Online Retail, Spatial Spillover and Household Consumption

Liang Wang[1], Meiyu Pan[2,*]

[1,2]*School of International Economics and Business, Nanjing University of Finance and Economics, Nanjing, Jiangsu 210023, China*
[*]*Corresponding author. Email: PMYpanmeiyu@163.com*

ABSTRACT

This paper designs three spatial correlation models, and uses dynamic spatial Durbin model to empirically analyze the impact of online retailing on household consumption expenditure from two dimensions of space and time. The results show that: online retailing has only a short-term impact on household consumption expenditure, and its direct effect, spatial spillover effect and total effect are all "U-shaped" which first decreases and then rises. The effective distance boundary of the "U-shaped" spatial spillover effect of online retail on household consumption expenditure is 1100-1800 km, and the strongest distance is 1200 km. Within the effective boundary, the spatial spillover effect does not decrease with the increase of geographical distance.

Keywords: online retail, household consumption expenditure, dynamic SDM, spatial spillover

1. INTRODUCTION

The rapid development of online retailing has brought about new changes in China's economy, played an important role in economic structural adjustment and the conversion of old and new kinetic energy, and also triggered a transformation of household consumption expenditure. Online retailing has caused unprecedented changes in people's consumption concepts, consumption patterns, and consumption structure (Jiang Xiaojuan, 2017) [3]. This has been discussed in the past in the literature. The role of the online retail market as a third-party intermediary in aggregating goods and services, matching supply and demand between buyers and sellers, transmitting product-related information, and improving market transaction efficiency has been generally affirmed (Soh et al., 2006) [2]. There is still controversy over household consumption expenditure.

In the early days, many foreign researchers believed that online retailing had caused a huge impact on physical retail. Online retailing only shifted consumer consumption from offline to online, and did not produce a substantial consumption promotion effect. For example, Bakos (2001) believed that online retail could reduce consumers' information search costs and improve transaction efficiency, but it is only a substitute for promoting online consumption to offline consumption [1]. In addition, some researchers believe that online retailing can improve the conditions for realizing consumption by breaking through the constraints of time and space, expanding the scope of selection, and reducing transaction costs (Zhang Hongwei and Xiang Yubing, 2016; Sun Puyang et al., 2017) [4][5]. This has the effect of promoting consumption (Liu Changgeng et al., 2017) [6].

In summary, previous studies have focused on the impact of online retail on household consumption from different perspectives, but these documents ignore the spatial spillover effect of household consumption expenditure itself, and do not take into account the online retail of the region on the household consumption expenditure of surrounding areas. On the one hand, online retail has overcome physical and spatial constraints, so that consumption is not limited by time and space, and consumers can conduct cross-region online shopping and consumption at any time throughout the country. The reduction of the cross-region information matching cost makes the development of a region's online retailing have an impact on the residents' consumption expenditure in the surrounding areas, that is, the online retailing has a spatial spillover effect on the residents' consumption expenditure. On the other hand, neither online retail nor household consumption expenditure exists in isolation, but shows spatial dependence and spatial heterogeneity among regions. Therefore, it is necessary to consider the existence of spatial effects between regions as a prerequisite for analysis. In view of this, from the perspective of space spillovers, this paper incorporates the spatial effects of regions into the analysis framework through a spatial econometric model to empirically analyze the impact of online retail on household consumption expenditure.

2. SPATIAL CORRELATION ANALYSIS

2.1. *Indicator Construction and Variable Selection*

The development of China's online retail is relatively short. At the same time, considering the availability of data, this paper selects the data of provinces, municipalities and autonomous regions in mainland China from 2007 to 2017 as samples.

2.1.1. *Explained variable*

The explained variable is the log of household consumption expenditure (ln*Con*). In order to eliminate the influence of inflation, this variable is measured at the constant price in 2007.

2.1.2. *Core explanatory variables*

The core explanatory variable is the logarithm of the online retail market size (ln*Or*). To eliminate the effects of inflation, this variable is measured at constant 2007 prices. In addition, the model also introduces the logarithmic square of the online retail market size to examine the possible non-linear relationship between online retail and household consumption expenditure.

2.1.3. *Control variable*

With reference to previous literature, this paper selects the following variables related to household consumption expenditure as control variables: (1) the logarithm of disposable income per capita (ln*Inc*); (2) the inflation rate (*Infla*); (3) the registered urban unemployment rate (*Uer*) (4) Total dependency ratio (*Gdr*); (5) Tax rate (*Taxr*); (6) Urbanization rate (*Urb*); (7) Local government fiscal expenditure log (ln*Rpex*); (8) Social security (*Socr*).

2.2 *Design of Spatial Weight Matrix*

Based on the previous literature, this paper designs three kinds of spatial weight matrices: (1) Inverse distance spatial weight matrix W_1: when $i \neq j$, $w_{ij} = 1 / d_{ij}$, d_{ij} is the geographical distance between area i and area j ; Otherwise $w_{ij} = 0$. (2) Economic distance spatial weight matrix W_2: when $i \neq j$, $w_{ij} = (Q_i \times Q_j) / d_{ij}$, Q_i and Q_j represent the actual average GDP per capita of area i and area j in 2007-2017; otherwise $w_{ij} = 0$. (3) Internet distance spatial weight matrix W_3: when $i \neq j$, $w_{ij} = (M_i \times M_j) / d_{ij}$, M_i and M_j represent the average internet penetration rate of area i and area j in 2007-2017, Measured by the proportion of Internet users in the local population; otherwise $w_{ij} = 0$.

2.3 *Spatial Correlation Test*

In order to determine whether online retail and household consumption expenditure have spatial correlations, this paper uses the global spatial autocorrelation index Moran's I to test. Table 1 shows the results of the spatial correlation test. The results show that under the three spatial weight matrices, the Moran's I index of the online retail market scale (ln*Or*) and the household consumption expenditure (ln*Con*) are both larger than 0 at a significant level of 5%, which indicates that the network both retail and household consumption expenditure are not randomly distributed in space, but present a significant positive spatial dependence.

Table1 Correlation test of online retail and household consumption expenditure

	W_1 Moran's I	W_2 Moran's I	W_3 Moran's I
ln*Or*	0.401***(21.426)	0.571***(19.155)	0.578***(19.738)
ln*Con*	0.044**(2.495)	0.217***(7.356)	0.231***(7.966)

Note ：We denote significant at 10%, 5% and 1% with *,** and *** respectively, z-values are denoted in parentheses.

3. SPATIAL ECONOMETRIC ANALYSIS

3.1 *Spatiotemporal Effect of Online Retail on Household Consumption Expenditure*

This paper analyzes the impact of online retail on household consumption expenditure by building a dynamic spatial econometric model. In this paper, the maximum likelihood estimation method is adopted to obtain the consistency parameter estimation of the model. Table 2 reports the results of the effect decomposition of online retail on household consumption expenditure under the inverse distance matrix, economic distance matrix, and Internet distance matrix.

Table2 Direct, indirect and total effects of online retail on household consumption expenditure

	W_1		W_2		W_3	
	$\ln Or$	$(\ln Or)^2$	$\ln Or$	$(\ln Or)^2$	$\ln Or$	$(\ln Or)^2$
Short-term direct effect	-0.168*** (-4.36)	0.004*** (3.37)	-0.141*** (-3.72)	0.003** (2.39)	-0.139*** (-3.70))	0.003** (2.31)
Short-term indirect effects	0.014 (0.11)	0.001 (0.19)	-0.152* (-1.76)	0.004* (1.67)	-0.144* (-1.72)	0.004* (1.68)
Short-term total effect	-0.154 (-1.25)	0.005 (1.10)	-0.293*** (-3.51)	0.007*** (2.95)	-0.283*** (-3.46)	0.007*** (2.80)
Long-term direct effect	-5.274 (-0.06)	0.119 (0.06)	-0.662 (-1.57)	0.013 (1.40)	-0.803 (-0.69)	0.016 (0.59)
Long-term indirect effects	5.089 (0.05)	-0.118 (-0.06)	-1.449 (-0.42)	0.036 (0.44)	-3.310 (-0.11)	0.077 (0.11)
Long-term total effect	-0.185 (-0.02)	0.001 (0.00)	-2.111 (-0.59)	0.049 (0.59)	-4.114 (-0.13)	0.093 (0.13)

Note ：We denote significant at 10%, 5% and 1% with *, ** and *** respectively, z-values are denoted in parentheses.

As shown in Table 2, under the three spatial weight matrices, the long-term direct effects, long-term indirect effects, and long-term total effects of online retail on household consumption expenditure are not significant, which indicates that online retail has no long-term impact on household consumption expenditure. Judging from the short-term direct effect of online retail on household consumption expenditure, the impact of online retail on household consumption expenditure in this region is "U-shaped." Judging from the short-term indirect effects and total effects of online retail on household consumption expenditure, after considering both economic (or Internet) and geographical distance factors, online retail has a "U-shaped" space spillover on household consumption expenditure Effect and total effect.

The reason for the "U-shaped" relationship between online retail and household consumption expenditure is that online retail has produced a price reduction effect and market expansion effect by reducing search costs. In the early days of online retail development, there were fewer online sellers and buyers, and online merchants Consumption is mainly expanded through the effect of price reduction. Consumers are gradually shifting from offline to online, seeking to buy the same products as offline at a lower price. This stage is mainly the replacement of the traditional market. At this time, basically all the short-headed goods with less price elasticity such as food, clothing and daily necessities entered the market. Therefore, the consumption of residents will increase and the consumption expenditure of residents will decrease. With the in-depth development of online retail, more and more sellers and buyers have entered the market, and a large number of long-tail products have begun to appear, such as a wide range of non-selling books, imported food and drinks, and so on. This stage is not only a replacement of traditional markets, but also a process of creating new markets. At this time, online retail mainly increases household consumption and household consumption expenditure through market expansion effects.

Table3 SDM estimation of spatial spillover effect of online retailing on household consumption expenditure at different geographical distances

Geographical distance (Km)	$\ln Or$	$(\ln Or)^2$	Geographical distance (Km)	$\ln Or$	$(\ln Or)^2$
200	-0.0448	0.0046*	1200	-0.2503**	0.0083***
300	-0.1333	0.0070**	1300	-0.1732*	0.0063*
400	-0.0530	0.0013	1400	-0.1461*	0.0040*
500	0.0132	-0.0020	1500	-0.1230*	0.0044**
600	0.1310	-0.0053	1600	-0.1487**	0.0048**
700	-0.0307	0.0007	1700	-0.2185***	0.0080***
800	-0.0639	0.0000	1800	-0.2179***	0.0083***
900	0.0204	-0.0020	1900	-0.0019	0.0018
1000	-0.0513	0.0009	2000	-0.0459	0.0027
1100	-0.2071**	0.0062**	2100	-0.0539	0.0028

Note ：We denote significant at 10%, 5% and 1% with *, ** and *** respectively.

3.2 The Effective Boundary of Internet Retailing's Spillover Effect on Household Consumption Expenditure

The empirical results in this paper show that online retail has a "U-shaped" space spillover effect that first decreases and then rises, but the previous analysis did not consider the difference in geographical distance. The "first law of geography" believes that the spatial dependence of economic activities will decline with the increase of geographical distance. So does the spatial spillover effect of online retail on household consumption expenditure also have this feature? In order to examine in more depth how the spatial spillover effect of online retail on household consumption expenditure changes with geographic distance, this paper is based on the Internet distance matrix, starting with the shortest inter-provincial distance of 200 kilometers and performing an SDM regression every 100 kilometers. Examine how the spatial spillover effect changes as the distance between the spatial units participating in the regression gradually increases. Since there are too few spatial units participating in the regression beyond 2100 kilometers and there is more noise, this paper examines the changes in the spatial spillover effect of online retail on household consumption expenditure in 2100 kilometers. The regression results are reported in Table 3.

Table 3 shows that the coefficients of online retail and its square terms are not significant within 1000 kilometers. Within 1100-1800 kilometers, the coefficients of online retail and its square terms are significantly negative and positive, respectively, and the distance is more than 1900 kilometers. The regression coefficient is no longer Significantly, this shows that the effective distance boundary of the "U-shaped" space spillover effect of online retail on household consumption expenditure is 1100-1800 kilometers. At 1200 km, the estimated coefficient of space spillover effect is at the highest level, and the space spillover effect reaches the maximum value, which indicates that the strongest effect of online retail on the space spillover effect of household consumption expenditure is 1200 km. It is worth noting that judging from the changes in the estimated coefficients of the spatial spillover effect within the effective boundary, the spatial spillover effect of online retail on household consumption expenditure does not appear to have a spatial attenuation characteristic with increasing geographic distance. This is because the online retail transaction process relies on the Internet to overcome the constraints of physical time and space, thereby greatly reducing the geographical distance limit of online retail's spatial spillover effect on household consumption expenditure.

4. CONCLUSION

Based on the panel data of 31 provinces in China from 2007 to 2017, this paper constructs inverse distance weight matrix, economic distance weight matrix and internet matrix, economic distance spatial weight matrix and internet distance spatial weight matrix, uses dynamic SDM to empirically analyze the impact of online retail on household consumption expenditure. The conclusions are as follows: firstly, the direct effect, spatial spillover effect and total effect of online retail on household consumption expenditure are all "U-shaped". Secondly, the effective distance boundary of the "U-shaped" spatial spillover effect of online retail on household consumption expenditure is 1100-1800 km, and the strongest distance is 1200 km. The last, Within the effective boundary, the spatial spillover effect does not decrease with the increase of geographical distance.

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