Research the Impact of E-commerce on China's Economy

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Abstract: E-commerce has evolved as a generation of technology that provides consumers and industries with the belief to process transactions. While China has gone through a period of pandemic, China's GDP in e-commerce has been growing steadily. In the forecasting model, there is an upward trend in the top five industries in China. And the larger percentage of wholesale and retail industries represents their importance in the future. Therefore, this paper will investigate the impact of e-commerce on China's economy by building two linear regression models. In building the linear regression models to find the relationship, different control variables are selected from various aspects, such as labor force, natural population growth rate, number of employed people and the proportion of enterprises with e-commerce transaction activities, to study their effects on the relationship between e-commerce and China's GDP. Through the research analysis, it is found that e-commerce has a significant positive impact on the Chinese economy, and securing the per capita disposable income of the population helps to promote the development of e-commerce, thus better promoting China's economic development for the better. Finally, this paper gives suggestions from both enterprise and government levels. Enterprises should develop suitable business strategies to meet consumers' needs better. On the one hand, the government should encourage residents to consume while protecting consumers' rights and interests. On the other hand, the government should encourage enterprises to innovate and make appropriate policies to help them develop better.

Keywords: e-commerce, economy, PCDI, linear regression model, enterprise

1.   Introduction

In the generation of big data, the involvement of the Internet is getting wider and wider. So many industries and companies would like to try to build a connection between the Internet and business. In this case, e-commerce is introduced into the business market. It brings not only convenience but also more growth opportunities in the profit. Electronic commerce is a transaction of selling and buying goods and services on the internet [1]. Owing to the continued expansion of e-commerce and advancements in e-commerce applications, total e-commerce sales keep showing a consistent growth trend. The total value of e-commerce sales made by Chinese businesses in 2021 was 2,276.13 billion yuan [2]. In the meanwhile, from an industry perspective, the growth of e-commerce has started to gradually expand to retail, manufacturing, raw material supply and other industries. [3].
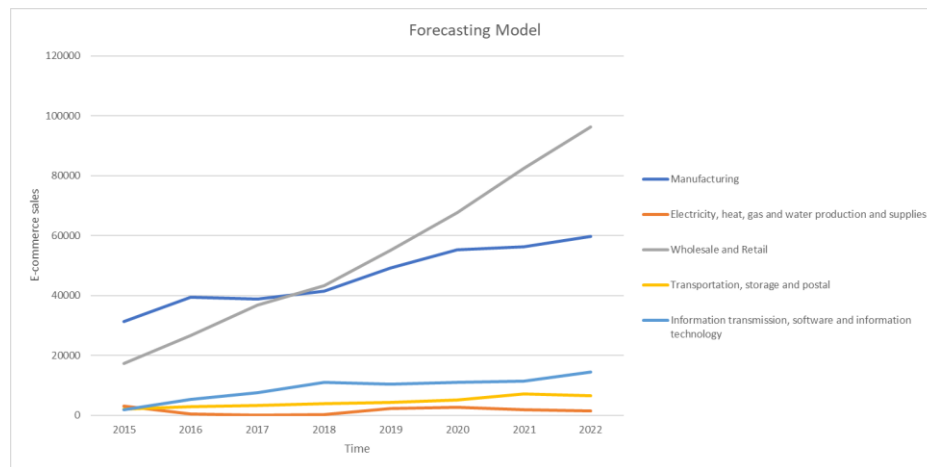
Figure 1: Forecasting the trend of the e-commerce transaction sales within Chinese top 5 industries.

We intend to choose the top five e-commerce industries in China to observe the future development of e-commerce within those industries. We use the data from 2013 to 2021 to predict the number of e-commerce transactions in 2022 by creating a forecasting model in Figure 1. According to Figure 1, the number of e-commerce transactions in these two industries which are manufacturing and retail is significantly higher compared to other businesses. At the same time, the retail industry has been experiencing steady growth. In addition, Figure 1 also shows that the industry of wholesale and retail is growing at a higher rate than the manufacturing industry. It estimates that the e-commerce revenue of the wholesale and retail industry is expected to exceed RMB 10,000 billion by 2022. All of these represent there will be an increasing proportion of the wholesale and retail industry in the future for the development of e-commerce.

After predicting the further development of five industries of e-commerce in China, the change in population can also affect e-commerce. For example, Hansen constructed a study illustrating that household income has a positive impact on online shopping, which is the consumer's perspective from e-commerce [3]. Because of the significant advances in information technology, e-commerce based on the consumers' perspectives has a unique capability in tracking and analyzing customer behavior [4]. It can provide useful data about customers' preferences and a deeper understanding of their willingness to pay, which allows for individualized pricing in e-commerce [4]. In this case, the factor of consumer price will be considered as a variable to examine whether it affects the relationship between e-commerce transaction sales and Chinese GDP from the consumer's perspective.

In addition, some studies mention that more and more people pay more attention to the impact of the platform economy on labor relations [5]. The change in the market of producers and consumers might affect e-commerce [6], labour might be a factor that affects the relationship between e-commerce sale transaction and China's economy [5]. Besides, there is another research that summarizes the demographic situations from different countries such as Korea, Turkey and the U.S. to find whether demographic information affects the relationship between e-commerce and countries' GDP [7]. Therefore, our paper will also choose one characteristic of demographic information, which is the natural population growth rate as a control variable to observe its influence.

The aim of this paper is to illustrate the impact of e-commerce on China's economy by analyzing e-commerce transaction sales. And this paper will focus on the growth of e-commerce and its impact on the economy from the perspective of consumers by controlling the variables, which are labor force, natural population growth, the number of employees and the proportion of enterprises with e-commerce transaction activities.

2. Literature Review

When it comes to how the Chinese government deals with the relationship between e-commerce and GDP, there is a general name for these approaches and solutions, which is "strategy". A strategy is a comprehensive and long-term decision made to influence the direction of an important event in a positive way [8]. The growth of e-commerce results in the change on the business environment. If countries want to exist and further develop in a new environment, the government has acted to find a method of strategic transformation by making good use of the opportunities taken by the growth of e-commerce [6]. In this case, how to make a satisfactory strategy is a difficulty that the government should solve. In China, the first strategy made by the government to face the emergence of e-commerce is to create an e-commerce Agricultural Wholesale Online Market [9]. It is a site that is provided to deal with online transactions [9]. Compared to the perspective of consumers, China is used to concentrate more on the level of industries and enterprises. For example, the government implements a collaborative strategy with social entrepreneurs to push the development of social innovation of e-commerce by improving the quality of local human resources and training the local residents who lack e-commerce skills [10]. In terms of agriculture, Shenyang City used to implement Central Document No. 1 to support the expansion of the rural electric industry in counties featuring a strong agricultural industry [11]. In addition to China's government policy, other countries also release the related policy to regular the development of e-commerce. The government of Japan encourages e-commerce as a component of its internationalization strategy. For instance, electronic components are excluded from customs duties [12].

With the rapid development of e-commerce, scholars at home and abroad are increasingly rich in research on e-commerce, and the literature has more studies on the development of e-commerce. However, there are fewer empirical analyses on the macro aspect and the impact of e-commerce on the economy. Previous literature has taken the Yangtze River Economic Belt as an example and studied the impact of different factors on the development of e-commerce in the region [13]. Li Lin studied the mediating effect played by consumption upgrading as well as residents' income in the impact of e-commerce on the economy. And three suggestions are given [14]. Ying Chen studied the dynamic relationship between e-commerce and the consumption gap of residents, and the study showed that the impact of e-commerce on the consumption gap is divided into short-term and long-term [15]. Gao Jianqiang et al. explored the impact of e-commerce on the level and structure of residents' consumption by building a panel fixed-effects model, taking six central provinces as an example. The study found that e-commerce changed the structure of residents' consumption [16]. Shujuan Cui studied the impact of e-commerce on economic trade in the UK [17]. The impact of e-commerce is globalized, and the impact of e-commerce on other countries and their coping strategies also contribute to this thesis on the Chinese economy.

3. Research Hypothesis

E-commerce is based on the product of digital background, coupled with the development of technologies such as big data in recent years, which has further promoted the progress of e-commerce. In many industries, e-commerce is involved. Nowadays, people's consumption is closely related to e-commerce, and e-commerce provides great convenience for people's consumption. Especially during the epidemic, the offline retail industry was severely hit, while the transaction volume of e-commerce was not affected too much, and it provided a relatively safe and convenient way for consumers to consume. Based on the above theoretical analysis, this study makes the following hypotheses:

Hypothesis 1: The impact of e-commerce development on China's economy is positive.

Hypothesis 2: The per capita disposable income of consumers is an important factor for e-commerce to influence economic development.

4. Study Design

4.1. Sample Selection and Data Sources

The dependent variable in Hypothesis 1 is selected to measure the state of China's economic development by gross national product, which is denoted by GDP. For the independent variable, total e-commerce transactions are selected to measure the level of e-commerce development, which is denoted by GMV1. The units of both main variables are trillions of yuan. For the control variables, labor force is selected to measure the number of China's working population, denoted by Labor, in units of 10,000 people. Labor force is crucial to the development of China's economy and is an important factor influencing China's economic development for the better [18]. The natural population growth rate is chosen to measure the increase in China's population, expressed in POP in units of ‰.

In hypothesis 2, the dependent variable is total e-commerce transactions to measure the development level of e-commerce, which is expressed as GMV2 in trillion yuan. For the independent variable, the per capita disposable income of residents is selected to measure the income of residents, which is expressed by PCDI in ten thousand yuan. For the control variables, the number of employees is selected to measure the overall employment situation in China, denoted by Employment, in ten thousand. The proportion of enterprises with e-commerce transaction activities is selected to measure the participation of Chinese enterprises in e-commerce, denoted by Enterprises, in %.

National data from 2012 to 2021 are selected for this study, with a total of ten observations. The data used are from the National Bureau of Statistics, China Statistical Yearbook.

4.2. Descriptive Statistics

Table 1: Descriptive statistics of the data.

Name	Sample size	Min	Max	Mean	Standard deviation	Median
GDP	10	53.860	114.920	81.111	20.200	78.920
Total e-commerce transactions	10	8.110	42.330	25.793	11.473	27.630
Per capita disposable income	10	1.651	3.513	2.530	0.622	2.490
Labor force	10	78024.000	80091.000	79035.300	603.630	79013.500
The natural population growth rate	10	0.340	7.430	4.597	2.341	5.255
The number of employment	10	74652.000	76349.000	75847.200	601.458	76151.500
The proportion of enterprises with e-commerce transaction activities	10	5.200	11.200	9.250	2.018	9.800

The descriptive statistics of each data are shown in Table 1, each group of data has ten sample sizes, and there are no outliers in the table. The standard deviation coefficients can be calculated from the table. The standard deviation coefficients of the natural population growth rate, total e-commerce transactions, GDP, per capita disposable income of residents, and the proportion of enterprises with e-commerce transactions are relatively large, indicating that the data of these five variables are relatively discrete. From this, we can analyze that the scale of e-commerce is expanding rapidly and

the GDP is growing significantly. There is also a relatively large change in the natural population growth rate. There is a significant change in the percentage of enterprises involved in e-commerce, indicating that it has an infinite potential for future development and improvements. The standard deviation coefficients of labor force and employment are relatively small, indicating that both sets of data are relatively concentrated and do not have particularly large fluctuations.

4.3. Model Construction

A linear regression model is developed to study the impact of e-commerce on China's economic development, and the results of the regression analysis are shown in Table 2. The model is constructed as Equation (1). Where GDP represents the Chinese economy, GMV1 represents the development level of e-commerce, Labor, POP represent the 2 control variables of labor force and natural population growth rate respectively. α represents the constant in the model; ε1 represents the error in the model.

$$GDP = \alpha + \alpha1 * GMV1 + \alpha2 * Labor + \alpha3 * POP + \varepsilon1 \tag{1}$$

Table 2: Results of linear regression analysis of e-commerce on GDP.

	Unstandardized coefficient		Standardized coefficient	t	p	VIF
	B	Standard error·	$Beta$			
Constant	417.259	145.039	-	2.877	0.028*	-
Total e-commerce transactions	1.231	0.141	0.699	8.734	0.000**	4.089
Labor force	-0.005	0.002	-0.136	-2.456	0.049*	1.949
The natural population growth rate	-1.937	0.756	-0.225	-2.561	0.043*	4.906
R^2			0.991			
Adjusted R^2			0.986			
F			$F_{(3,6)} = 210.744, p=0.000$			
D-W value			2.536			

Dependent variable: GDP (trillion yuan)
* $p<0.05$ ** $p<0.01$

The relationship between total e-commerce transactions and per capita disposable income of residents is investigated by building a second linear regression model, and the results of the regression analysis are shown in Table 3. The model is constructed as Equation (2). Where GVM2 denotes total e-commerce transactions, PCDI denotes per capita disposable income, and Employment and Enterprises denote the number of employed people and the proportion of enterprises with e-commerce transactions, respectively. β represents the constant in the model; ε2 represents the error in the model.

$$GMV2 = \beta + \beta1 * PCDI + \beta2 * Employment + \beta3 * Enterprises + \varepsilon2 \tag{2}$$

Table 3: Results of linear regression analysis of disposable income per capita on e-commerce.

	Unstandardized coefficient		Standardized coefficient	t	p	VIF
	B	Standard error	$Beta$			
Constant	-318.929	65.921	-	-4.838	0.003**	-
Per capita disposable income	12.661	0.795	0.687	15.918	0.000**	4.694
The number of employment	0.004	0.001	0.211	4.483	0.004**	5.592
The proportion of enterprises with e-commerce transaction activities	0.793	0.231	0.140	3.436	0.014*	4.162
R^2			0.998			
Adjusted R^2			0.996			
F			$F(3,6) = 839.054, p=0.000$			
D-W value			1.622			

Dependent variable: Total e-commerce transactions (trillions of yuan)

* $p<0.05$ ** $p<0.01$

5.   Analysis of Results

The two models established in this study were tested for multicollinearity by calculating the variance inflation factor of each variable, and it can be found that the VIF values of all variables except the variable of employment number are less than 5, which indicates that there is no significant multicollinearity problem among the variables. The VIF value of the variable of employment number is less than 10, which indicates that there is no serious problem of multicollinearity and can be used for regression analysis.

By analyzing the first linear regression model, it was found that both control variables were significantly positive at the 5% significance level. The coefficients are negative but small, indicating that labor force and population growth rate have some negative effects on China's economic development, but the coefficients are small and therefore negligible. Regarding the independent variables, the total e-commerce transactions are significantly positive at both the 5% and 1% significance levels, and the coefficients are positive, indicating that the development of e-commerce has a significant positive impact on the Chinese economy. Therefore, hypothesis one is consistent. However, the coefficient of e-commerce is small, indicating that the development of e-commerce is not the main factor driving the development of China's economy.

With the second linear regression model, the study finds that the control variable of employment is significantly positive and has a positive coefficient at both the 5% and 1% significance levels. The other control variable is significant and positive at the 5% significance level. This means that both control variables have a significant positive effect on the development of e-commerce, and the proportion of enterprises with e-commerce transactions has a slightly greater effect on e-commerce than the number of employed people has on e-commerce. The independent variable disposable income per capita is significantly positive at both the 5% and 1% significance levels. The positive coefficient indicates that disposable income per capita has a significant positive impact on the development of e-commerce. The coefficient of disposable income per capita is relatively large, which indicates that it has a positive impact on e-commerce. Because the established hypothesis one shows that e-commerce has a positive impact on China's economic development; the test of model

two shows that disposable income per capita has a non-negligible positive impact on the development of e-commerce. Therefore, disposable income of residents is an important factor for e-commerce to influence economic development, and hypothesis two is consistent.

6.   Conclusions

This study investigates the relationship between e-commerce and China's economy by building two linear programming models based on the background of the current stage of e-commerce in China. It is found that e-commerce has a significant positive impact on China's economy, where disposable income per capita is a major factor affecting the development of e-commerce and has a significant positive impact on e-commerce. Therefore, promoting China's economic development, every link is very important. Only when the per capita disposable income is guaranteed can it help to promote the development of e-commerce. And e-commerce as one of the links affecting China's economic development for the better, the development of e-commerce cannot be ignored. Therefore, this study proposes the following conclusions:

6.1.   Encouraging Residents' Consumption

This paper finds through research and analysis that the per capita disposable income of residents has a significant positive impact on the development of e-commerce. Therefore, from the government level, the government should guarantee the stability of residents' income first and foremost. On the basis of income stability, the income of residents should be adjusted according to social and economic development. It should also continue to narrow the income gap between urban and rural residents and stabilize prices so that the income of residents can be adjusted to the growing consumption level. The government should also strengthen the supervision of the e-commerce industry to ensure a healthy development environment for the e-commerce market. The policies and measures introduced by the government should also follow the growing technological development in real-time, so that the policies can better serve the e-commerce industry, rather than becoming a fetter. A stable and guaranteed income and a healthy and sustainable e-commerce market environment is what will stimulate consumer spending. This not only protects the rights and interests of consumers, but also creates a virtuous circle.

From the corporate level, companies should personalize their business strategies to address consumer preferences. Safeguard payment security, shopping security, etc. to give consumers peace of mind and thus encourage consumers to spend.

6.2.   The development of e-commerce has a positive role in promoting the Chinese economy

E-commerce has a positive role in promoting China's economy. So the development of e-commerce industry can also drive the development of China's economy. From the enterprise level, as a market participant, enterprises should provide high-quality services and products, constantly innovate and upgrade, increase technological investment, optimize industrial structure, so as to better meet market demand.

From the government level, the government should encourage the development of e-commerce in various aspects, such as: policies, funds, etc. Assist enterprises to improve the upstream and downstream industrial chain construction, so as to lay a good foundation for the development of the e-commerce system. The government should also encourage the industry's leading enterprises to develop their own development path and support small and micro enterprises to stand firm in the e-commerce industry. Together with the government, enterprises should promote the sustainable and healthy development of the e-commerce industry as well as the Chinese economy.

Authors' Contributions

Zhiyi Li: Literature review, Research Hypothesis, Study design, Analysis of results, Conclusions and Recommendations.

Wenzhao Zhou: Introduction, Literature review.

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