

Analysis of the Influence Factors of E-Commerce on China's Economic Growth

Jiarong Guo*

Department of Economics, Boston University, Boston, USA

*Corresponding author: jrguo@bu.edu

Abstract. In recent decades, China has witnessed tremendous growth in the field of e-commerce, also known as electronic commerce. This paper aims to analyze the impact of e-commerce on China's economic growth through empirical analysis. By applying the Ordinary Least Squares (OLS) method, this study is based on time-series data from 2008 to 2016 acquired from The World Bank and the National Report on E-Commerce Development in China. The analysis seeks to support that e-commerce, as a large portion of China's total consumption, not only has some degree of influence on the traditional economy but also yields a positive effect on the GDP of China. The paper will provide a holistic overview including aspects such as a comprehensive exploration of e-commerce's history and development in China, a careful assessment of the potential influence factors, and a series of future suggestions that will guide the path of e-commerce and the entire economy in China. In the end, this paper aspires to contribute to a nuanced understanding of the pivotal role and impact it has on China's economic growth.

Keywords: E-commerce; GDP; traditional economy; China; ordinary least squares.

1. Introduction

E-commerce (Electronic Commerce) has grown tremendously over the past few decades, especially in China. The development of e-commerce goes back to the mid-1990s when the Internet first arrived in China [1]. During this phase when online trading was initialized in China, the government launched some “golden projects” to assist with the process. The objective of these projects was aimed at laying out the foundations for future e-commerce in China [2]. By 2003, “the number of Internet users in China had reached 123 million”, increasing at a skyrocketing rate and making China the second largest Internet-using market in the world at the time [2]. At the same time, with Jack Ma's founding of Alibaba, China's e-commerce was entering another stage [3]. The start of Taobao, a consumer-to-consumer online shopping platform, was quickly taking up the entire market. In 2014, the total sales of Taobao reached 2766.4 billion RMB Yuan [4]. E-commerce in China continued to boom after the 2010s with the emergence of accessible payment methods such as Alipay and WeChat Pay. It is expected that China's e-commerce will continue to grow and it will reach 21 trillion RMB Yuan by 2024 for all online retailing [5]. Some of the reasons that helped with the popularity of e-commerce include the ease to build corporate imagery and the ability to provide better customer service online [6]. Overall, being able to buy things online with ease has revolutionized the way people live.

Even though e-commerce is a way to help with selling products and therefore improving GDP, the convenience comes at a cost. The rapid growth of electronic commerce can negatively impact the traditional economy in places such as the shopping mall. According to Hou, the development of a traditionally-styled economy has slowed down and even regressed. She mentioned that opening a physical store requires many additional costs on equipment and decoration; however, e-commerce businesses can reduce these costs by opening up an online store on Taobao with a significantly smaller amount of money. If looking at the traditional economy as a whole, the outlook is not as optimistic as e-commerce [7].

Regardless of the pessimism about the traditional economy, this paper hypothesizes that e-commerce positively affects economic growth in China. In the linear regression model, this study will use data collected from the World Bank to test the assumptions and predictions of a theoretical model.

By building linear and log-log regression models, this paper will explore the relationship between e-commerce and China's GDP and quantify the extent of the impact on the retail sector. By studying this topic, this study will be able to understand e-commerce and its function for the past and the future.

This paper consists of six sections. Following Section I, which is the introduction of this topic, a literature review of a similar search done in the field about the relationship between e-commerce and the real economy is written in Section II. Next, Section III explains the variables and data chosen for this research and how econometric models are constructed. Then, the corresponding results will be talked about in Section IV. Based on the results, Section V discusses some potential limitations and drawbacks of the research. Finally, this paper will include references in Section VI.

2. Literature Review

One study that is related to the field of e-commerce and economic growth was done by Wei, Lin, and Zhang. In the paper "E-Commerce, Taobao Villages and Regional Development in China", Wei et al. examined the history and development of Taobao villages in China. These villages emerged mostly in rural areas as a way to make a living. It turned out that these villages were making profits and doing good because of the support they received from Alibaba and other e-commerce companies. However, the future of these villages was uncertain as mentioned by the authors, just like how the e-commerce industry will develop in the future is not clear [8].

In Johri's 2016 paper titled "Econometric Analysis of the Relationship between Indian E-Commerce Transaction and GDP", Johri studied the impact of e-commerce on GDP in India using econometrics. Besides using the unit root method and the cointegration test to see whether the author's hypothesis was true or not, the most important method that Johri used was the Ordinary Least Square Method. Specifically, he tested the coefficients, t-statistics, and the coefficient of determination; as a result, the writer concluded that e-commerce had a significant impact on India's GDP. However, the author was not able to identify the limitations of their studies, which would have made the argument stronger if the limitations had been addressed [9].

A similar study called "The Econometric Analysis of the Relationship between Chinese E-commerce Transactions and GDP" was conducted by Rao, Zhang, and Li. This study focused on analyzing the relationship between China's e-commerce transactions and economic growth. Using the Ordinary Least Square Method just like the previous paper, Rao et al. tested the coefficient of determination to prove their hypothesis. In the end, two conclusions were made: the growth of e-commerce in China increases the country's GDP and the relationship between GDP growth and e-commerce is long-lasting and stable. It was also interesting that they included a suggestion section, making note of the potential drawbacks of their model and stating the improvements that e-commerce could make including taxation policies and market positioning [10].

3. Econometric Model

3.1. Data Presentation

One dataset, which is China's Gross Domestic Product (GDP), used in this study is collected from The World Bank. The sample interval is from 2008 to 2016. Another dataset, which is China's total e-commerce sales per year, is obtained from the National Report on E-Commerce Development in China. The time interval for this dataset is the same as the previous one, ranging from 2008 to 2016. As shown in figure 1 and figure 2, the trend of GDP and the trend of e-commerce annual sales are demonstrated on a timeline. Both graphs have similar upward sloping trends over the chosen time interval. Specifically, each year's value is higher than that of the previous year's, which is consistent.

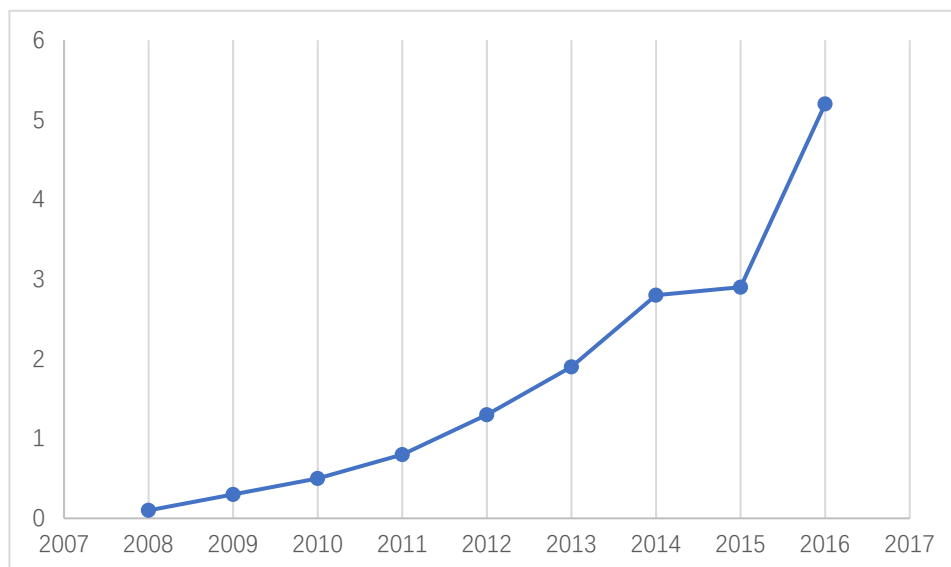


Fig. 1 Graph of China's GDP from 2008 to 2016

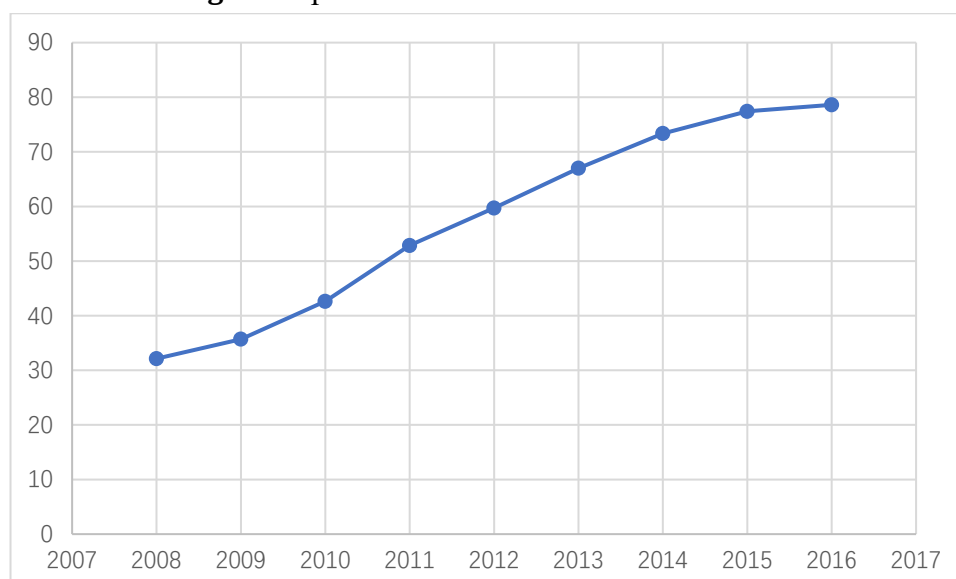


Fig. 2 Graph of China's E-Commerce Total Sales from 2008 to 2016

3.2. Variable Setting and Model Introduction

The dependent variable (y) in the following models is termed as gdp, and the independent variable (x) is termed as e-commerce.

Simple Linear Regression Models:

$$gdp = \beta_1 + \beta_2 * ecommerce + e \quad (1)$$

$$\log (gdp) = \beta_1 + \beta_2 * \log (ecommerce) + e \quad (2)$$

At the most fundamental level, this paper aims to study whether e-commerce significantly impacts China's GDP or not. These two simple regression models provide a foundation for further research and models. The first model is a linear function, regress gdp on e-commerce because the Ordinary Least Square assumptions are met. Since this is no more than one independent variable, the assumption that there is no multicollinearity is met. Besides, the distribution of gdp is mostly normally distributed, which means that another assumption of OLS is met. Furthermore, the mean of the error term e is almost 0 as shown in Table 1, suggesting that an assumption of OLS is met. However, one

assumption that is not met is that the datasets are time-series, which is likely to cause autocorrelation. Autocorrelation refers to that gdp over time is likely correlated.

4. Results

The simple linear regression models are meant to test if e-commerce aids the overall economic growth of China. Based on the generated results from the data, the simple linear regression indicates that GDP of China will increase 9.581646 trillion RMB Yuan for each one-unit increase in e-commerce sales, which is shown in Table 1. When the simple linear regression model is transformed into a log-log regression model to adjust for the skewness of the varying data, a unit of increase will result in approximately 26% of increase in GDP. Moreover, b1 shown in Table 1, refers to the coefficient of GDP, 40.89 These values are all positive and make logical sense because the booming of e-commerce should definitely lead to an increase in GDP of China.

Since x and y are not dummy variables, this study transforms them into a more accurate model that represents the coefficient of determination, R2. In Table 1, R2 is 0.7863, whereas R2 is 0.9627. Comparing both values, it can conclude that the log-log linear regression model is a better fit because a model fits better when the R2 is closer to 1.

Table 1: Linear Regressions and Log-Log Regressions

Variables	Model 1 (Linear)	Model 2 (Log-Log)
N	9	9
Coefficient (b2)	9.581646	0.2637294
cons (b1)	40.89	4.000995
F	25.76	180.52
R-squared (R2)	0.9627	0.7863
Adj R-squared	0.9573	0.7558

5. Conclusion

The objective of this paper was to find out the impact of e-commerce on economic growth in China. Within the time span of our data, the results support the hypothesis previously mentioned in this paper, which is that e-commerce positively affects economic growth in China. In my linear regression models, both linear and log-log models are positively correlated. From these two models, it could be concluded that the development and growth of e-commerce aids the growth of GDP. However, this paper did not account for omitted variables and only used a short time span as my time interval. Some of the omitted variables may include age, gender, marital status, education level, and special events like the 2008 financial crisis. These variables could potentially change my results.

Another issue that this paper tried to address was whether or not e-commerce is replacing the traditional style of shopping in person. Comparing economic growth, e-commerce total sales, and retail total sales on the same dimension could be challenging, but there are many suggestions and advice learnt from my linear regression models. With the episode of the global pandemic and recent events, many retail sectors have trends to go downhill. Therefore, businesses and companies should pay more attention to how to balance between e-commerce and the in-store retail sector. One way to revitalize in-person shopping may be implementing policies such as discounts and special offers. I believe that the traditional way of shopping will return to its golden age soon.

As this paper mentioned before, this study has some limitations and drawbacks that the author would like to fix or dig deeper if I were to have another chance in future research. For example, even though this paper avoided the past three years that were severely impacted by COVID-19, this paper did not include any omitted variables such as a natural disaster or a policy change by the government. These are the things that could make my results more accurate and precise if added.

References

- [1] Tan, J., Tyler, K., & Manica, A. Business-to-business adoption of eCommerce in China. 2007, 44: 332-351.
- [2] Li, H., & Suomi, R. E-commerce development in China: Opportunities or challenges. 2015.
- [3] Shen, R. The Comparative History and Development of E-Commerce in China and the United States. SCIRP. 2020.
- [4] Ji, Y. The impact of Taobao e-commerce platform on the commodity sales market and the real economy. 2017, 1.
- [5] Cramer-Flood, E. China Ecommerce Forecast 2023. Insider Intelligence. 2023.
- [6] Huang, J., Jiang, X., & Tang, Q. (2009, January 24). An e-commerce performance assessment model: Its development and an initial test on e-commerce applications in the retail sector of China. *Information & Management*. 2009, 46, 2: 100-108.
- [7] Hou, S. Discussion on the influence of e-commerce on the real economy. *Palm bridge scientific research*. 2014, 13: 398-398.
- [8] Wei, Y. D., Lin, J., & Zhang, L. E-Commerce, Taobao Villages and Regional Development in China. 2019, 110, 3: 380-405.
- [9] Johri, B. Econometric Analysis of the Relationship between Indian E-Commerce Transaction and GDP. 2016, 56, 4.
- [10] Rao, Y., Zhang, K., & Li, L. The Econometric Analysis of the Relationship between Chinese e-Commerce Transactions and GDP. 2020.