sciendo

NS global economics

ECONOMICS
Innovative and Economics Research Journal
Volume 11, No. 1, 2023

www.economicsrs.com

THE IMPACT OF COUNTRIES' PARTICIPATION IN THE ICT SERVICES MARKET ON ECONOMIC GROWTH, CPI, AND EXCHANGE RATES

Andrii Oliinyk [1]

Received 06. 02. 2023. | Sent to review 15. 02. 2023. | Accepted 29. 05. 2023.

Review Article

CC BY NC ND

[1] State University of Trade and Economics, Kyiv, Ukraine

Corresponding Author:
Andrii Oliinyk
Email: oliynik12@gmail.com

JEL Classification:
C10, E01, F14, F17, O24

Doi: 10.2478/eoik-2023-0009

UDK: 339.1(100):[616.98:578.834

ABSTRACT

Finding a way of achieving economic growth in the crisis period due to the COVID-19 pandemic, Russia's invasion of Ukraine, and probable global regression aggravates the need for the implementation of managerial solutions of entering or intensifying participation in the perspective markets. The ICT industry has been a locomotive of economic development for the last decade for participating economies. The basic idea of the paper is based on the need to analyze the impact of countries' participation in the ICT services market on their economic growth, consumer price indices (CPI), and exchange rates. The purpose was achieved by performing an analysis of the state and dynamics of the main indicators of the world ICT services market. The results show that the volume of ICT services exported and imported is growing. Moreover, we aimed to provide empirical evidence on the ICT services market's impact on the economic parameters of the countries. We proposed a statistical model of Pearson's r regression, based on the data of GDP values, CPI, and exchange rates of the 30 largest markets accounting for more than 90% of the ICT world market. The core results demonstrate stronger ICT services export and import correlation with GDP for economies with lower GDP per capita. The model shows a high success rate depending on variables. Based on the results obtained during modelling, propositions, and recommendations for countries with different socio-economic development levels were given.

Keywords: *ICT services market, economic growth, GDP, CPI, exchange rate.*

1. INTRODUCTION

The world market of Information Technology and Communication (ICT) services is of great importance for the economy's development, it is considered a major driver of economic growth which has been shown to have a positive impact on job creation and competitiveness. It also plays a critical role in enabling the digital transformation of businesses and governments, helping them to become more efficient, effective, and responsive to changing needs and demands. The world market of ITC services is a key driver of global trade and cross-border investment. As businesses and governments increasingly rely on digital technologies to conduct their operations, the demand for ITC services has become more global and more diversified, with companies and countries seeking out the best providers of services regardless of their location.

The major challenges faced by the world community, particularly in the context of the ongoing COVID-19 pandemic and the Russian full-scale invasion of Ukraine in 2022. The basic forecasts of the IMF are for growth to fall from 3,4 percent in 2022 to 2,8 percent in 2023, before rising slowly

and settling at 3,0 percent five years out––the lowest medium-term forecast in decades according to the IMF World Economic Outlook (2023). The forecast also shows that the GDP growth is accompanied by the need to bring down inflation, stabilize exchange rates, and define new authority policies for development.

The above-mentioned brings to the need to find out the level of determination of key economic indicators (GDP, CPI, and exchange rates) within the ICT services market. So, the basic idea of this paper is to study the impact of countries' participation in the ICT services market on the economies depending on different levels of development and to develop recommendations for the authorization policy. For the purpose of this study, it was suggested to consider economies' stances through their economic growth, consumer price indices (CPI), and exchange rates.

2. LITERATURE OVERVIEW

The definition of ICT services, their place, and their role in the modern digital economy has become the subject of research by a number of researchers. Thus, Bukht, and Hicks (2018) systematized the existing definitions and developed the structure of the global digital economy, examining ICT services as its central part.

Analysis of the impact of ICT and the digital economy on the economic and social development of countries is the subject of UNCTAD's annual Digital Economy Report (2021). The OECD Digital Economy Outlook (2020) considered the policies of member countries aimed at using the potential of ICT and the digital economy as driving force for innovation and sustainable development. The OECD researchers (2019) have systematized measures to stimulate the development of the ICT sector, which are practiced in OECD member countries and partner countries.

Gomes, Lopes, and Ferreira, (2022) suggests that the impact of the digital economy as measured by the technology proxy – internet, mobile phone, and fixed-broadband – on the economic growth of OECD countries depends on their level of development and the measures of the technologies that capture the digital economy. ICT positively influence the development of the economies of OECD countries and can be used as instruments by policymakers. These agents must implement policies that strengthen the physical and technological infrastructures of the ICT, the digital empowerment of human capital, and more significant social equity in accessing the ICT.

Some researchers consider high-income countries have achieved positive and significant economic development from high Internet and information penetration (Kurniawati, 2022). Also, Bahrini, and Qaffas (2019) suggest the middle-income countries have started to benefit from ICT. Except for fixed telephone, other information and communication technologies such as mobile phones, Internet usage, and broadband adoption are the main drivers of economic growth in developing countries. Goodwin (2022) made consideration that upper-middle-income countries get a greater effect from ICT investments on GDP growth than high-income countries.

Ishnazarov, Kasimova, Tosheva, and Isaeva (2021), also find that Internet users, mobile phone users, and Internet servers have inverted U-shaped association with GDP growth. The results of their paper suggest that innovative activities proxied by ICT and digitalization are instrumental for economic growth in the long run.

Kim, Estrada, Jinjarak, and Tian (2022) analyzed ICT and economic resilience during COVID-19. There was found empirical support for the positive impact of ICT. For a given COVID-19 infection rate, it was found that economies with better internet access showed greater resilience, defined as less in terms of economic growth. The obvious policy implication is that governments should invest more in ICT infrastructure to strengthen the resilience of their economies in the face of major shocks Kim, et al. (2022).

Roztocki, and Weistroffer (2016) proposed a broad framework linking ICT and socioeconomic development. The framework shows ICT, such as computing resources, Internet, mobile telephony, GPS, and Wi-Fi, enabling business activities and services, such as e-commerce, e-government,

online social networks, online teaching, and so on. The study shows that these business activities impact the socioeconomic development of individuals, organizations, and the country as a whole. These are manifested in individuals' education, health, income, quality of life, etc., as well as organizations' global competitiveness and resources, and the country's national product, political freedom, wealth, esteem, and labor market.

Another impact of ICT is suggested on GDP per worker (Waqar, 2015). It is observed that ICT does have a strong positive correlation and causal relationship with GDP per worker. In light of the results, the author recommends that economic policies must be tailored to support ICT development in countries.

It should be highlighted that a significant impact on the economic growth of investments in ICT towards specific regions implies whereby countries seek to enhance their economic growth, they need to implement specific policies that facilitate investment in the ICT (Soon, & Wee, 2011). Some authors (Bahrini & Qaffas, 2019) confirm that authorities in developing countries should increase investments in ICT infrastructure. To benefit from the ICT drivers of economic growth, policymakers should enact several important policies that permit the development of financial sectors, provide a more convenient regulatory and institutional environment, increase economic openness, prioritize the allocation of resources to the development of ICT infrastructure, and contain the negative effects of inflation and government consumption.

Some studies suggest that ICT has a positive impact on the countries' economic growth as well as other factors except for inflation which has a negative impact on economic growth for countries. The impact degree of ICT on economic growth is less than that of other countries, especially emerging and developed economies (Hodrab, Maitah, & Smutka, 2016).

Csonto, Huang, and Tovar Mora (2019) suggested that digitalization has a statistically significant negative effect on inflation in the short run and is a key driver of lower-trend inflation.

However, scientists have not yet fully investigated the impact of trade in ICT services on the economy of countries, taking into account the levels of their development and the features of national policies for the development of the ICT sector. So, this problem does not lose its relevance.

3. METHODS

Analyzing the impact of countries' participation in the ICT services market on economic growth, CPI, and exchange rates can be a complex and challenging task for several reasons:

1. Data availability. One of the main challenges is the availability of reliable and consistent data on the participation of countries in the ICT services market. This can include data on exports and imports of ICT services, the size of the ICT services industry in each country, and the level of ICT adoption in different sectors of the economy.

2. Causality and correlation. Another challenge is establishing a causal relationship between countries' participation in the ICT services market and economic growth, CPI, and exchange rates. While there may be a correlation between the two, establishing causality can be difficult due to the presence of other confounding factors that may influence these economic indicators.

3. Country-specific factors. The impact of ICT services on economic growth, CPI, and exchange rates can vary significantly across different countries due to factors such as the level of economic development, government policies, and the regulatory environment. Therefore, any analysis of the impact of countries' participation in the ICT services market on these indicators must take into account these country-specific factors.

4. Time lag. Finally, there can be a time lag between countries' participation in the ICT services market and the impact on economic growth, CPI, and exchange rates. For example, it may take several years for increased ICT adoption to translate into higher productivity and economic

growth.

5. In order to perform research, we did time series of historical data analysis for selected countries. The analysis process includes the following steps:

Data collection. We collected four major data series:

1. Information and Communication Technology Services Export (ICT Export) and Import (ICT Import). ICT services are an aggregation of computer and telecommunications services according to the BPM6 version. Data is collected from ICT, UNCTAD, WTO trade in services database based on Eurostat, International Monetary Fund, Organization for Economic Co-operation and Development (OECD) and relevant national statistical authorities' statistics.
2. Nominal Exchange Rates (ER). ER is calculated as an amount of national currency per 1 US Dollar. For the purpose of the paper the USA case is based on Euro (US Dollars per 1 Euro). Data is collected from IMF eLibrary-Data.
3. Gross Domestic Product (GDP). Data is collected from UN Conference on Trade and Development's UNCTADstat database.
4. Consumer Price Index (CPI). Data is collected from UN Conference on Trade and Development's UNCTADstat database.

Countries set defining. In order to define the countries (economies) analyzed in our study, the 30 largest markets accounting for more than 90% of the ICT Export for the last 3 years (2019, 2020, 2021) were chosen. Data series cover the 2005–2021 analyzed period. Some limitations were taken into account when implementing this stage. Due to the absence of data, ICT export and import data for Ireland is presented with the 2008–2021 series, for the Netherlands is presented with 2010–2021 series, for France is presented with the 2008–2021 series, for Spain is presented with 2012–2021 series, for the United Arab Emirates is presented with 2014–2021 series.
Data preparation. After data collection, it was normalized to make all indices comparable. For this reason, each data for a certain market is transformed into yearly percentage change (YPG) to demonstrate the annual growth rate according to the equation:

$$YPC_{i+1} = \frac{x_{i+1}}{x_i} \tag{1}$$

We applied Pearson's method in searching for correlations between data sets (Nettleton, 2014). This function is formalized according to the equation:

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}} \tag{2}$$

In formula (2) $x \in$ Array1 and $y \in$ Array2. Array1 refers to GDP, ER or CPI, while Array2 refers to ICT Export or Import. Furthermore, $\bar{x}$ and $\bar{y}$ are mean values of Array1 and Array2 respectively, and can be formalized according to the equation:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i \tag{3}$$

Another method we have utilized is multiple linear regression. The multiple linear regression method simply aims to predict the outcome of a response variable. The equation used is the next one:

$$y_i = b_0 + b_1 x_{i1} + b_2 x_{i2} + \cdots + b_p x_{ip} + \epsilon \tag{4}$$

where, for i=n observations: y_i = dependent variable, x_i = explanatory variables, b_0 = y-intercept (constant term), b_p = slope coefficients for each explanatory variable, $\in$ = the model's error term (also known as the residuals).

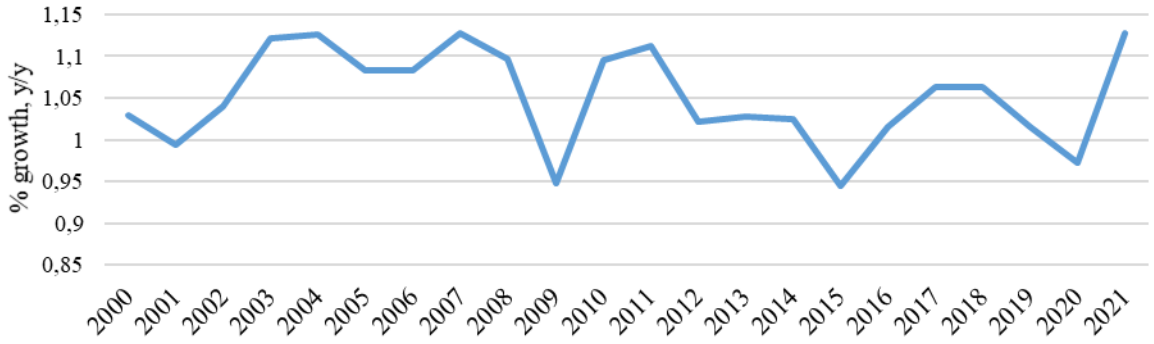
Referring to the multiple linear regression equation above, in our example for GDP as dependent variable: y_i = dependent variable – GDP, x_{i1}= ICT Export, x_{i2}= ICT Import, x_{i3}= CPI, x_{i4}= ER; for CPI as dependent variable: y_i = dependent variable – CPI, x_{i1}= ICT export, x_{i2}= ICT Import, x_{i3}= GDP, x_{i4}= ER; for ER as dependent variable: y_i = dependent variable – ER, x_{i1}= ICT Export, x_{i2}= ICT import, x_{i3}= CPI, x_{i4}= ER

Using Pearson's method and multiple linear regression, estimates of the parameters of the regression equation that were obtained are features of a particular statistical observation. To assess the statistical significance of the regression and correlation coefficients, we apply the Student's t-test and the confidence intervals for each of the calculated indicators. If the actual value of the t-criterion is less than the tabular one (in absolute value), then there is no reason to reject the main hypothesis.

4. RESULTS

Economic growth, to which the policy of state authorities is directed, is the basis of the growth of the population's well-being. Analysis of global GDP growth indicators shows a decline in economic activity from 2010 to the present. If in the period from 2000 to 2008, the average growth rate of global GDP was 7,81%, then from 2010 to 2021 the growth rate decreased to 4,05% per year (figure 1). According to the IMF World Economic Outlook of April 2023, the forecast is for growth to be 2,8 percent in 2023, before rising slowly and settling at 3,0 percent five years out, which is the lowest medium-term forecast in decades. Moreover, advanced economies are expected to see an especially pronounced growth slowdown, from 2,7 percent in 2022 to 1,3 percent in 2023. In a plausible alternative scenario with further financial sector stress, global growth declines to about 2,5 percent in 2023 – the weakest growth since the global downturn of 2001, barring the initial COVID-19 crisis in 2020 and during the global financial crisis in 2009 – with advanced economy growth falling below 1 percent.

Figure 1. The dynamics of global GDP growth in 2000-2021.



Source: Author's calculations based on UNCTAD.

Another issue for policymakers is to stabilize the inflation rate. According to the IMF World Economic Outlook (2023), this economic situation reflects the tight policy stances needed to bring down inflation, the fallout from the recent deterioration in financial conditions, the ongoing war in Ukraine, and growing geoeconomic fragmentation. Global headline inflation is set to fall from 8,7 percent in 2022 to 7,0 percent in 2023 on the back of lower commodity prices, but underlying (core) inflation is likely to decline more slowly. Inflation's return to target is unlikely before 2025 in most cases. Once inflation rates are back to targets, deeper structural drivers will likely reduce

interest rates toward their pre-pandemic levels.

The GDP decline and rise of inflation lead to trade imbalances, especially for unstable countries with low diversification of trade export or share of high-value goods and services. To overcome trade imbalances, exchange rates, need to be in equilibrium. For example, if one country's currency is undervalued relative to another country's currency, the first country may find it easier to export goods to the second country, while the second country may struggle to compete.

Based on the above-mentioned, we consider the GDP, CPI, and exchange rate relevant for the paper's purpose analysis.

According to the Balance of Payments and International Investment Position Manual (2009) Sixth Edition (BPM6) computer and telecommunication services are defined in terms of the nature of the service, not the method of delivery.

ICT services include:

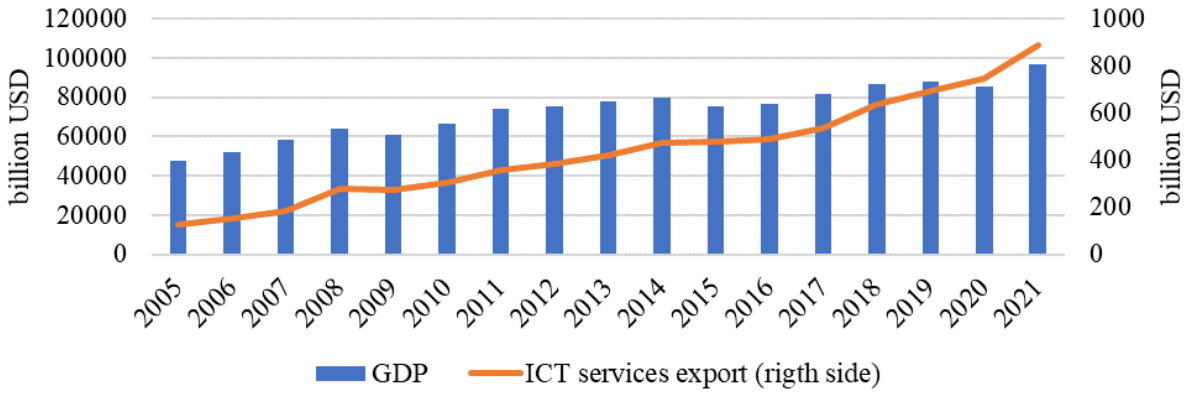
1. Telecommunications services. Telecommunications services encompass the broadcast or transmission of sound, images, data, or other information by telephone, telex, telegram, radio and television cable transmission, radio and television satellite, electronic mail, facsimile, and so forth, including business network services, teleconferencing, and support services. They do not include the value of the information transported. Also included are mobile telecommunications services, Internet backbone services, and online access services, including provision of access to the Internet. Excluded are installation services for telephone network equipment (included in construction) and database services (included in information services).

2. Computer services. Computer services consist of hardware- and software-related services and data-processing services.

3. Information services. Information services include news agency services, such as the provision of news, photographs, and feature articles to the media. Other information provision services include database services – database conception, data storage, and the dissemination of data and databases (including directories and mailing lists), both online and through magnetic, optical, or printed media; and web search portals (search engine services that find Internet addresses for clients who input keyword queries). Also included are direct nonbulk subscriptions to newspapers and periodicals, whether by mail, electronic transmission, or other means; other online content provision services; and library and archive services. (Bulk newspapers and periodicals are included under general merchandise.) Downloaded content that is not software (included in computer services) or audio and video (included in audiovisual and related services) is included in information services.

The global ICT services market has experienced rapid growth in recent years, driven by the increasing adoption of digital technologies and the growing demand for IT services across various industries. The global ICT services market is expected to reach $1.3 trillion by 2023, growing at a CAGR of 7,9% (Moore, J., 2022). While the global GDP has grown to 96,241 trillion USD in 2021 or 101,63% from 2005 to 2021, the ICT export has grown to 889,77 billion USD in 2021 or 613,47% from 2005 to 2021 (figure 2).

Figure 2. The dynamics of the global GDP and ICT services export from 2005 to 2021.



Source: Author's calculations based on UNCTAD.

The ICT services market can be broadly categorized into two segments: professional services and managed services. Professional services include IT consulting, system integration, software development, and training services, while managed services include infrastructure management, network management, and security management services. The professional services segment dominates the global ICT services market, accounting for the majority of the market share.

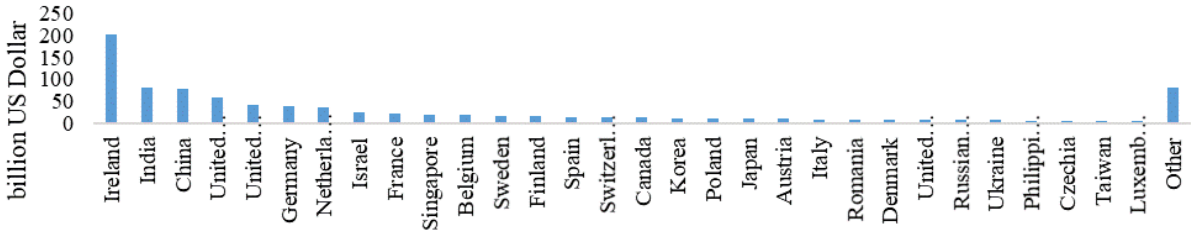
The Asia Pacific region is expected to be the fastest-growing market for ICT services, driven by the increasing adoption of digital technologies in emerging economies such as China, India, and Indonesia. North America and Europe are also significant markets for ICT services, due to the presence of several multinational corporations and the high level of technological sophistication in these regions.

The ICT services market is highly competitive, with several multinational corporations and smaller firms vying for market share. Major players in the global ICT services market include IBM, Accenture, HP Enterprise, Fujitsu, TCS, Capgemini, and Infosys, among others. These companies compete on the basis of service quality, pricing, and innovation, among other factors.

One of the key trends in the global ICT services market is the growing demand for cloud-based services, as more companies seek to leverage the benefits of cloud computing for their IT needs. The emergence of new technologies such as artificial intelligence, machine learning, and the Internet of Things (IoT) is also expected to drive growth in the global ICT services market in the coming years.

The global ICT market has been demonstrating rapid growth during the last years. Gross ICT export reached 889,77 billion USD in 2021 which is 82,18% more than in 2016 and 149,49% more than in 2011. The best exporters for 2016-2021 analyzed period are Ireland (201,24 billion USD or 209,21% growth), India (82,03 billion USD or 52,25%), China (76,99 billion USD or 190,2% growth), USA (59,80 billion USD or 38,67% growth), UK (42,22 billion USD or 47,31% growth). Significant growth is recorded by Saudi Arabia (436,26%), Lithuania (344,41%), Estonia (261,01%), Uruguay (216,11%), Korea (213,20%), Ukraine (207,66%) and others (figure 3).

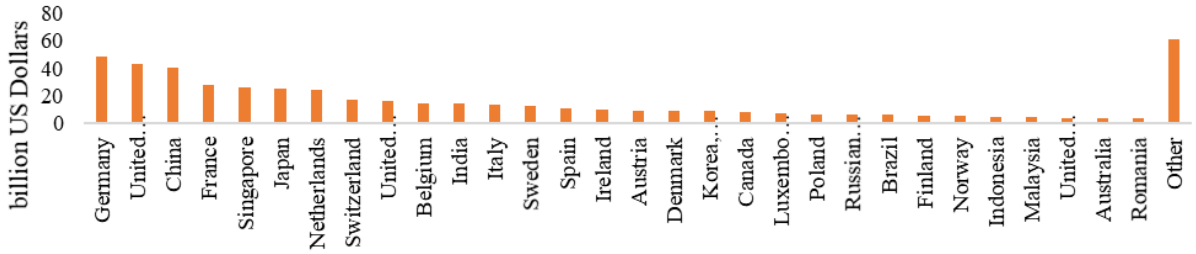
Figure 3. The ICT services export in 2021 by countries.



Source: Author's calculations based on UNCTAD.

Gross ICT import reached 500,53 billion USD in 2021 which is 60,76% more than in 2016 and 130,14% more than in 2011. The best importers for the 2016-2021 analyzed period are Germany (48,50 billion USD or 44,71% growth), USA (43,14 billion USD or 8,62% growth), China (40,11 billion USD or 218,89% growth), France (28,09 billion USD or 44,82% growth), Singapore (26,53 billion USD or 107,70% growth). Significant growth is recorded by Estonia (644,47%), India (202,82%), Ireland (241,79%), Korea (228,08%), Philippines (217,59%), and others (figure 4).

Figure 4. The ICT services import in 2021 by countries.



Source: Author's calculations based on UNCTAD.

The correlation matrix (table 1) is built on the binary coupling of Array1 with Array2 and correlation indexes are calculated on the basis of Pearson's function From the correlation matrix, the GDP and ICT Export correlations are moderate (from 0,3 to 0,5) in 8 economies, and it is highly correlated in the other 8 economies (0,5 and more). The highest correlation is detected in Spain (0,73). The CPI and ICT Export correlation is moderate (from 0,3 to 0,5) only in 2 economies – Spain and Canada. The highest correlation is detected in Germany (0,54). The ER and ICT Export correlation is moderate (from 0,3 to 0,5) in 7 economies, and it is highly correlated in other 6 economies (0,5 and more). The highest correlation is detected in Russian Federation (0,62).

From the correlation matrix, the GDP and ICT Import correlations are moderate (from 0,3 to 0,5) in 4 economies, and it is highly correlated in the other 6 economies (0,5 and more). The highest correlation is detected in France (0,67). The CPI and ICT Import correlation is moderate (from 0,3 to 0,5) in 1 economy – the USA, and it is highly correlated in 2 economies (0,5 and more) – Spain and Japan. The ER and ICT Import correlations are moderate (from 0,3 to 0,5) in 8 economies, and it is highly correlated in the other 4 economies (0,5 and more). The highest correlation is detected in France (0,61).

Table 1. Binary correlation coefficients.

№	Countries/ Correlation Indexes	ICT Export/ GDP	ICT Export/ CPI	ICT Export/ ER	ICT Import/ GDP	ICT Import/ CPI	ICT Import/ ER	ICT Export/ ICT Import
1.	Ireland	0,51*	0,14	0,36*	0,43*	0,03	0,14*	0,48*
2.	India	0,31*	0,01	0,24	0,23	0,23	0,37*	0,31*
3.	China	0,38*	0,13	0,26*	0,04	0,11	0,06	0,00002
4.	United States of America	0,06	0,19	0,05	0,25*	0,30*	0,13	0,34*
5.	United Kingdom	0,48*	0,05	0,02	0,20	0,02	0,28*	0,34*
6.	Germany	0,33*	0,54*	0,21	0,27	0,20*	0,10	0,07
7.	Netherlands	0,03	0,08	0,01	0,35	0,16	0,42*	0,57*
8.	Israel	0,02	0,01	0,02	0,04	0,05	0,02	0,29*
9.	France	0,57*	0,21*	0,50	0,67*	0,20	0,61*	0,72*
10.	Singapore	0,15	0,19	0,50*	0,07	0,23	0,34*	0,16
11.	Belgium	0,25*	0,05	0,59*	0,23	0,05	0,55*	0,91*
12.	Sweden	0,43	0,01	0,34*	0,45*	0,0001	0,45*	0,48*
13.	Finland	0,00	0,28*	0,12	0,20	0,04	0,07	0,06
14.	Spain	0,73*	0,41	0,17	0,54*	0,50*	0,56*	0,36
15.	Switzerland	0,25*	0,05	0,19	0,22	0,05	0,25*	0,36
16.	Canada	0,39*	0,45*	0,43*	0,28*	0,09	0,42*	0,63*
17.	Korea	0,11	0,001	0,27*	0,02	0,003	0,11	0,87*
18.	Poland	0,62*	0,00	0,58*	0,50*	0,001	0,49*	0,70*
19.	Japan	0,0004	0,01	0,00	0,10	0,62*	0,12	0,0001
20.	Austria	0,06	0,00	0,03	0,18	0,02	0,12	0,92*
21.	Italy	0,53*	0,02	0,41*	0,27*	0,00	0,15	0,67*
22.	Romania	0,44*	0,01	0,33*	0,19	0,01	0,04	0,36*
23.	Denmark	0,19	0,01	0,19	0,48*	0,06	0,35*	0,001
24.	United Arab Emirates	0,72*	0,10	0,02	0,60*	0,03	0,01	0,61*
25.	Russian Federation	0,59*	0,00	0,62*	0,50*	0,04	0,39*	0,65*
26.	Ukraine	0,39*	0,19	0,35*	0,22	0,00002	0,15	0,09
27.	Philippines	0,20	0,01	0,08	0,02	0,10	0,01	0,21
28.	Czechia	0,52*	0,29*	0,56*	0,53*	0,19	0,56*	0,12
29	Taiwan	0,17	0,05	0,26*	0,17	0,02	0,21	0,09
30	Luxembourg	0,27*	0,20	0,31*	0,07	0,03	0,16	0,65*

* - indicates significance at the 5% level

Source: Author's calculation.

In terms of the research, an analysis of correlation coefficients was performed according to socioeconomic level of countries in 2021 (table 2). We distinguished 4 different groups of economies: GDP per capita up to 20 000 USD (1st group), from 20 000 to 40 000 USD (2nd group), per capita from 40 000 to 60 000 USD (3rd group) and GDP per capita from 60 000 USD, and more (4th group). Our analysis indicates a stronger average ICT Export/GDP correlation for economies with low GDP per capita: 0,42 for the 1st group, 0,34, 0,3, and 0,24 for the 2nd, 3rd and 4th respectively. A

similar picture belongs to the average ICT Export/ER: 0,35 for the 1st group, 0,28, 0,21, and 0,27 for the 2nd, 3rd and 4th respectively. This correlation demonstrates stronger dependence of GDP growth on ICT export for lower GDP countries, which is accompanied by national currency depreciation. When a national currency depreciates, domestic companies obtain price leverage for international clients, which leads to higher currency flow and, eventually, GDP growth. The average ICT Export/CPI correlation demonstrates weak dependence for all 4 groups with less than 0,16.

Table 2. Average binary correlation coefficients with ICT Export for different GDP per capita groups of economies.

GDP per capita, USD	Average ICT Export/GDP correlation	Average ICT Export/ CPI correlation	Average ICT Export/ ER correlation	Economies
up to 20000	0,42	0,05	0,35	7 (India, China, Poland, Romania, Russian Federation, Ukraine, Philippines)
20000-40000	0,34	0,13	0,28	6 (Spain, Korea, Japan, Italy, Czechia, Taiwan)
40000-60000	0,30	0,16	0,21	11 (United Kingdom, Germany, the Netherlands, Israel, France, Belgium, Sweden, Finland, Canada, Austria, United Arab Emirates)
above 60000	0,24	0,13	0,27	6 (Ireland, United States of America, Singapore, Switzerland, Denmark, Luxemburg)

Source: Author's calculation.

As for ICT Import correlation with dependent variables our analysis indicates stronger average ICT Import/GDP correlation for economies with 40000-60000 GDP per capita: 0,31 for the 3rd group, 0,27, 0,25 and 0,24 for the 2nd, 4th and 1st group respectively. The average ICT Import/ER remains in 0,23-0,29 diapason. The average ICT Import/CPI correlation demonstrates weak dependence for all 4 groups with less than 0,22 (table 3).

Table 3. Average binary correlation coefficients with ICT Import for different GDP per capita groups of economies.

GDP per capita, USDs	Average ICT Import/GDP correlation	Average ICT Import/ CPI correlation	Average ICT Import/ ER correlation	Economies
up to 20000	0,24	0,07	0,22	7 (India, China, Poland, Romania, Russian Federation, Ukraine, Philippines)
20000-40000	0,27	0,22	0,29	6 (Spain, Korea, Japan, Italy, Czechia, Taiwan)
40000-60000	0,31	0,08	0,28	11 (United Kingdom, Germany, the Netherlands, Israel, France, Belgium, Sweden, Finland, Canada, Austria, United Arab Emirates)
above 60000	0,25	0,12	0,23	6 (Ireland, United States of America, Singapore, Switzerland, Denmark, Luxemburg)

Source: Author's calculation.

We have utilized multiple linear regression for all data sets and for different groups depending on GDP rep capita. Multiple linear regression equation for GDP for economies all data set is:

$$GDP = 1,82 + 0,036 \times ICT\ Export + 0,023 \times ICT\ Import + 0,01 \times CPI - 0,86 \times ER \quad (5)$$

R Square equals 0,587, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for ICT Export, CPI, and ER. Multiple linear regression equation for GDP economies in GDP per capita up to 20 000 US Dollars group data set is:

$$GDP = 1{,}73 + 0{,}198 \times \text{ICT Export} + 0{,}06 \times \text{ICT Import} + 0{,}009 \times \text{CPI} - 0{,}98 \times \text{ER} \quad (6)$$

R Square equals 0,749, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for ICT Export, CPI, and ER. Multiple linear regression equation for GDP for economies in GDP per capita up from 20 000 to 40 000 US Dollars group data set is:

$$GDP = 1{,}89 + 0{,}047 \times \text{ICT Export} - 0{,}04 \times \text{ICT Import} + 0{,}014 \times \text{CPI} - 0{,}89 \times \text{ER} \quad (7)$$

R Square equals 0,824, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for CPI, and ER. Analysis demonstrates a high impact of the ICT market on economic development. A 1% change in ICT Export leads to 0,036% GDP in countries covering 90% of the ICT market.
Multiple linear regression equation for GDP for economies in GDP per capita up from 40 000 to 60 000 US Dollars group data set is:

$$GDP = 1{,}6 + 0{,}006 \times \text{ICT Export} - 0{,}017 \times \text{ICT Import} + 0{,}017 \times \text{CPI} - 0{,}65 \times \text{ER} \quad (8)$$

R Square equals 0,512, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for CPI, and ER. Multiple linear regression equation for GDP for economies in GDP per capita above 60 000 US Dollars group data set is:

$$GDP = 1{,}63 + 0{,}003 \times \text{ICT Export} - 0{,}021 \times \text{ICT Import} + 0{,}017 \times \text{CPI} - 0{,}6 \times \text{ER} \quad (9)$$

R Square equals 0,48, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for CPI, and ER. Multiple linear regression equation for CPI for economies all data sets is:

$$CPI = -49{,}03 + 19{,}8 \times \text{GDP} + 1{,}2 \times \text{ICT Export} + 0{,}2 \times \text{ICT Import} + 28{,}9 \times \text{ER} \quad (10)$$

R Square equals 0331, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, and ER. Multiple linear regression equation for CPI for economies in GDP per capita up to 20 000 US Dollars group data set is:

$$CPI = -78{,}9 + 27{,}05 \times \text{GDP} - 0{,}95 \times \text{ICT Export} + 1{,}8 \times \text{ICT Import} + 52{,}6 \times \text{ER} \quad (11)$$

R Square equals 0,561, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, ER. For CPI for economies in GDP per capita from 20 000 to 40 000 US Dollars group, from 40 000 to 60 000 US Dollars group, above 60 000 US Dollars group R Square is less than 0,3 which indicates insignificance of the model.
Multiple linear regression equation for ER for economies all data sets is:

$$ER = 1{,}66 - 0{,}62 \times \text{GDP} - 0{,}016 \times \text{ICT Export} - 0{,}007 \times \text{ICT Import} + 0{,}01 \times \text{CPI} \quad (12)$$

R Square equals 0,624, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER economies in GDP per capita up to 20 000 US Dollars group data set is:

$$ER = 1,6 - 0,58 \times GDP + 0,03 \times ICT\ Export - 0,03 \times ICT\ Import + 0,01 \times CPI \quad (13)$$

R Square equals 0,801, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER for economies in GDP per capita up from 20 000 to 40 000 US Dollars group data set is:

$$ER = 1,89 - 0,86 \times GDP + 0,002 \times ICT\ Export - 0,023 \times ICT\ Import + 0,01 \times CPI \quad (14)$$

R Square equals 0,797, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER for economies in GDP per capita up from 40 000 to 60 000 US Dollars group data set is:

$$ER = 1,7 - 0,66 \times GDP - 0,026 \times ICT\ Export + 0,0003 \times ICT\ Import + 0,01 \times CPI \quad (15)$$

R Square equals 0,454, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER for economies in GDP per capita above 60 000 US Dollars group data set is:

$$ER = 1,54 - 0,54 \times GDP + 0,01 \times ICT\ Export + 0,007 \times ICT\ Import + 0,006 \times CPI \quad (16)$$

R Square equals 0,409, which demonstrates a moderate correlation. Model is significant at the 5% level. P-value is significant for GDP, CPI.

Results demonstrate stronger ICT Export and Import correlation with GDP for economies with lower GDP per capita, especially for group of countries up to 20 000 GDP per capita. A 1% change in ICT services export growth leads to 0,198% GDP in this group. According to the calculations, it can be assumed that countries that have just entered the ICT services market receive higher indicators of GDP economic growth due to the impact of IT on the structural transformation of other sectors of the economy and improving their efficiency as well as the efficiency of personnel. A further increase in the share of the ICT services market in GDP affects its growth, but at a slower pace. It is also worth assuming that due to the globalization of the ICT services market, the level of salaries of IT specialists has a more positive effect on countries with a low level of GDP per capita than on countries with an average and high level of GDP per capita. It also contributes to the improvement of the purchasing power of the population and the growth of countries' GDP.

Another hypothesis we proposed to research is to find out how GDP growth, CPI, and exchange rates correlations with ICT Export and import depend on the share of ICT Export and import in GDP (table 4). From one's point of view, the deeper share is, the stronger correlation should be. Like the previous analysis, it was stated with distinguishing different groups. As for the share of ICT Export to GDP, there were 3 groups: up to 1% (1st group), from 1% to 10% (2nd group), and above 10% (3rd group).

Table 4. Average Binary Correlation Coefficients with ICT Export for Different Share of ICT Export in GDP Levels.

ICT export share in GDP	Average ICT Export/GDP correlation	Average ICT Export/ CPI correlation	Average ICT Export/ ER correlation	Economies
up to 1%	0,31	0,16	0,30	10 (United States of America, China, Germany, France, Canada, Korea, Japan, Italy, Russian Federation, Taiwan)
1%-10%	0,32	0,10	0,25	19 (India, United Kingdom, the Netherlands, Israel, Singapore, Belgium, Sweden, Finland, Spain, Switzerland, Poland, Austria, Romania, Denmark, United Arab Emirates, Ukraine, Philippines, Czechia, Luxembourg)
above 10%	0,51	0,14	0,36	1 (Ireland)

Source: Author's calculation.

As it was expected, the analysis indicates a stronger average ICT Export/GDP correlation for economies with a high share of ICT Export in GDP: 0,31 for the 1st group, 0,32, 0,51 for the 2nd and 3rd respectively. The average ICT Export/CPI correlation demonstrates weak dependence for all 3 groups, with less than 0,16. As for average ICT Export/ER correlation, the moderate link is demonstrated by the group of up to 1% (0,3) and above 10% (0,36)

We have utilized the multiple linear regression for different groups depending on the share of ICT Export in GDP. Multiple linear regression equation for economies with share of ICT Export in GDP up to1% group data set is:

$$GDP = 1{,}869 + 0{,}125 \times \text{ICT Export} - 0{,}03 \times \text{ICT Import} + 0{,}011 \times \text{CPI} - 0{,}95 \times \text{ER} \quad (17)$$

R Square equals 0,6, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for ICT Export, CPI, and ER. Multiple linear regression equation for economies with share of ICT Export in GDP from 1% to 10% group data set is:

$$GDP = 1{,}83 + 0{,}018 \times \text{ICT Export} - 0{,}016 \times \text{ICT Import} + 0{,}01 \times \text{CPI} - 0{,}836 \times \text{ER} \quad (18)$$

R Square equals 0,621, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for CPI, and ER. Multiple linear regression equation for economies with share of ICT Export in GDP above 10% group data set is:

$$GDP = 1{,}123 + 0{,}326 \times \text{ICT Export} - 0{,}133 \times \text{ICT Import} + 0{,}02 \times \text{CPI} - 0{,}61 \times \text{ER} \quad (19)$$

R Square equals 0,684, which demonstrates a strong correlation. Model is significant at the 5% level. Multiple linear regression equation for CPI for economies with share of ICT Export in GDP from 1% to 10% group data set is:

$$CPI = -57{,}47 + 23{,}93 \times GDP + 1{,}26 \times \text{ICT Export} + 0{,}33 \times \text{ICT Import} + 32{,}7 \times \text{ER} \quad (20)$$

R Square equals 0,386, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, and ER.

Multiple linear regression equation for CPI for economies with share of ICT Export in GDP above 10% group data set is:

$$CPI = -8{,}095 + 8{,}53 \times GDP + 1{,}66 \times ICT\ Export - 1{,}94 \times ICT\ Import - 26{,}26 \times ER \quad (21)$$

R Square equals 0,335, which demonstrates a moderate correlation. Model is significant at the 5% level.
For CPI for economies share of ICT Export in GDP up to1% group data set R Square is less than 0,3 which indicates insignificance of the model.
Multiple linear regression equation for ER economies with share of ICT Export in GDP up to1% group data set is:

$$ER = 1{,}533 - 0{,}49 \times GDP - 0{,}04 \times ICT\ Export + 0{,}005 \times ICT\ Import + 0{,}007 \times CPI \quad (22)$$

R Square equals 0,56, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER economies with share of ICT Export in GDP from 1% to 10% group data set is:

$$ER = 1{,}751 - 0{,}7 \times GDP - 0{,}017 \times ICT\ Export + 0{,}013 \times ICT\ Import + 0{,}012 \times CPI \quad (23)$$

R Square equals 0,678, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER economies with share of ICT Export in GDP above 10% group data set is:

$$ER = 0{,}9 - 0{,}15 \times GDP + 0{,}21 \times ICT\ Export + 0{,}005 \times ICT\ Import - 0{,}0002 \times CPI \quad (24)$$

R Square equals 0,439, which demonstrates a moderate correlation. Model is significant at the 5% level.
Analysis confirms significant results for up to 1% share of ICT Export in GDP group of countries. A 1% change in ICT Export growth leads to 0,125% change in GDP. Results for ICT Import demonstrate insignificance. The other groups and results for ICT Import and ICT Export determinations with CPI and ER demonstrate insignificance.
As for the share of ICT Import to GDP there were 2 groups (table 5): up to 1% (1st group) and from 1% to 10% (2nd group).

Table 5. Average binary correlation coefficients with ICT Import for a different share of ICT Import in GDP.

ICT import share in GDP	Average ICT Import/GDP correlation	Average ICT Import/ CPI correlation	Average ICT Import/ ER correlation	Economies
up to 1%	0,26	0,15	0,23	16 (India, China, United States of America, United Kingdom, Israel, France, Spain, Canada, Korea, Japan, Italy, United Arab Emirates, Russian Federation, Ukraine, Philippines, Taiwan)
1%-10%	0,30	0,08	0,29	14 (Ireland, Germany, the Netherlands, Singapore, Belgium, Sweden, Finland, Switzerland, Poland, Austria, Romania, Denmark, Czechia, Luxembourg)

Source: Author's calculation.

The study shows a weak link between average ICT Import/CPI and ICT Import/ER correlations, with less than 0,3. The average ICT Import/GDP correlation is moderate 0,3 for the 1%-10%

analyzed group.
We have utilized the multiple linear regression for different groups depending on the share of ICT import in GDP. Multiple linear regression equation for GDP for economies with a share of ICT Import in GDP up to 1% group data set is:

$$GDP = 1{,}59 + 0{,}135 \times ICT\ Export + 0{,}02 \times ICT\ Import + 0{,}008 \times CPI - 0{,}727 \times ER \quad (25)$$

R Square equals 0,581, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for ICT Export, CPI, and ER. Multiple linear regression equation for GDP for economies with share of ICT Import in GDP above 10% group data set is:

$$GDP = 1{,}97 - 0{,}004 \times ICT\ Export - 0{,}027 \times ICT\ Import + 0{,}015 \times CPI - 0{,}98 \times ER \quad (26)$$

R Square equals 0,65, which demonstrates a strong correlation. Model is significant at the 5% level. The P-value is significant for CPI, and ER. Multiple linear regression equation for CPI for economies with share of ICT Import in GDP up to 1% group data set is:

$$CPI = -56{,}02 + 20{,}64 \times GDP + 1{,}96 \times ICT\ Export + 0{,}6 \times ICT\ Import + 34{,}04 \times ER \quad (27)$$

R Square equals 0,403, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, and ER.
For CPI for economies share of ICT Import in GDP from 1% to 10% group data set R Square is less than 0,3 which indicates insignificance of the model.
Multiple linear regression equation for ER for economies with share of ICT Import in GDP up to 1% group data set is:

$$ER = 1{,}66 - 0{,}63 \times GDP - 0{,}0003 \times ICT\ Export - 0{,}017 \times ICT\ Import - 0{,}01 \times CPI \quad (28)$$

R Square equals 0,637, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, and CPI. Multiple linear regression equation for ER for economies with share of ICT Import in GDP from 1% to 10% group data set is:

$$ER = 1{,}61 - 0{,}57 \times GDP - 0{,}002 \times ICT\ Export + 0{,}007 \times ICT\ Import + 0{,}005 \times CPI \quad (29)$$

R Square equals 0,604, which demonstrates a moderate correlation. Model is significant at the 5% level. The P-value is significant for GDP, ICT Export, and CPI.
Analysis confirms significant results and up to 1% share of ICT Import in GDP group of countries. A 1% change in ICT Export growth leads to 0,135% change in GDP. The other groups and results for ICT Import demonstrate insignificance.
As for exchange rate determination from the ICT services market, it was defined that a 1% change in ICT services export growth leads to an appreciation of national currency for 0,002% in the group of countries with a share of ICT import in GDP from 1% to 10%. The other groups and results for ICT Import and ICT Export demonstrate insignificance.

5. DISCUSSION

In this paper, estimations were made in order to evaluate the effect of the ICT services market (export and import) on the economic development of a certain set of countries.
It was offered to take the export and import of ICT services as the core variables, although investigations may be focused on different aspects of the ICT services market. It could be extended

with ICT investment, and ICT services domestic market of certain countries. Another direction in which this research could be further developed is ICT services regional market analysis. Besides ICT services, UNCTAD offers data on bilateral exports, imports, re-exports, and re-imports of ICT goods aggregated at the ICT goods category level. The five ICT goods categories are defined according to the OECD's Guide on Measuring the Information Society 2011. The definition has been adapted to HS 2012 and HS 2017 in the UNCTAD ICT4D technical notes 2 and 10 referenced below:

- computers and peripheral equipment
- communication equipment
- consumer electronic equipment
- electronic components
- miscellaneous

The ICT services market has been changing and developing financial services, insurance, intellectual property services, personal, cultural, and government services. This gradually increases the scope of further research on defining of ICT services market impact on the above-mentioned categories. This idea is based on the concept of potentially ICT-enabled services as developed by s in a report of the United Nations Statistical Commission (2016).

Significant consideration should be added to the indicators of economic development. Except for GDP, CPI, and exchange rate, future directions could be linked with socioeconomic country development indicators, such as investment, salary, and product efficiency. Another control variable could be added for multiple linear regression. Some of them are trade openness, capital controls, level of democracy, and IT infrastructure development.

6. CONCLUSION

The purpose of this paper is to analyze the impact of countries' participation in the ICT services market on their economic growth, CPI, and exchange rates.

The analysis of studies demonstrates that the impact of trade in ICT services on the economy of countries has not been yet fully investigated, taking into account the levels of their development and the features of national policies for the development of the ICT sector.

In order to perform research, we did time series of historical data analysis for 2005-2021 analyzed period for selected countries, covering more than 90% of ICT services market accounted in export. After Data collection, countries set defining and data preparation Pearson's method in searching for correlations between data sets and multiple linear regression in predicting the outcome of a response variable were applied.

From the Pearson's binary correlation coefficients matrix, the GDP/ICT services export, exchange rate/ICT services export, GDP/ICT services import, CPI/ICT services import demonstrate moderate and high correlations. CPI/ICT services export and ER/ICT services import correlations are moderate.

According to multiple linear regression analysis a 1% change in ICT services export growth leads to 0,036% GDP growth in countries covering 90% of the ICT market. Results demonstrate stronger ICT services export and import correlation with GDP for economies with lower GDP per capita, especially for group of countries up to 20 000 GDP per capita. A 1% change in ICT services export growth leads to 0,198% GDP in this group. According to multiple linear regression analysis the ICT market impact confirms significant results for up to 1% share of ICT services export in GDP and up to 1% share of ICT services import in GDP group. A 1% change in ICT services export growth leads to 0,125% and 0,135% GDP growth in these groups respectively. As for exchange rate determination from the ICT services market, it was defined that a 1% change in ICT services export growth leads to an appreciation of national currency for 0,002% in the group of countries with a share of ICT import in GDP from 1% to 10%. The model shows a high success rate depending on variables.

The results of the research could be used by policymakers to formulate policies that promote the growth of the ITC sector and its positive impact on the economy. The factors that contribute to the growth of the ICT market and incorporate them into policy decisions can be identified. Another prospect of the research results is to define ways of resources allocation to the ICT sector, such as investing in research and development or providing tax incentives for companies operating in the sector. The research to determine the optimal level of investment in the ICT sector relative to other sectors of the economy in determining economic growth can be used.

Based on our results, we identify several areas for future research. While research has shown that the ICT services market has a positive impact on economic growth, further studies can investigate how the adoption of ICT systems affects productivity and innovation in different sectors of the economy. There is a growing interest in the role of ICT in promoting sustainable development, and future research can explore how the ICT market can be leveraged to address social and environmental challenges and support sustainable economic growth. Other prospects refer to the research examining the impact of the ICT market on income inequality and identifying policies that can promote more equitable growth, and opportunities for policymakers to promote more inclusive and sustainable trade.

REFERENCES

Bahrini, R., & Qaffas, A. A. (2019). Impact of information and communication technology on economic growth: Evidence from developing countries. *Economies*, 7(1), 21. https://doi.org/10.3390/economies7010021

Balance of Payments and International Investment Position Manual (2009). International Monetary Fund, 371. https://www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf

Balazs Csonto, Yuxuan Huang, Camilo E Tovar Mora, (2019). Is Digitalization Driving Domestic Inflation? *IMF Working Papers,* 271. https://doi.org/10.5089/9781513519944.001

Bukht, R., & Hicks, R. (2018). Definition, concept and measurement of the digital economy. *Bulletin of international organizations*, *13*(2), 143-172. https://doi.org/10.17323/1996-7845-2018-02-07

Digital Economy Report (2021). United Nations Conference on Trade and Development. https://unctad.org/system/files/official-document/der2021_en.pdf.

Gomes, S., Lopes, J. M., & Ferreira, L. (2022). The impact of the digital economy on economic growth: The case of OECD countries. *RAM. Revista de Administração Mackenzie*, *23*. https://doi.org/10.1590/1678-6971/eRAMD220029.en

Goodwin, T. (2022). The Impact of ICT Investments on GDP Growth and the Digital Divide between Nations. https://doi.org/10.13140/RG.2.2.35095.65445

Hodrab, R., Maitah, M., & Smutka, L. (2016). The effect of information and communication technology on economic growth: Arab world case. *International Journal of Economics and Financial Issues*, 6(2), 765-775. https://www.econjournals.com/index.php/ijefi/article/view/1935

Ishnazarov, A., Kasimova, N., Tosheva, S., & Isaeva, A. (2021). ICT and Economic Growth: Evidence from Cross-Country Growth Modeling. In The 5th International Conference on Future Networks & Distributed Systems, 668-671.

Kim, J., Estrada, G., Jinjarak, Y., Park, D., & Tian, S. (2022). ICT and Economic Resilience during COVID-19: Cross-Country Analysis. *Sustainability*, 14(22), 15109. https://doi.org/10.3390/su142215109

Kurniawati, M. A. (2022). Analysis of the impact of information communication technology on economic growth: empirical evidence from Asian countries. *Journal of Asian Business and Economic Studies,* 29(1), 2-18. https://doi.org/10.1108/JABES-07-2020-0082

Moore, J., (2022). IT services market size set to grow 7.9% in 2023. https://www.techtarget.com/searchitchannel/news/252526462/IT-services-market-size-set-to-grow-79-in-2023

Nettleton, D. (2014). Chapter 6-Selection of variables and factor derivation. Commercial data mining: Processing, analysis and modeling for predictive analytics projects. https://doi.org/10.1016/B978-0-12-416602-8.00006-6

OECD Digital Economy Outlook. (2020). Organisation for Economic Co-operation and Development. https://www.oecd-ilibrary.org/docserver/bcb82cff-en.pdf?expires=1681481612&id=id&accname=guest&checksum=F7171D3D613DDAF42494828482B0EDB7

OECD Guide to Measuring the Information Society. (2011). Organisation for Economic Co-operation and Development. https://read.oecd-ilibrary.org/science-and-technology/oecd-guide-to-measuring-the-information-society-2011_9789264113541-en#page1

Organisation for Economic Co-operation and Development. (2019). ICT investments in OECD countries and partner economies: Trends, policies and evaluation. OECD Publishing. https://doi.org/10.1787/bcb82cff-en

Roztocki, N., & Weistroffer, H. R. (2016). Conceptualizing and researching the adoption of ICT and the impact on socioeconomic development. *Information Technology for Development*, 22(4), 541-549. https://doi.org/10.1080/02681102.2016.1196097

Soon, K., & Wee, T. D. K. (2011). The role and Impact of ICT on Economy Growth. Available at SSRN 1766282. http://doi.org/10.2139/ssrn.1766282

UNCTADstat https://unctadstat.unctad.org/EN/

United Nations Statistical Commission Report. (2016). United Nations Statistical Commission. https://unstats.un.org/unsd/statcom/47th-session/documents/Report-on-the-47th-session-of-the-statistical-commission-E.pdf

Waqar, J. (2015). Impact of ICT on GDP per worker: A new approach using confidence in justice system as an instrument.: Evidence from 41 European countries 1996-2010. https://www.diva-portal.org/smash/get/diva2:931181/FULLTEXT01.pdf

World Economic Outlook (2023). International Monetary Fund. https://www.imf.org/en/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023