

## Research on the Influence of Internet Development on China's Price

### Based on the data analysis of the time series of 31 provinces, municipalities directly under the central government, autonomous regions between 2011 and 2016

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**Abstract:**-The development of information technology has penetrated into the public's daily life. The article uses factor analysis to construct an indicator system for measuring the Internet level to evaluate the level of contemporary Internet development. Furthermore, by constructing a time series model, we explore the extent of the impact of the Internet on prices in 31 provinces, municipalities directly under the central government, autonomous regions across the country. The research results show that for every 1% increase in China's Internet level index, the total CPI index will decrease by 2.1%. The index of food, housing, travel and entertainment generally tends to be stable and reduced, but not all of them are statistically significant enough to be further studied.

**Keywords:** Internet Development, Price, CPI, Impact, Province, Time Series

#### 1. Research background and significance

In the context of the current era, the importance of information development is self-evident. President Xi Jinping attached great importance to the development of national informatization. "Since the 18th National Party Congress, the Party Central Committee has paid attention to the development of the Internet, developed the Internet, and governed the Internet. What's more, it made overall plans and coordinate about major issues concerning informationization in the political, economic, cultural, social, and military fields." In the 2018 government work report, Premier Li Keqiang summed up the past five years, "deeply carry out the "Internet +" action, implement inclusive and prudent supervision, promote the widespread application of big data, cloud computing, and the Internet of Things. The emerging industries are booming and the traditional industries are reshaped." With the continuous advancement of national informatization construction,

the level of consumer price index (CPI) is particularly important under the guidance of the "people-centered" development philosophy. This paper hopes to analyze the price changes of food, housing, travel and entertainment in various provinces in China from 2011 to 2016, and then clarify the impact of informationization development on prices.

#### 2. Theoretical analysis and hypothesis

From a holistic perspective, domestic and international research on the impact of the Internet on prices has been constantly emerging. Alan Tapp (2002) stated that in the traditional non-Internet market, there may be a high "transaction isolation"[1]. In other words, consumers buy without adequate understanding of alternatives, often with high inertia barriers. Knowing that customers don't look around too much, companies will take advantage of this laziness and charge high prices. But now the "power" of customers is getting bigger and bigger. Tian Tao (2016) studied the ASPI index released by Alibaba Research Institute and believed that the development of e-commerce platform has greatly reduced the circulation cost of online sales of goods. At the same time, online sales have also broken through the geographical restrictions of online sales, and the market scope. The expansion has enabled companies to achieve economies of scale to a greater extent, which has led to lower unit costs. At the same time, in order to maintain their influence in the field of e-commerce, various e-commerce platforms have also resorted to various major moves to enhance the visibility and competitiveness of specific e-commerce brands through various forms of price promotions. Taobao has launched the annual "Double 11" large discount promotion since 2009[2].

Sapna Rakesh(2012) also pointed out that India's online shopping site is committed to maximizing returns and profits. For low-differentiation products, consumers can view the price and promotion information during leisure time on the online shopping

website[3]. Therefore, instead of focusing on website features or products, the lowest price is the popular unique sales proposition. Therefore, it is proposed that:

**2.1 Hypothesis one: information development has an impact on prices. The higher the level of information development is, the lower and more stable prices will be.**

E-commerce on the Internet has realized the "point-to-point" transaction mode between enterprises and consumers and between enterprises, and the transaction cost has been greatly reduced. This ancient and evergreen for food industry, Tang Dong equality (2016) studied by system dynamics model based on the pattern of O2O e-commerce impact on food prices trend, the result shows that before 2012, due to factors such as price competition, the buyer of the dominant, e-commerce mode of food prices downward trend; After 2012, due to factors such as personalization and standardization, it generally shows a trend of stable recovery, and will eventually become stable[4]. Therefore, it is proposed that:

**2.2 Hypothesis two: the development of informatization has an impact on food prices. The higher the level of informatization development is, the lower and more stable the food price will be.**

No matter in the domestic or overseas markets, there are many listed companies in the home furnishing industry, such as Red Star Macalline Group Corporation Ltd and OPPEIN home furnishing and so on, but the home furnishing e-commerce platform is rare. Wayfair, America's biggest vertical home-furnishing firm, has emerged from Amazon's shadow with annual sales of more than \$3 billion and is still growing fast. Kasmaliasari (2009) investigated the ways of understanding Jepara wooden furniture in China. At that time, 67% of consumers displayed Jepara wooden furniture through samples, and the Internet only accounted for 11%[5]. There is considerable room for market development in the future. Therefore, it is proposed that:

**2.3 Hypothesis three: Informatization development has an impact on the price of household equipment and supplies and services. The higher the level of informatization development is, the lower and more stable the price of household equipment and supplies and services will be.**

Take the traditional automobile industry as an example, the middle process of sales and publicity is extremely complex and costly, and informatization has given birth to new ways. Du Guoning (2018) analyzed the successful case of TMALL unmanned car supermarket, highlighting its more favorable price and excellent customer experience[6]. 《ADMEN》 (2018) reviewed another case, in which BMW quickly found

target users and stimulated strong interaction with users by joining hands with the chattering platform. In the context of increasingly fierce competition in the automobile consumer market, the marketing value should be enhanced to contribute to the accumulation of brand assets[7]. Therefore, it is proposed that:

**2.4 Hypothesis four: the informatization development has an impact on the transportation price. The higher the informatization development level is, the lower and more stable the transportation price will be.**

JIAO Xinyu (2016) by using cluster analysis, the district difference analysis, qualitative analysis and quantitative analysis method of combining the panel data model. He summed up China's cultural consumption, in the case of different provinces, autonomous regions and municipalities directly under the central government. The results show that differences in eastern and western, the price level and urbanization level of these two factors have important influence[8]. Therefore, it is proposed that:

**2.5 Hypothesis five: the development of informatization has an impact on the price of entertainment education and culture. The higher the level of informatization development, the lower and more stable the price of entertainment education and culture will be.**

### 3. The establishment of the Internet development index

#### 3.1 Samples and data sources

This paper takes 31 provinces, municipalities directly under the central government and autonomous regions of China from 2011 to 2016 as the research object, and constructs the Internet development index through relational variables to represent the level of informatization. The data were obtained from the national bureau of statistics, 《China information yearbook》, 《Internet development report》 and Wind database.

#### 3.2 Research method and index system construction

In order to measure the level of informatization reasonably and accurately, this paper mainly uses the construction method provided by Wang Peng (2017), namely selecting evaluation indexes from three aspects of Internet infrastructure, Internet use and Internet application degree[9]. However, due to the significant increase of the computer penetration rate in recent years, it has changed a lot from the situation ten years ago. If the computer penetration rate is still adopted, it is not a good way to measure the informatization level

at a low level. Based on this, this paper does not include it into the construction system. Table 1 lists the variables used to construct the Internet water evaluation.

**Table 1:** Internet development level evaluation system

name of index	Variables identify
Internet penetration rate (%)	X1
Number of domain names (10,000)	X2
Number of websites (10,000)	X3
Telephone penetration rate (including mobile phones)(per 100)	X4
Domestic patent application acceptance (10,000)	X5

**3.3 factor analysis**

The KMO test values and SMC test values of each variable were calculated in table 2 by using Stata14.0 software. It can be clearly found that the correlation test values between variables are all greater than 0.6, indicating that the effect of factor analysis is better. Based on this, we obtain the relationship between variables and components according to the output results:

- X1 (Internet penetration rate) = 0.3486f1 + 0.8061f2
- X2 (number of domain) = 0.4935f1 + 0.7866f2
- X3 (number of sites) = 0.8461f1 + 0.4094f2
- X4 (telephone penetration rate) = 0.8208f1 + 0.3932f2
- X5 (domestic patent application acceptance) = 0.6680f1 + 0.4291f2

**Table 2** KMO and SMC tests

variable	KMO test	SMC test
X1	0.8163	0.7331
X2	0.7469	0.8144
X3	0.7699	0.8387
X4	0.7614	0.7949
X5	0.9364	0.6059
The overall	0.7988	-

Then, according to the factor score coefficient matrix, the factor score can be written:

$$f1 = -0.17138X1 - 0.25486X2 + 0.69441X3 + 0.40364X4 + 0.12094X5$$

$$f2 = 0.45417X1 + 0.71569X2 - 0.29829X3 - 0.13581X4 + 0.01283X5$$

After calculating the scores of f1 and f2, we use the variance contribution rate of them as the factor weight, and use the factor weighting method to get the new expression:

$$F = 0.5811f1 + 0.4687f2$$

The calculated F is processed by the normalization method, as follows

$$Int_i = (F_i - F_{min}) / (F_{max} - F_{min})$$

To map the data to the interval of (0,1) according to the original differences. In this way, the  $Int_i$  we calculated can represent the development degree of Internet in each region.

**3.4 Index measure results**

As can be seen from the graph (figure 1), from 2011 to 2016, China's Internet development index increased steadily, with little difference in annual growth rate. From 0.152 in 2011 to 0.294 in 2016, the annual average growth rate was about 2.84 percent. Even if the overall growth rate is relatively stable, it can still be seen that the growth rate of the development index slowed down in 2013-2015. In addition to viewing the Internet development index from a national perspective, this paper also shows the development of the eastern, central and western regions through regional division. The division is based on the standards of the statistical bureau: 11 provinces (cities) in the east; Eight provinces in central China; Western 12 provinces (cities, autonomous regions). Figure 2 depicts the changing trend of Internet development level in the three regions. We can clearly find that the overall change of the three regions in the past six years is similar to that of the whole country, showing a steady growth. However, the development gap between regions is quite wide. As of 2016, the index for the eastern region was about 0.3 points higher than the index for the central and western regions. That compares with a gain of only about 0.23 points in

2011. This shows that the development of information technology in China is still unbalanced, and this imbalance has a tendency to continue to expand. In addition, the index level in the central and western regions is roughly the same, but the growth rate in the central region is higher than that in the western region. The two are already converging.

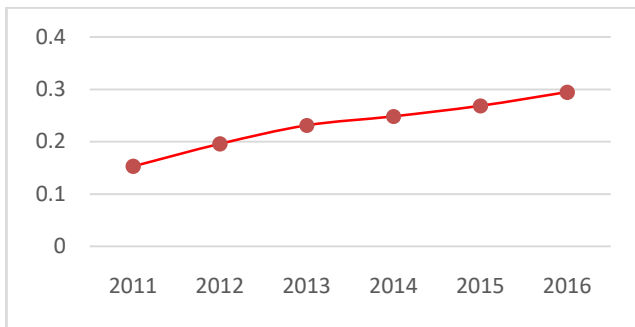


Fig-1: Trend chart of Internet development index from 2011 to 2016

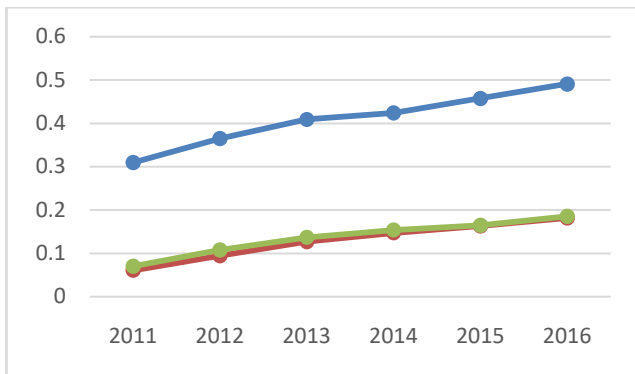


Fig-2: The trend of Internet development index in eastern, central and western regions changed from 2011 to 2016  
Green-the west Red-the middle Blue-the east

Above initial analysis, observation is the average Internet development index (national or subregional). The flaw of the average method is that it cannot reflect the variation or extreme cases of the data represented. Based on this, figure 3 calculates the variation coefficient of the national Internet development index to judge whether the development of informatization level in recent years is stable. From the figure, we can see that in recent years, the variation coefficient of the whole country is decreasing, from 0.98 in 2011 to 0.68 in 2016. This also fully shows that, with the advancement of time, the overall difference in the development of informatization level has been decreasing, and the fluctuation in each year is also decreasing.

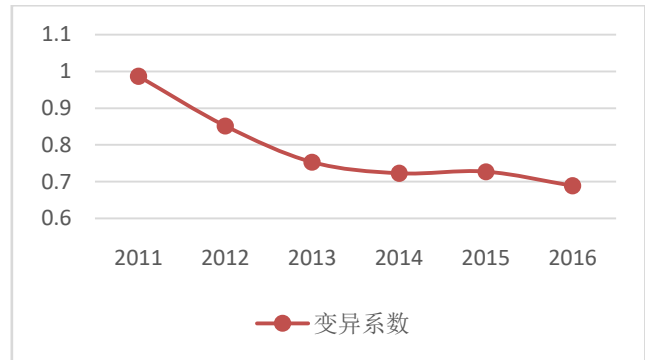


Fig-3: The change coefficient of the Internet development index from 2011 to 2016

#### 4.0 Regression analysis based on least square method

In order to further verify the hypothesis made in the previous paper, this paper took 31 provinces, municipalities directly under the central government and autonomous regions of China from 2011 to 2016 as the research object and conducted regression analysis by simple OLS method. About the selection of price level, combining with the above assumptions, this paper respectively from national statistical yearbook selected the general consumer price index, traffic tools consumer price index, the household equipment supplies and services to the consumer price index and recreational use durable consumer goods and services to the consumer price index is respectively as the explained variable. Due to the absence of consumer price index data of consumer durables and services for entertainment in 2016, we treat it as the missing variable in this regression (i.e., the sample number of this item is 155, and the rest is 186). For the selection of dependent variables, in addition to the above calculated Internet development level index, there should also be relevant control variables. Therefore, this paper selects the per capita GDP of each region (measured in thousand yuan and expressed by kavgdp). Economic development may lead to the rise or fall of the price of a certain type of consumer goods, so choosing GDP per capita as the control variable can effectively exclude the impact of social and economic development. Through the regression of the four price indexes, we get the following results:

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verified the first and fourth hypotheses, while the third and fifth hypotheses need to be further studied.

5. SUGGESTIONS

1. To further promote the popularization and development of the Internet in the central and western regions of China. In the past six years, the development level of Internet in various regions has shown a steady growth. However, the development gap between regions is quite wide. The eastern region is much higher than the central and western regions, while the western region has a slower growth rate than the central region. The development of information technology in China is still unbalanced, and this imbalance has a tendency to continue to expand. The government can strengthen the construction of mobile base stations in remote areas by supporting infrastructure construction projects. In addition, the government can also attach importance to the commercial potential of rural areas, thus expanding the Internet revenue group.

2. The government will increase its support for the Internet industry to facilitate People's Daily life. The price level is closely related to us. The application of information technology can improve the efficiency of all aspects and ultimately affect the price. For example, the typical e-commerce model can reduce intermediate links, reduce costs, and even drive the development of agricultural products, which can benefit the public. Authorities can ease policy to guide the growing and deepening use of the Internet.

3. Properly manage the garment, household and entertainment industries. The gap between the price of clothing is too wide, so this paper did not discuss. Compared with the traffic, the impact of the Internet on the home is not so significant. The comprehensive references and cases may be because the informatization of the industry is still in the uplifting stage of the development stage. As for the entertainment industry, even its durable goods and services, price is still not obvious. It may be influenced by the personalized consumption upgrade, but the vast majority of our population may be more suitable for the conclusion of Indian e-commerce, that the lowest price should be the sales proposition. The government can launch certain regulatory measures to optimize the industrial internal structure and promote the rapid and stable development of the national economy.

Table 3: Regression results by least square method

	(1) consumer price index	(2) consumer price index for household equipment, supplies and services	(3) consumer price index for transportation	(4) consumer durables for recreational use and consumer price index for services
Internet development index	-2.095** (-3.09)	-1.040 (-1.30)	-1.722* (-2.13)	2.947 (1.92)
GDP per capita	0.00385 (1.16)	0.00924 (1.78)	- (-1.70)	-0.0420*** (-4.18)
Constant term	103.0*** (573.03)	101.0*** (650.34)	99.94*** (567.06)	97.53*** (240.18)
Sample size	186	186	186	155

Note: the statistical value of t is in brackets; \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

From the regression results, we can find that except for the fourth type of price index, the Internet development index has a negative effect on the other three types of price index, that is, the higher the Internet development index is, the lower the corresponding price index is. However, this average negative effect is only significant in the overall consumer price index (category 1) and the consumer price index for vehicles (category 3). Specifically, an increase of 1% (or 0.01) in the Internet development index will reduce the price index of the first category by about 0.021 and the third by about 0.104. However, the regression results are not significant in the second category of price indices. Similarly, the regression results of the fourth price index, although positive, are not statistically significant. Based on this, we have

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