastructure construction. But in the long run, the central government's financial resources are limited. Such investment may not be sustainable. Considering the positive effects of Internet on innovation, innovation on economic growth, provincial governments should focus on Internet infrastructure construction, increase investment in network infrastructure and Internet access, comprehensively urge the implementation of the policy “speed-up and fee-reduction” proposed by the NPC and CPPCC, reduce the cost of Internet, increase the proportion of Internet users and promote the overall popularization of the Internet. Especially in the relatively backward areas and rural areas, so that they can make full use of the Internet as the main factor of production and promote resources from the more developed areas to flow more to the west driven by the market. In addition, local governments should actively support the national development policies in light of local conditions. We should encourage and guide all regions to vigorously promote the development of the “Internet+” policy, actively integrate the Internet with the local traditional industries, give full play to the positive role of Internet spillover effect in high-tech industries innovation, guide the flow of innovation among regions and achieve the improvement of the overall level of high-tech industry in China.

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