

6. Кількісні методи в економіці

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CONVERGENCE OF DIGITAL DEVELOPMENT GAP IN THE WORLD

Nowadays there is a significant gap between countries in the spread and use of digital technologies. Experts estimate that the economic development of many countries over the next decades will depend on the efficiency of the implementation of modern digital technologies and the building of the digital economy. It is expected that without the proper attention of governments and international organizations, the gap between advanced and third world countries in the area of digitization will widen annually, which will exacerbate already existing imbalances in the socio-economic development of the countries of the world [1].

The study aims to find out the trends and availability of convergence between 180 countries around the world with the spread of digital technology since 2014. It is known that convergence is interpreted as reducing inequalities in levels of development of countries or regions over time, and the opposite process is called divergence. In this paper we will use the concept of absolute β -convergence, according to which the reduction of inequality between countries is explained by the fact that countries with low initial levels of development tend to grow faster than countries with high levels of development.

As a general model of absolute β -convergence is proposed [2]

$$\ln \left(\frac{y_{iT}}{y_{i0}} \right) = a + b \ln y_{i0} + \varepsilon, \quad (1)$$

where y_{iT} and y_{i0} – the value of the studied indicator in the i -th

country in the initial (0) and last (T) periods of time; a , b – regression coefficients; ε – a random component.

If the parameter $b < 0$ and is statistically significant, then there is absolute β -convergence, otherwise divergence.

The convergence process is characterized by two indicators:

- the speed of convergence, which shows how much the gap between countries is narrowing over one time period:

$$\beta = -\frac{\ln(1 + T \cdot b)}{T}. \quad (2)$$

- half-life – the time for which the gap between countries is halved:

$$\tau = \ln(2) / \ln(1 + \beta). \quad (3)$$

As an indicator that characterizes the level of implementation of digital technologies by country, we choose the DAI (digital adoption index). This index was developed by Microsoft and the World Bank to assess the spread of digital and information technology on a scale of 0 to 1 in 180 countries [3]. The DAI general index consists of three subindices [4]:

1. DAI_{business} – the percentage of enterprises that have websites; the number of information security servers; download speed; state coverage with a 3G connection.

2. DAI_{people} – access to mobile communication in the house and access to the Internet in the house.

3. $DAI_{\text{government}}$ – the core of the management system, public Internet services, digital identification.

In order to demonstrate the existing disparities between countries in terms of the spread of digital technologies, we will present the minimum and maximum values of the DAI index and its sub-indices by countries of the world, and also the value of this index for Ukraine (Figure 1). Scandinavian countries, Switzerland, Luxembourg, Hong Kong and Singapore are among the leading countries in terms of the spread of digital technologies. The top ten countries with the lowest DAI and its subindices are from Africa region. The level of the spread of digital technologies in Ukraine can be described as average.

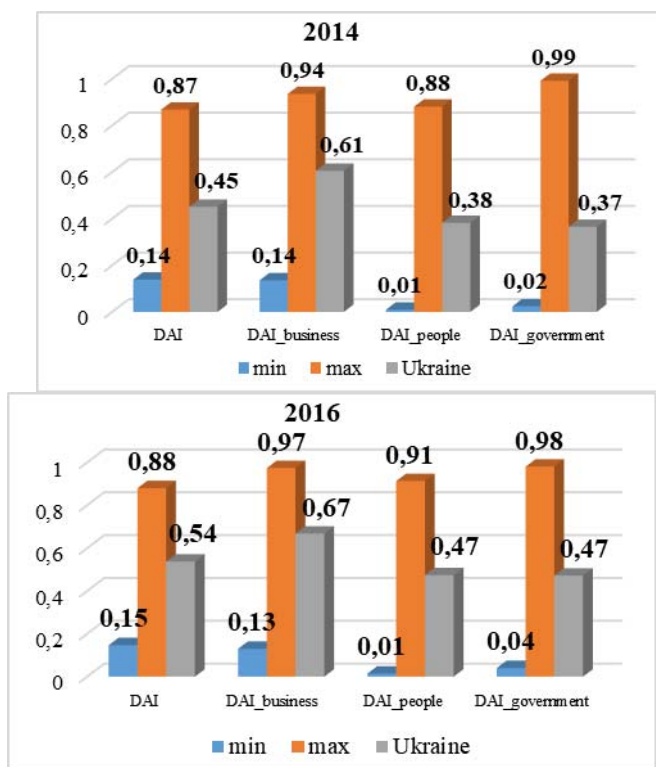


Fig. 1 The value of the DAI in 2014, 2016

Source: calculated by authors on the basis of [3]

To test for the presence of absolute β -convergence by formula (1), four econometric models are constructed: the convergence model for the DAI index and the convergence model for the DAI_{business}, DAI_{people}, DAI_{government} subindices. The results of the calculations – the value of the parameter b and its level of statistical significance, the speed of convergence and the half-life are given in Table. 1.

Table 1

Results of the estimation of absolute β -convergence

	Model 1	Model 2	Model 3	Model 4
Indicators	DAI	DAI _{business}	DAI _{people}	DAI _{government}
B	-0.064***	-0.081***	-0.138***	-0.032**
B	0,071	0,093	0,177	0,034
τ	10,1	7,8	4,2	20,9

Source: calculated by authors on the basis of [3]

Absolute β -convergence was diagnosed in all four models. In other words, inequalities in the spread of digital technologies between countries are decreasing over time due to higher rates of digitalization in countries with initially low levels of digital development.

The indicators β and τ indicate that the rate of reduction of the digital divide between countries is approximately 7% per year. At the same time, given the current trends in the pace of digitization of countries, it is possible to reduce the digital divide between countries by 2 times in about 10 years. The digital divide between countries in the field of spreading digital technologies among population is reducing the most (the convergence rate is almost 18% per year, reducing the digital divide by 2 times in about 4 years), the digital divide between countries in the field of governments and public services is reducing the most slowly (convergence rate is 3.4% per year, reducing the digital divide between countries will double in almost 21 years).

Taking into account the results of the study, it can be argued that, while keeping up with current trends, the gap between countries in the spreading of digital technologies will significantly decrease no earlier than 2030.

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