*Research Article*

# Educational Structure of Resident, E-commerce Transactions and Residents' Consumption-Empirical Analysis based on Synergistic and Mediating Effects

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## Abstract

This paper used the panel data of 31 provinces and cities in China from 2005 to 2016 to analyze the relationship among educational structure of resident, e-commerce transactions and residents' consumption. Firstly, we analyzed the impact of different educational structure of resident of consumers on online e-commerce transactions. We found that different educational structure of resident has different impacts on the application degree of e-commerce consumption. Secondly, we analyzed the synergistic effect between educational structure of resident and e-commerce transactions to residents' consumption. We found that interaction terms would not change the effect direction of educational structure of resident on consumer spending. Thirdly, this paper studied the impact of educational structure of resident on residents' consumption expenditure by acting on e-commerce transaction. The research results showed that educational structure of resident have an indirect effect on residents' consumption by e-commerce transaction. Finally, the robustness test was carried out by changing the dependent variables, and the results verified the previous conclusions.

## Keywords

E-commerce Transaction • Educational Structure of Resident • Resident Consumption • Synergistic Effect • Mediating Effect

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With the accelerated adjustment of the economic structure in China, the role of consumption became more and more essential in enhancing economic growth. In 2017, China's final consumption expenditure reached 43.5 trillion yuan, whose share of GDP reached 53.6 percent. This was also the fact that China's final consumer spending has accounted for more than 50% of GDP for six consecutive years since 2012. The contribution rate of economic growth was 58.8%, which was 26.7% higher than the contribution rate of total investment. At the same time, the rise of e-commerce accelerated the growth of consumption obviously. The number of Internet users in China reached 688 million, the popularizing rate of Internet reaching 50.3%, the number of online shopping users reaching 413 million, and the proportion of Internet users shopping online reached 60% at the end of December 2015 according to the statistics of China Internet Network Information Center. Premier Keqiang Li has emphasized that e-commerce, which was acombination of online consuming and offline consuming based on Internet, has become a "new growth point" for China's economics. The extensive application of e-commerce has promoted the digital transformation development of the supply chain system and the consumption network, and formed a unified consumption market in China with the business mode of e-commerce, thus driving economic growth through promoting consumption (Bi & Qiu, 2014). Whether the residents of China can enjoy the "information technology dividend" brought by e-commerce, whether the difference of individual education was reflected in the difference of consumption growth due to the different degrees of application of e-commerce in this context, this paper was mainly based on China's actual national conditions and educational structure of resident, combing with the development of e-commerce in recent years. Then we analyzed the different effects of educational structure of resident on consumption growth through the application of information technology from the perspective of consumer behavior. The research idea of this paper was shown in Figure 1, and the research structure was as follows: The second part was literature review, in which we summarized the current research results and analyzed the main contributions and innovations of this paper. The third part was theoretical analysis and research hypothesis. The fourth part was empirical research and robustness test. The fifth part was the conclusion of this study and the prospect of the next research.
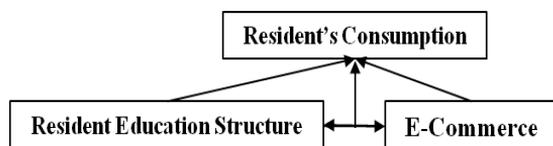


*Figure 1.* The affecting action of educational structure of resident and e-commerce transactions on residents' consumption expenditure

## Literature review

The theoretical development of consumption growth has mainly experienced changes in absolute income theory, relative income theory, life cycle theory, and sustainable income theory according to the existing literature. Since Keynes's creative introduction of the "income" variable, absolute income theory has become the pioneering work of consumption function research. Keynes believed that the increasing in income would be

converted into consumption in a certain proportion, and this ratio would continue to decrease as income increases. However, due to the serious deviations of estimation after the Great Depression, it was instead by relative income theory which was proposed by Duesenberry (1949) and Modigliani (1949). They introduced "past income" into the consumption function, and proposed the concept of "consumption stickiness". After that, life cycle theory and long-term income theory have successively proposed that the focus of consumption function research shifts from the belief in absolute income to the main point on saving and economic growth. In recent years, many Chinese and foreign scholars have tried to use the above-mentioned classical consumption theory to provide explanations and references to the relationship between population and consumption growth in China, but effects were not satisfactory. Many scholars have also pointed out the internal reasons (Sun & Wang, 2001; Zhu & Luo, 2011). Firstly, China's current market economic system development was not deep enough, and the economic environment was uncertain. Therefore, the arrangement of Chinese residents' consumption expenditure has significant stages (The important stages of life of Chinese residents were generally divided into: before marriage, after marriage, child-rearing and retirement, etc.) rather than purely a lifetime span. Secondly, the difference of educational structure of resident was obvious. There were significant differences between urban and rural residents in terms of consumption level, consumption structure, concept and habits. Thirdly, there were a large number of ethnic groups and a large regional gap, and it would be structural differences among regional consumers. Finally, the imperfect development of China's capital market and the impact of liquidity constraints have been amplified in China. Therefore, it would be inadequate to transplant Western theories to China directly. And it was necessary to analyze the influence of population on consumption expenditure based on Chinese educational structure of resident. Many scholars have made multi-angle analysis on the impact of China's population structure on consumption demand and consumption structure in recent years. Jin & Yan (2011) have discussed the ways and the influencing factors in expanding consumer demand. Shi and Wang (2014) have analyzed the relationship among fertility rate, age structure, urbanization and consumption. All these researches have laid a foundation for our study. After the emergence of e-commerce, an emerging consumption model, there was a significant transform in the convergence of goods and services, matching the needs of buyers and sellers, reducing trading links and increasing price transparency (Delina, 2014). Therefore, e-commerce has not only increased social welfare, but has also stimulated economic growth. Jing Huirong (2014) estimated the impact of e-commerce on the macroeconomics of the United States, Japan, Germany, the United Kingdom, and France based on a multi-regional econometric model. The conclusions showed that the e-commerce market has increased the GDP of the above five countries by 0.25%. A large number of empirical studies based on underdeveloped regions such as Asia and Africa have also shown that the popularity of e-commerce could help the market to play a better role, and increase the welfare to more people, especially to people with low-income, to address the needs of vulnerable groups. Inclusive innovation (Jensen, 2007; Conley & Udry, 2010; Kunwang et al., 2015).

Therefore, researches about the structural characteristics of the population and the impact of the development of e-commerce transactions on consumer spending were so rich. But it seemed to ignore two problems. One was the synergistic effect between educational structure of resident and e-commerce transactions to residents' consumption. The other was mediating effects of e-commerce transactions based on educational structure of resident to residents' consumption. We could draw that from the relationship of these three factors that: on one hand, the popularization and development of information technology would bring the "information

bonus" of convenient channels, which would bring about the inclusive effect on consumption growth, eliminating individual differences, and promoting balanced economic growth (Huang & Yue, 2016). On the other hand, different individuals corresponded to different consumer behaviors. So it was difficult to judge the effect of educational structure of resident on residents' consumption expenditure. Therefore, this paper would introduce the e-commerce transaction to discuss the affecting on Chinese educational structure of resident to residents' consumption expenditure.

The possible innovations in this paper were as follows. Firstly, we have expanded the microscopic explanatory research on the acceptance and application of e-commerce based on different individuals, introducing the study of demography in the perspective of macroscopic consumption promotion. Secondly, we analyzed the different influence to residents' consumption based on educational structure of resident and the promotion of consumption affected by the rising of information technology based on the different application of e-commerce. The combination of the three factors was more conducive to the optimization to the theoretical analysis results. In addition, it was more consistent with the characteristics of China's consumption structure adjustment and economic development mode transformation in recent years. Thirdly, we have done empirical test to the relationship among educational structure of resident, e-commerce transactions and residents' consumption based on the real data of the different areas in China in recent years. We have extended the research on e-commerce on the basis of some scholars' achievements in the study of Chinese consumption function. The results would provide a more reasonable and scientific explanation of the characteristics of China's economic development on e-commerce transaction, educational structure of resident and residents' consumption expenditure.

## Theoretical analysis and research hypothesis

### Educational structure of resident and e-commerce transactions

The distinctive features of China's demographic transition included the rising of the quality of education. According to statistics, the number of higher educations in China was increasing year by year. And the education level per capita was constantly transforming the pressure generated by China's population into the human resource advantage. The basic requirements of e-commerce for information technology applications were nothing more than the education level of the population. In other words, people with higher education level would master higher technical skills. Therefore, we assumed that the education level per capita was proportional to the total volume of e-commerce transactions.
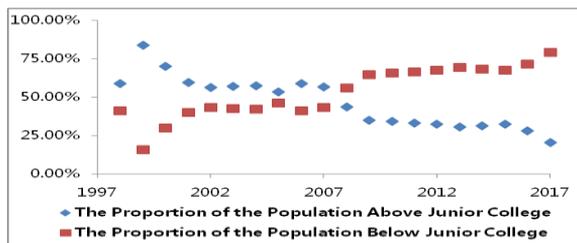


*Figure 2.* Education structure of Chinese residents from 2000 to 2016 in China

**The affecting of E-commerce to consumer expenditure**

There were three factors of commercial infrastructure supported by residents' online consumption: trading technology, information communication and logistics distribution. The normal operation of online retail relied on logistics distribution to play its supporting role (Huang, 2016). So the improvement of trading technology, information communication and logistics distribution would directly promote the online transaction volume of e-commerce. According to the display in Figure 3, the increase of online transactions would boost the total consumption of residents. Therefore, we assumed that the emergence of e-commerce conductively affected the effect of the population structure to residents' consumption.
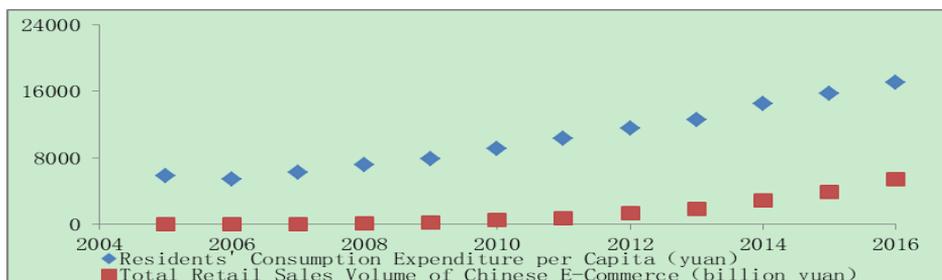


*Figure 3.* The relationship of total retail transaction volume of e-commerce and residents' consumption expenditure per capita from 2004 to 2016

# Research design and empirical analysis

**Data source and variable selection**

According to the above analysis, considering the short history of development of e-commerce in China and the availability of data, this paper has selected the provincial panel data from 2005 to 2016 as a sample for analysis. All the data was acquired from the China Statistical Yearbook, China City Statistical Yearbook, Demographic and Employment Statistics Yearbook, China Financial Statistics Yearbook, Statistical Report on the Development of China's Internet Network and Statistics from the General Post Office of China. Some missing data was complemented by method of interpolation.

Firstly, this paper mainly considered residents' consumption expenditure per capita (Consume) of each province and each city, and the total retail transaction volume of e-commerce (Onlinetrade) of each province and each city as dependent variables. It should be noted that due to the lack of data on the total retail transaction volume of e-commerce in each province, Fang & Xing (2005) chose the number of express delivery services in each province multiply by a weight (*Weight 1*), which equaled to the proportion of national online retail sales in the number of express delivery services. We could think *Weight 1* as the amount of retail merchandise included in each package. But there was one drawback in this method that it only considered the differences between different years were considered, while the differences between different provinces were ignored. And

we could see every province's online retail sales are equal to the national online retail sales after multiplying. So it would cause some deviation. This paper optimized the method by Fang & Xing (2005), we used the number of express delivery services in each province multiplying by *Weight 2* which equaled to Internet penetration rates in various provinces (*Pop*) to distinguish the difference between different provinces and cities after multiplied *Weight 1*. Huang & Yue (2016) and Sun (2017) have used the Internet penetration rate of each province to distinguish the differences of each province. Our method has not only distinguished the difference between transactions of online and offline, but also have distinguished different provinces, which has strong applicability.

Secondly, the description of educational structure of resident (*Char*) was mainly described by the proportion of population above junior college (*Education*). We have to say that because various kinds of survey report for characteristics of population research were aimed at the nation, it was lack of regional differences. This paper selected characteristics of educational structure of resident in each province and each time point to replace education structure of netizens. The specific operation method was to use the number of netizens in each province and each time point to multiply the characteristic variable coefficient of the total population to get the final explanatory variable. We have not only considered the Internet penetration rate of each province and each time, but also the differences in educational structure of resident of each region and each time were considered in this way.

Finally, this paper mainly considered control variables (*Control*) that affecting the total volume of e-commerce transactions from several dimensions: express delivery infrastructure, network infrastructure, the number of employees in e-commerce and residents' living standards. We selected the average number of people serviced per express outlet (*People*), the average area serviced per express outlet (*Area*), the number of Internet broadband access port (*Port*), total postal business (*Postage*), the number of broadband Internet access users (*User*), the number of employees in Internet and related services (*Worker1*), the number of employees in transportation, warehousing and postal (*Worker2*), consumer price index (*CPI*), residents' RMB savings balance (*Saving*) and residents' disposable income per capita (*Income*).

Table 1
*Meaning and Descriptive Statistics of Each Variable*

| Measurement of Variable | Mean | SD | Max. | Min. |
|---|---|---|---|---|
| Total Volume of Residents' Consumption Expenditure Per Capita (*Consume*) | 17655.66 | 7476.76 | 54305.35 | 7990.15 |
| Total Volume of Online E-Commerce Transaction (*Onlinetrade*) | 113.82 | 397.76 | 3985.96 | 0 |
| The Proportion of Population Above Junior College (*Education*) | 12.84% | 9.09% | 55.87% | 2.54 |
| The Average Number of People Serviced per Express Outlet (*People*), | 1.57 | 0.72 | 3.59 | 0.30 |
| The Average Area Serviced Per Express Outlet (*Area*) | 329.14 | 965.00 | 6666.67 | 0.74 |
| The Number of Internet Broadband Access Port (*Port*) | 868.48 | 1020.06 | 6515.61 | 0 |
| Total Postal Business (*Postage*) | 81.02 | 167.44 | 1886.25 | 1.05 |
| The Number of Broadband Internet Access Users (*User*) | 0.05 | 0.06 | 0.52 | 0 |
| The Number of Employees in Internet and Related Services (*Worker1*) | 0.61 | 1.49 | 11.03 | 0 |
| The Number of Employees in Transportation, Warehousing and Postal (*Worker2*) | 23.61 | 14.38 | 91.38 | 0.60 |
| Consumer Price Index (*CPI*) | 102.81 | 1.95 | 110.09 | 97.65 |
| Residents' RMB Savings Balance (*Saving*) | 10344.62 | 10088.29 | 58509.63 | 119.20 |
| Residents' Disposable Income Per Capita (*Income*) | 17655.66 | 7476.76 | 54305.35 | 7990.15 |

*Note*. SD: Standard Deviation; Max.: Maximum value; Min.: Minimum value

## Establishment of Model

Before the regression, we considered the problem of endogeneity was caused by the bidirectional causality between the independent variable and the dependent variable. So we analyzed the problem by taking the data of the time lag period of the independent variable. We used the CPI in 2005 as the base period for deflating in this paper to eliminate the influence of monetary purchasing power or inflation. Then considering that the dimensions of each variable vary greatly and part of the variable value is 0, all variables except educational structure of resident are treated by adding 1 and taking the natural logarithm. The original observation value of 0 was still 0 after processing, this method have not affected the result analysis (Xue & Guo, 2012; Zhang & Cao, 2017). We built models separately and used Stata12.0 to do the panel data regression analysis.

$$Ln(Onlinetrade_{it}) = \alpha_j Char_{jit} + \alpha_g Ln(Control1)_{git} + C + \varepsilon \tag{1}$$

$$Ln(Consume_{it}) = \alpha_1 Onlinetrade_{it} + \alpha_{j'} Char_{j'it}$$
$$+ \alpha_{1j'} Onlinetrade_{it} * Char_{j'it} + \alpha_{g'} Ln(Control1)_{g'it} + C + \varepsilon \tag{2}$$

In models we established, $t$ represented the year which valued from 2005 to 2016 as the time series dimension. $i$ represented the region which valued 31 provinces and cities in China as the cross-sectional dimension. Some missing data were complemented by interpolation. $j$ and $j'$ represented the dimensions of the educational structure of resident. $g$ and $g'$ represented the sequence numbers of the control variables.

## Empirical test

**Regression analysis of educational structure of resident on the total volume of e-commerce transaction volume.** We used panel data method to analyze the sample in this paper. However, in order to select the most appropriate method, we have carried out F test and Hausman test. The results showed that the P value is less than 0.05, indicating that the fixed effect model was more effective. Then we do regression on model (1) to analyze the affecting of educational structure of resident on total volume of e-commerce transaction volume. The results were shown in Table 2.

Table 2
*Results of Regression for Educational Structure of Resident on Total Volume of E-Commerce Transaction*

| Variable | Model 1 | Model 2 |
|---|---|---|
| Education | 2.44 (20.41***) | 0.29 (3.58***) |
| People | | -4.72 (-6.95***) |
| Area | | 2.12 (5.46***) |
| Port | | -0.03 (-0.70) |
| Postage | | 1.21 (11.47***) |
| User | | 0.43 (8.03***) |
| Worker1 | | 0.08 (2.44*) |
| Worker2 | | 0.49 (4.95***) |
| CPI | | -0.83 (-0.61) |
| Saving | | -0.63 (-0.53) |
| Income | | 1.79 (8.76***) |
| C | -10.27 | -29.82 |
| $R^2$ | 42.13% | 28.43% |

According to the empirical analysis of the fixed effect model in Table 2, we could get as follows:

(1) Education level was positively proportional to e-commerce transaction volume. According to the description of Xue & Guo (2012), the online shopping consumers were mainly young and highly educated. E-commerce was an emerging product of the new century, and the requirements for consumers included search technology, online finance, security precautions, etc. Therefore, the level of education inevitably determined the level of e-commerce transactions.

(2) The affecting of Internet broadband access ports on e-commerce transaction volume was not significant. With the intervention of capital, China's e-commerce has developed rapidly, and it has completed the transition from PC to mobile in recent years. Comparing with the PC end, mobile e-commerce transactions represented by mobile phones and Ipads have more application scenarios, and consumers could use any fragmented time for online shopping, which greatly promoted the increase in e-commerce transaction volume.

(3) The affecting of CPI and the saving deposits of residents per capita to the volume of e-commerce transactions were not significant. According to the logic of the consumption function, residents' consumption were directly affected by income, and savings were affected by life cycle or the sensitivity of emergencies. In addition, online trading volume was not affected by CPI.

**The Synergistic Effect of Educational structure of resident and the Total Volume of E-Commerce Transaction on Residents' Consumption.** (1) Model 3-4 have verified that e-commerce could promote consumption growth per capita, and that the upgrading of information technology has led to an increase in consumption, which has brought consumers an inclusive dividend for information and thus improved people's quality of life.

Table 3
*Results of Regression for The Synergistic Effect of Educational Structure of Resident and the Total Volume of E-Commerce Transaction on Residents' Consumption*

| Variable | Model 3 | Model 4 |
|---|---|---|
| Onliedeal | 0.12 (12.53***) | 0.04 (2.48*) |
| Education | 5.56 (5.45***) | 2.41 (2.92**) |
| Education* Onlinetrade | 5.12 (5.19***) | 2.22 (2.80**) |
| People | | 0.15 (0.84) |
| Area | | -0.32 (-3.16**) |
| Port | | 0.02 (2.10**) |
| Postage | | -0.06 (-1.93*) |
| User | | -0.01 (-0.69) |
| Worker1 | | -0.05 (-4.29***) |
| Worker2 | | 0.10 (3.87***) |
| CPI | | -1.02 (-2.99**) |
| Saving | | 0.17 (5.79***) |
| Income | | 0.23 (4.11***) |
| C | 40.34 | 24.21 |
| $R^2$ | 88.64% | 63.51% |

(2) Interaction terms have not changed the original symbol of the explanatory variable in the educational structure of resident. So, it could be concluded that the emerging of e-commerce would enhance the affecting effect of educational structure of resident on residents' consumption. However,

(3) We noted that the goodness of fit $R^2$ of models were obviously high, indicating that the different consumer behavior attributed to residents' consumption per capita.

We have done regression analysis on formula (2), and the results were shown in Table 3.

**The Mediating Effect of the Total Volume of E-Commerce Transaction on Educational structure of resident to Residents' Consumption**. The above analysis discussed the synergistic effect caused by individual differences of educational structure of resident and the volume of e-commerce transaction on residents' consumer expenditure. The following would analyze the mediating effect of the total volume of e-commerce transaction on educational structure of resident to residents' consumption. We mainly referenced the method proposed by Hayes (2009), established models as follows:

$$Ln(Consume_{it}) = \alpha_{j''}Char_{j''it} + \alpha_g Ln(Control)_{git} + C + \varepsilon \tag{3}$$

$$Ln(Onlinetrade_{it}) = \alpha_j Char_{jit} + \alpha_g Ln(Control)_{git} + C + \varepsilon \tag{4}$$

$$Ln(Consume_{it}) = \alpha_1 Onlinetrade_{it} + \alpha_j Char_{j'it} + \alpha_g Ln(Control)_{g'it} + C + \varepsilon \tag{5}$$

The procedure of the mediating effect testing in this paper was as follows. Firstly, regression estimation was made for equation (3) to test the impact of educational structure of resident on residents' consumption per capita. Secondly, regression estimation was conducted on (4) to test the impact of educational structure of resident on the total volume of e-commerce transaction. Finally, we have done regression estimation to (5) in the case that both $\alpha_{j'}$ and $\alpha_j$ were significant. We could concluded that the mediating effect existed when both $\alpha_1$ and $\alpha_{j'}$ were significant.

It could be seen from the regression results in table 2 that equation (4) has passed the hypothesis test. Therefore, the following tests were performed on (3) and (5) respectively. The data of the independent variable with a lag period was taken to analyze the problem. The CPI index in 2005 was used as the base period for deflation. Each variable was treated by adding 1 and taking the natural logarithm.

Table 4
*Regression Results of Educational Structure of Resident on Residents' Consumption*

| Variable | Model 5 | Model 6 |
|---|---|---|
| Education | 0.64 (25.70***) | 0.12 (5.56***) |
| People | | -0.12 (-0.67) |
| Area | | -0.20 (-1.98*) |
| Port | | -0.06 (-4.58***) |
| Postage | | -0.01 (-0.26) |
| User | | 0.01 (0.65) |
| Worker1 | | -0.01 (-1.52) |
| Worker2 | | 0.12 (4.66***) |
| CPI | | -1.11 (-3.16**) |
| Saving | | 0.18 (5.88***) |
| Income | | 0.34 (6.34***) |
| C | 5.81 | 8.56 |
| $R^2$ | 65.89% | 68.37% |

Regression results showed that education structure of residents would affect e-commerce transactions indirectly impacting residents' consumption per capita. The education features had positive effects to total volume of e-commerce transaction. It indicated that the indirect effect of educational structure of resident on consumption expenditure through e-commerce transactions was significant and the mediating effect was effective.

Table 5
*Regression Results of The Mediating Effect of the Total Volume of E-Commerce Transaction on Educational Structure of Resident to Residents' Consumption*

| Variable | Model 7 | Model 8 |
|---|---|---|
| Onlinetrade | 0.15 (20.67***) | 0.05 (3.78***) |
| Education | 0.26 (10.53***) | 0.10 (4.84***) |
| People | | 0.13 (0.71) |
| Area | | -0.31 (-3.02**) |
| Port | | 0.02 (2.41*) |
| Postage | | -0.07 (-2.24**) |
| User | | -0.01 (-0.93) |
| Worker1 | | -0.05 (-4.45***) |
| Worker2 | | 0.09 (3.59***) |
| CPI | | -1.07 (-3.09**) |
| Saving | | 0.18 (6.11***) |
| Income | | 0.24 (4.18***) |
| C | 7.40 | 10.14 |
| $R^2$ | 86.93% | 62.93% |

Table 6
*Results of Regression Educational Structure of Resident on Residents' Food Consumption on E-commerce*

| Variable | Model 9 | Model 10 |
|---|---|---|
| Education | 1.93 (12.13***) | 0.59 (3.77***) |
| People | | -4.50 (-6.37 ***) |
| Area | | 2.58 (7.94***) |
| Port | | -0.02 (-0.81) |
| Postage | | 0.18 (1.18) |
| User | | 0.52 (6.45***) |
| Worker1 | | 0.21 (3.77***) |
| Worker2 | | 0.45 (1.94*) |
| CPI | | -0.53 (-0.56) |
| Saving | | -0.23 (-0.45) |
| Income | | 1.51 (1.09) |
| C | -72.97 | -221.76 |
| $R^2$ | 19.43% | 37.33% |

**Robustness test**

Besides the total consumption of residents and the total consumption of residents per capita, the national bureau of statistics classified residents' consumption into eight categories in the statistical yearbook of China, consumption of food, consumption of clothing, consumption of living, consumption of household appliances and services, consumption of health care, consumption of transportation, consumption of education and culture, consumption of health care, consumption of sundry. We have replaced the dependent variable by consumption of food per capita for the following reasons: Firstly, some categories of consumption statistics belonged to

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service consumption. Secondly, Food was one of the most basic consumer goods. Engel's coefficient described the proportion of residents' income used to purchase food, so the description of food consumption and total consumption would not deviate too much.

The following was an analysis of the regression results on affecting of educational structure of resident to total volume of e-commerce food transaction. We used the total amount of e-commerce transactions in each region in each time period multiplied by the corresponding Engel's coefficient as dependent variable. The regression results were shown in table 6.

The synergistic effect of educational structure of resident and total volume of e-commerce transaction on consumption of food was shown in table 7

Table 7
*Results of Synergistic Effect on Educational Structure of Resident and Total Volume of E-commerce Transaction to Residents' Food Consumption*

| Variable | Model 11 | Model 12 |
|---|---|---|
| Onliedeal | 0.09 (10.43***) | 0.04 (3.03**) |
| Education | 4.64 (5.15***) | 1.14 (2.48*) |
| Education* Onlinetrade | 4.24 (4.89***) | 1.02 (2.36**) |
| People | | 0.26 (1.51) |
| Area | | -0.27 (-2.81**) |
| Port | | 0.01 (1.64) |
| Postage | | -0.09 (-2.90**) |
| User | | -0.02 (-2.11*) |
| Worker1 | | -0.01 (-0.11) |
| Worker2 | | -0.10 (-1.90) |
| CPI | | 0.07 (2.81**) |
| Saving | | 0.17 (5.95***) |
| Income | | 0.26 (4.80***) |
| C | 33.94 | 10.24 |
| $R^2$ | 77.79% | 54.65% |

The regression results of the impacting of the total volume of e-commerce transaction on food consumption expenditure were shown in Table 8.

Table 8
*Results of Affecting of Educational Structure of Resident to Residents' Food Consumption*

| Variable | Model 13 | Model 14 |
|---|---|---|
| Education | 0.52 (25.93***) | 0.11 (5.65***) |
| People | | 0.01 (0.09) |
| Area | | -0.16 (-1.69*) |
| Port | | 0.15 (1.63) |
| Postage | | -0.03 (-1.19) |
| User | | -0.03 (-2.38*) |
| Worker1 | | -0.02 (1.41) |
| Worker2 | | -0.01 (-1.45) |
| CPI | | -0.09 (-3.76***) |
| Saving | | 0.17 (5.92***) |
| Income | | 0.35 (7.09***) |
| C | 5.39 | 2.42 |
| $R^2$ | 54.26% | 58.67% |

Results of the mediating effect of the total volume of e-commerce transaction on educational structure of resident to residents' food consumption was shown in Table 9.

The results of the robustness test verified the above conclusion. Firstly, educational structure of resident has significant influence on both residents' consumption expenditure and total volume of e-commerce transaction. Secondly, synergistic effect of educational structure of resident and the total volume of e-commerce transactions to residents' consumption expenditure was significant. Thirdly, the mediating effect of the total volume of e-commerce transactions on educational structure of resident to residents' consumption expenditure was significant.

Table 9
*Regression Results of the Mediating Effect of the Total Volume of E-commerce Transaction on Educational Structure of Resident to Residents' Food Consumption*

| Variable | Model 15 | Model 16 |
|---|---|---|
| *Onlinetrade* | 0.12 (17.76***) | 0.05 (3.82***) |
| *Education* | 0.24 (10.94***) | 0.10 (4.92***) |
| *People* | | 0.24 (1.45) |
| *Area* | | -0.26 (-2.75**) |
| *Port* | | 0.02 (1.81*) |
| *Postage* | | -0.09 (-3.07**) |
| *User* | | -0.02 (-2.22*) |
| *Worker1* | | -0.15 (-1.98*) |
| *Worker2* | | 0.06 (2.69**) |
| *CPI* | | 0.04 (0.13) |
| *Saving* | | 0.17 (6.15***) |
| *Income* | | 0.26 (4.85***) |
| *C* | 6.59 | 3.89 |
| $R^2$ | 77.23% | 54.44% |

## Conclusions and inspiration

This paper has empirically tested the effect of educational structure of resident to residents' consumption expenditure based on the panel data of 31 provinces in China from 2005 to 2016. The main research conclusions were as follows: (1) China's education structure has a positive influence on residents' consumption expenditure. (2) The benchmark regression model based on the fixed effect showed that the high population of education was positively proportional to the total volume of e-commerce transaction. (3) Different educational structure characteristics of population and transaction volume of e-commerce interact with residents' consumption expenditure under the environment of e-commerce. E-commerce transactions have a positive effect on population education structure to consumer spending. (4) Based on the recursion of the basic regression equation, the equation examined the mediating mechanism of the impact of educational structure of resident on the consumer expenditure. The results showed that the rapid development of e-commerce in China has significantly supported the increase of residents' consumption per capita in China.

The results of this paper concluded that: (1) It was so important to promote consumption and economic growth to guide the development of urbanization, strengthen the education of population and improve their vocational skills and comprehensive quality. (2) The application of information technology significantly released the consuming power of various areas. Under the background of the gradual upgrading of consumption and the expansion of domestic demand in China, the unified and large domestic market was an important basis for the economic transformation and upgrading in China, and the extensive application of e-commerce online

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transactions would be able to become a driver to excavate the consumption capacity of China's market.

# References

Bi, D. T., & Qiu, C. B. (2014). Research on the influence mechanism of e-commerce business-customer interaction on customer experience. *China Soft Science*, *1*(12), 124-135. http://dx.doi.org/10.3969/j.issn.1002-9753.2014.12.012

Conley, T. G., & Udry, C. R. (2010). Learning about a new technology: Pineapple in Ghana. *American economic review*, *100*(1), 35-69. http://dx.doi.org/10.1257/aer.100.1.35

Delina, R. (2014). Transparency in electronic business negotiations–evidence based analysis. *Quality Innovation Prosperity, 18*(2), 79-89. http://dx.doi.org/10.12776/qip.v18i2.417

Duesenberry, J. S. (1949). Income, Saving and the Theory of Consumer Behavior. *Review of Economics & Statistics, 33*(3), 111-117.

Fang, F. Q., & Xing, W. (2015). The U-shaped relationship between household consumption and e-commerce market scale. *Finance & Trade Economics, 36*(11), 131-147

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*(4), 408-420. http://dx.doi.org/10.1080/03637750903310360

Huang, W. D., & Yue, Z. G. (2016). Information technology application, inclusive innovation and consumption growth. *China Soft Science, 1*(5), 163-171. http://dx.doi.org/10.3969/j.issn.1002-9753.2016.05.015

Jensen, R. (2007). The digital provide: Information technology, market performance, and welfare in the South Indian fisheries sector. *The quarterly journal of economics, 122*(3), 879-924. http://dx.doi.org/10.1162/qjec.122.3.879

Jin, X. T., & Yan, C. (2011). An empirical study on the convergence of urban residents' consumption and income in different regions of China. *Economic Research Journal, 33*(2), 5-18.

Jing, H. R. (2014). The Study of dynamic effect relationships between the e-commerce, the logistics and economic growth based on the VAR Model. *International Journal of and e-Service, Science and Technology, 7*(3), 187-196.

Li, H. X., & Li, W. (2010). Research on relation model of the aging of population and e-commerce. *China Population Resources and Environment, 20*(3), 85-88. http://dx.doi.org/10.3724/SP.J.1087.2010.02828

Liu, K. H., & Liu, Y. L. (2014). Solving the riddle of China's economic growth -- an explanation of demographic change. *Economic Science, 36(3)*, 5-21.

Modigliani, F., & Miller, M. H. (1959). The cost of capital, corporation finance, and the theory of investment: reply. *American Economic Review, 49*(4), 655-669. http://dx.doi.org/10.1080/00346765900000019

Shi, B. B., & Wang, J. Y. (2014). An Empirical study of the impact of demographic factors on regional consumption: Based on China's provincial data. *Population Research, 37*(1), 78-89.

Sun, F., & Wang, Y. H. (2001). Research on the Chinese resident's consumption behaviour. *Statistical Research, 18*(4), 24-30. http://dx.doi.org/10.3969/j.issn.1002-4565.2001.04.005

Sun, P. Y., Zhang, J. J., & Jiang, X. Y. (2017). E - commerce, search costs and changes in consumer prices. *Economic Research Journal, 1*(7), 25-38.

_____

Xue, Y. Z., & Guo, Y. F. (2012). Competitive Strategy of E-business Sellers on Consumer- to- Consumer Platform: Based on Data from Taobao.com. *Nankai Business Review, 15* (5), 129-140. http://dx.doi.org/10.3969/j.issn.1008-3448.2012.05.014

Zhang, X. X., & Cao, G. H. (2018). Analysis on competition strategy of B2C import cross-border E-commerce seller: As an example of www Tmall hk. *Journal of Chongqing University (Social Sciences Edition. 1*(1), 46-57. http://dx.doi.org/10.11835/j.issn.1008-5831.2018.01.005

Zhu, Q., & Wei, T. Y. (2016). Future impacts of population aging and urbanization on household consumption in China. *Population Research, 40*(6), 62-75.

Zhu, X. K., & Luo, C. (2011). The theoretical logic of consumption function and its sinicization: A literature review. *Economic Research Journal, 1*(1), 140-153.