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MODELING THE IMPACT OF E-COMMERCE ON ECONOMIC DEVELOPMENT

Abstract

The article shows the role of e-commerce as a promising area of activity in Ukraine. In recent years, there has been an increase in e-commerce, which leads to an increase in the share of people employed in this field. And this in turn absorbs the reduction of the unemployed in the country. Also, the growth of e-commerce brings additional income to the country, because the level of GDP is growing and encourages investment in the country. So, e-commerce has a positive impact on economic development. An economic-mathematical model of the impact of e-commerce on economic indicators in Ukraine was built. Also, COVID-19 pandemic helped increase the share of e-commerce.

Keywords: e-commerce, e-business, economic development, economic growth, the Cobb-Douglas function

Introduction

The rapid development of technology, as well as the growth of the information sector of the economy, contributes to the search for various methods to increase the company's profits or reduce its costs.

A promising area of the information economy is e-commerce. Interest in the e-commerce market is increasing every year. There are objective reasons for this fact: the growing number of Internet audiences, the growing share of online sales in total sales, the development of social and mobile networks. The COVID-19 pandemic has also been a factor in the significant growth of this sector of the economy.

The pace of development and spread of e-commerce deserves special attention: every year the speed of spread of this area is growing. In 2020, there will be 2.05 billion online buyers of digital services, which is about 25% of the total population [1].
It is projected that by 2021 there will be $ 4.5 trillion in online store sales, which is 15% more than in 2020 [2].

The pandemic also affected the number of visitors and online purchases, as it forced millions of people to stay at home to stop the spread of the virus. China has the largest sales of e-commerce and ranks 1st in the world in e-commerce. And the second is occupied by the United States. The share of mobile devices in online shopping is growing.

Research overview

The study of the impact of e-commerce on the economic development of countries is becoming more widespread. Some scientists consider the impact of ICT on the economic development of the country. At the firm level, there are Berndt, E. R., Morrison, C.J., & Rosenblum, L. S. [3] and Sichel [4], Parsons, Gottlieb, & Denny [5] do research about the influence of ICT on company growth. This research shows that ICTs can help increase business efficiency.

Lund and McGuire [6] continued to explore the relationship between e-commerce and economic growth. In their work, they proved that e-commerce has increased the profits of firms, which in turn has led to the development of countries.

Studies by Purohit M. and Purohit V. show that many countries have been able to achieve higher levels of development through e-commerce. And also to create a favorable investment climate that will promote further economic growth [7].

Jorgenson and Stiroch (2005) show that e-commerce is an important factor in increasing economic growth. In their work, they note that e-commerce leads to increased investment in information communication technology (ICT), which, in turn, leads to increased productivity and economic growth [8].

Sumanjeet notes in its work that with the help of e-commerce, production, wages, and welfare of the country will increase [9]. In Deloitte's report notes that online payments stimulate economic growth [10].

R. Anvari, D. Noruzi, and N. Terzi proved the positive relationship between the development of e-commerce and its impact on economic development as GDP growth per capita [11].

Florin-Valeriu Pantelimon, Tiberiu-Marian Georgescu, Bogdan-Ştefan Posedaru consider the promising direction of e-commerce as mobile e-commerce. The study analyzes the impact of mobile trade growth on gross domestic, the impact of COVID-19 on e-commerce [12].

In addition, the study of the impact of e-commerce on the economic development of the country was engaged in such scientists as A. Kenneth, R. Solow, A. Tofler, O. Sobenko, V. Pleskach, A. Chubukov, Y. Lysenko, L. Ponomarenko D. Iorrnem, Yu. Vasiliev and others.

Goal

The goal of the study is to construct economic and mathematical models to study the impact of e-commerce on world GDP.

Scientific hypothesis

The growth of the share of e-commerce will affect the growth of GDP per capita.

Methodology

To clarify the impact of e-commerce on economic development and analyze the literature, the Cobb-Douglas function was chosen [13, 14, 15]. The Cobb-Douglas production function is a convenient tool in economics that reflects the relationship between output and factors of production — labor and capital.

$$Y = AL^{\alpha}K^{\beta}$$

A Cobb-Douglas function can be transformed as:

$$\log Y = A + \alpha \log L + \beta \log K$$

In our case, this model will be used to study the relationship between the parameters that characterize e-commerce and the variables that reflect economic development.

Results

The model was constructed to investigate the dependence between e-commerce parameters and economic growth. We take into account different e-commerce parameters such as the volume of e-commerce in billion dollars, internet penetration in percentage, number of internet users in millions, internet sales in dollars.

As a result of construction models the best turned out:

$$\log GDP = 10.15 + 0.73 \log VE - 0.66 \log IN,$$

where GDP - GDP per capita in dollars, VE – the volume of e-commerce in billion dollars, IN - internet penetration in percentage.

Thus, the elasticity of GDP to the volume of e-commerce has a direct relationship and is 0.73%. This means that an increase of 1% in e-commerce will increase Ukraine's GDP by 0.73%. The elasticity of GDP to Internet penetration is 0.66%, which means that an increase in the percentage of Internet users will contribute to a decreasing GDP by 0.66%. This result can be explained as an increase in Internet coverage incurs costs more than bring income to the country. Since the main part of clients is already covered. The level of Internet penetration in 2019 was 67,3%.

If we analyze the sum of the coefficients of elasticity, we can see that $\alpha + \beta$ = 0.73-0.66 = 0.07, so the total impact is not so high, but positive influence on GDP per capita.

All coefficients are significant (with significance level α = 0.999). The R^2 = 0,6567. To determine the quality of the model, we need to check several conditions: the absence of multicollinearity, absence of heteroscedasticity, and absence of autocorrelation. To check for multicollinearity, we realized two tests: VIF and CI. Both tests confirmed the absence of multicollinearity. To verify the absence of heteroscedasticity, we used the criteria Goldfeld-Quandt and White. All the factors of the regression are significant (with significance level α = 0.999), but R^2 has a value of 0,6567, which indicates that the value is not enough.

Conclusions

As a result of the study, we learned the main trends in e-commerce. Seeing how fast it is evolving is also helped by the pandemic, which has increased the number of e-

commerce users. And the built model showed that the volume of the e-commerce market affects the growth of GDP per capita, ie economic development.

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