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Analysis of the Relationship Between Information Communication Technology (ICT) and Economic Growth: Empirical Evidence from European Countries

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Abstract:

Information and communication technology (ICT) are usually considered to be significant economic development factors in all nations, particularly developing ones. In our situation, this is also true for EU member states. The information and communication technology section includes businesses of service and manufacturing whose goods are mostly applied for information processing and communication, such as transmission and display, or allow this function. This work is an attempt to evaluate the association between ICT and economic growth in the EU for the years of 2000– 2020, through utilizing ARDL approach for exploring the short-run and long-run association between ICT services, ICT manufacturing industries, ICT employment and GDP. The findings reveal a long-run and significant connection among the response and explanatory variables.

Keyword: ICT manufacturing, ICT service, ICT employment, GDP, ARDL approach, EU.

الملخص:

تُعتبر تكنولوجيا المعلومات والاتصالات عادةً عوامل مهمة في التنمية الاقتصادية في جميع الدول، وخاصة النامية منها، يشمل قطاع تكنولوجيا المعلومات والاتصالات الشركات الخدمية والتصنيعية التي تستخدم منتجاتها بشكل أساسي في معالجة المعلومات والاتصال، مثل النقل والعرض، أو تتيح هذه الوظائف. تهدف هذه الدراسة إلى تقييم العلاقة بين تكنولوجيا المعلومات والاتصالات والنمو الاقتصادي في الاتحاد الأوروبي للفترة من عام 2000 إلى 2020، من خلال استخدام نهج (نموذج الانحدار الذاتي للفجوات الزمنية الموزعة) لاستكشاف العلاقة القصيرة والطويلة الأجل بين خدمات تكنولوجيا المعلومات والاتصالات، والصناعات التصنيعية لتكنولوجيا المعلومات والاتصالات، وتوظيف تكنولوجيا المعلومات والاتصالات والناتج المحلي الإجمالي. وتكشف النتائج عن وجود علاقة طويلة الأجل وذات دلالة إحصائية بين المتغيرات المستقلة والمتغيرات التابعة.

الكلمات المفتاحية: تكنولوجيا المعلومات والاتصالات فى التصنيع، تكنولوجيا المعلومات والاتصالات فى الخدمات، تكنولوجيا المعلومات والاتصالات فى توظيف ، الناتج المحلي الإجمالي، الاتحاد الاوروبى ،نهج ARDL .

پوختە:

تەکنەلۆژیای پەیوەندی و زانیاری بەفاکتەری گرنگی گەشەپێدانی ئابوری دادەنرێت لەهەمو وڵاتاندا بەشێوەیەکی گشتی، وە لەوڵاتانی تازە گەشەکردوو بەشێوەیەکی تایبەتی، ئەمە بۆ وڵاتانی ئەندام لە یەکێتی ئەورووپاش ڕاستە. تەکنەلۆژیای پەیوەندی و زانیاری ئەو کۆمپانیایانە دەگرێتەوە کە پیشەسازیان هەیەو خزمەت گوزاری پێشەکەش دەکەن ، کاڵاکانیان بە پرۆسەکردنی پەیوەندی و زانیاری پێشکەش دەکەن وەك گواستنەوەو گەیاندن، ئەم تۆژینەوەیە هەوڵێکە بۆهەڵسەنگاندنی پەیوەندی نێوان تەکنەلۆژیای پەیوەندی و زانیاری وگەشەی ئابوری لە یەکێتی ئەوروپا بۆساڵانی (2000-2020) لەڕێگەی بەکارهێنانی میتودی . بۆدۆزینەوەی پەیوەندی کورتخایەن و درێژخایەن لەنێوان تەکنەلۆژیای پەیوەندی و زانیاری (پیشەسازی و خزمەتگوزاری وداهەزراندن) و (گەشەی ئابوری). ئەنجامەکان ئەوە دەردەخەن کە پەیوەندیەکی درێژخایەن هەیە لە نێوان هەموگۆڕاوە ئابوریەکاندا . (ARDL)

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کلیلە وشە: تەکنەلۆژیای پەیوەندی و زانیاری(پیشەسازی)، تەکنەلۆژیای پەیوەندی و زانیاری(خزمەتگوزاری)، تەکنەلۆژیای پەیوەندی و زانیاری(دامەزراندن)،گەشەی ئابووری ، یەکێتی ئەورووپا،ARDL .

1. Introduction

Significant advancements in information and communication technology (ICT) over the last two decades have energized many researchers to investigate its economic implications, particularly the role of ICT in increasing efficiency, promoting financial development, and decreasing scarcity. The majority of studies in the field have concluded that information and communications technology has a significant impact on the financial and social development of nations because it has a positive impact on financial progress, efficiency, and employment. Correspondingly, intercontinental administrations such as the United Nations, the International Telecommunications Union, the Organization for Economic Cooperation and development (OECD), and the World Bank conclude that the ICT subdivision is a crucial driver of economic and sustainable development.

Furthermore, ICT is another word for information technology (IT) that emphasizes the character of joined communications and the amalgamation of tele-communications (telephone lines and wireless indications) and computers, in addition to critical enterprise software, middleware, storage, and cinematic, that enable manipulators to access, store, communicate, understand, and function information. Furthermore, ICT refers to the integration of audio-visual and telephone networks with computer networks via a single cabling or connection system. In addition, there are compelling economic reasons to integrate the telephone network with the computer network structure via a single integrated system of wiring, signal distribution, and control. ICT can have a positive impact on economic growth through a variety of significant channels, including: the production of goods and services (employment, ICT manufacturing industry, ICT services) within the ICT subdivision directly contributes to the formation of value-added possessions and services in the economy.

The service sector is at the present a significant constituent of the universal economy, predominantly in the advanced economies. According to evidence, over the last ten years, this subdivision has been responsible for roughly two-thirds of employment and value added in the majority of developed economies. As a result, greater attention has been paid in recent years to determining the driving force behind the prosperous development of (most) service manufacturing.

For much of the twentieth century, the development of production and trade in manufactured goods was the engine of prosperity in the EU. Nowadays, European countries are proud of their manufacturing inheritance and uphold a technical lead in various industries around the world. On the other hand, a nearer investigation of European economic development indicates that manufacturing has long taken a back seat to services industries with respect to output and employment. In the meantime, manufacturing companies have become more service focused, comparatively to continue inexpensively in a universal economy where more and more discommoded goods are being produced in emerging countries with lower production costs.

The EU economy is undergoing structural change. The last two decades have been characterized by two major tendencies. One is that manufacturing's role in the economy is dwindling. The other trend is that services, particularly business facilities, are accounting for a steadily increasing share of

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the EU economy. Both structural changes are linked to one another in a variety of ways. Because of the growing concentration in knowledge facilities, the manipulation of scale financial prudence for human wealth, the decreased costs of subcontracting in-house facilities, and the increasing tertiarisation of all manufacturing processes, including that of the manufacturing industry, the fabric of inter-industry associations is being interlaced in a modern technique. Several of these processes are heavily reliant on the business facilities industry. Many connections between the advancement of the business services industry and its role in financial development remain unexplored in the literature.

Consequently, the current paper focuses on the ICT manufacturing industries which include (Manufacture of electronic components and boards, Manufacture of computers and peripheral equipment, Manufacture of communication equipment, Manufacture of consumer electronics) and ICT services industries which include (Telecommunications, Computer and related activities). Moreover, a series of data collections referring to the period between (2000 to2020).

This Paper has the following objectives

1) To identify and describe the ICT channels.
2) To explain theoretically what is the connection between ICT and economic growth.
3) To determine the kind and amount of the association between ICT manufacturing, ICT service, employment and GDP of the EU during 2000- 2020.

The significance of the study comes from analyzing the (long run or short rune) relationship between the ICT and economic growth in EU. And also the information and communication technology and economic growth have being tow important factors of the growth and development of countries, because they are the means and the goal in the same for all modern economic policies.

The research problem can be formulated in the following question: How can ICT contribute to supporting economic growth? To what extent does the European economy benefit from the advantages of information technology in achieving economic growth? In order to achieve the objective of the study, ARDL approach was adopted and the secondary data during 2000-2020 were used.

Research hypothesis: ICT has great potential in achieving economic development by increasing production and productivity, creating jobs and stimulating investment.

The current study differs from previous studies in that the current study will focus on using a time series data approach. And also ARDL approach was adopted and the secondary data during 2000-2020 were used.

The current paper consists of five sections. Section one presents the introductory issues and section two provides explanations for the literature review related to the paper. Section three includes the used data, along with this the research methodology employed. Section four conveys the empirical results and discussions regarding these findings. Conclusions and summary given in section five.

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2.Literature review

Over the last 30 years, many scholars have investigated the influence of ICT on the economic development of countries, through a variety of procedures, time periods, and data sources, at both national and international panel of a nation's level.

In macroeconomic experiential research on ICT and progression, growth accounting and econometric studies are frequently used. Previous research focused primarily on industrialized economies. Several experimental studies in developed economies discovered that after the mid-1990s, ICT capital contributed significantly to economic evolution. (Oliner and Sichel, 2000) and (Jorgenson and Stiroh, 2000) for instance, concentrated on efficiency effect of information communication technology (ICT) in the USA and they long-established ICT's constructive involvement to the USA economic development. Inklaar et al. (2005) associated the ICT contributions of the USA and the EU-4 (Netherlands, Germany, France and the United Kingdom), illustrated that the US contributed more than the EU-4 between 1979 and 2000. With the publication of the EU KLEMS database (O'Mahony and Timmer, 2009), cross-country studies (Inklaar et al., 2008; Van Ark et al., 2008; Timmer et al., 2011; Strauss and Samkharadze, 2011) emerged, revealing important cross-country and sectorial heterogeneity in the involvement of ICT to labor efficiency advance in developed countries.

Stanley et al., (2018) conducted a meta-study about the connection between information and communication technology and economic progress in the advanced and developing worlds. They demonstrated that cell phones, the internet, and landlines all contribute to economic growth. According to a study conducted by Niebel et al., (2018) and Aghaei and Rezagholizadeh, (2017) information and communication technology, along with the *Organization of Islamic Cooperation* OIC, subsidizes commercial progression in both industrialized and developing countries. Using a sample of 59 countries from 1995 to 2010, Niebel et al., (2018) discovered no confirmation of bounding.

Over the last ten years, developed countries have conducted a number of macroeconomic studies on information and communication technology and productivity. Stiroh et al., (2002) discovered a startling undesirable productivity pliability of ICT assets in his IV regressions and mutual OLS using data from industrial engineering factories in the United States of America (USA) from the mid-1980s to the late 1990s. Using an informed data-set and a more comprehensive manufacturing itemization, Stiroh et al., (2005) discovered a positive coefficient of ICT resources in fabrication function regressions.

Another study conducted by Zuhdi et al., (2012) applied input-output technique to investigate the in non-industrialized (Indonesia) and advanced (Japan) states. Indonesian data were collected between 1990 and 1995, and again between 1990 and 2005. In Japan, data were collected from 1995 to 2005 and 2000 to 2005 and used for the analysis. Overall, the results presented that In Japan, but not in Indonesia, the ICT industry had a substantial positive effect on the economy. Ahmed and Ridzuan, (2013) also from 1975 to 2006 utilized ASEAN panel data. Both ASEAN5 and ASEAN3 reported that telecommunications investment had a statistically substantial positive influence on financial development.

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According to O'Mahony and Vecchi (2005), ICT negatively affects the output progress in the United Kingdom because of a lack of proficiency and investment of information and communication technology, but in the United States it has a positive effect. According to Lee et al., (2005), ICT influences economic development by a variety of channels, including FDI and spillover effects. According to the findings, in developing countries ICT investments does not have more effect because of low output improvements. Based on Ishida et al., (2014), ICT reduced energy depletion while not contributing to economic growth of Japan. The starring function of ICT in production rate and economic growth of Latin America is evaluated by Hofman et al. (2016). The overall findings indicated that the influence of ICT on economic development is minor.

Criscuolo and Waldron, (2003) discovered that using electronic commerce increased labor productivity by 7 to 9 percent based on a board of industrial corporations in the United Kingdom. Furthermore, Gretton et al., (2004) discovered that ICT increased annual MFP growth by 20% using firm-level information in Australia. According to an OECD report (OECD, 2004), ICT use is expected to be greater in the service industry than in fields of manufacturing.

Furthermore, there is significant intra-sectoral heterogeneity related to the information and communication technology concentration on the service sector. Financial services, for instance, are among the service industries that heavily rely on ICT in various countries (OECD, 2004). According to documents from the United Kingdom, monetary intermediation is much more reliant on network machinery as compared to the other facility segments (OECD, 2004).

Kurniawati (2020) mentioned that according to empirical data from Asian nations, high-income Asian nations have had positive and considerable economic development as a result of high internet penetration. This is in reference to the examination of the influence of information and communication technology on economic growth. The middle-income nations have also begun to gain from the Internet. The results demonstrate that the penetration of landlines and mobile phones is quite effective in fostering economic development in middle-income Asian nations.

Gretton (2004) confirmed a constructive influence of information and communication technology on MFP evolution in a variety of facility parts in Australia and the USA, providing additional confirmation associated with the services. Doms et al., (2004) argued that, in the United States the substitution of obsolete traders by refined facilities in the United States retail sector throughout the 1990s was dependent on the introduction of modern technologies and procedures, particularly ICT. In Finland, the influence of ICT on labor efficiency is smaller in manufacturing than in the service sector (Maliranta and Rouvinen, 2004).

Arvanitis et al., (2004) discovered a similar outcome in Switzerland, discovering that internet applications in the facility sector were more significant for the performance of service corporations than for industrial companies. This is demonstrated by the fact that many industrial workers do not have access to a desk job that includes a computer and internet access. Farooqui et al., (2005) discovered that the electronic selling`s impact on employment productivity found affirmative results in service businesses (i.e., a 4% increase in labor productivity) but negative results in industrial firms through a sample of manufacturing and service organizations. In both Germany and the Netherlands, Hempell et al., (2004) recognized the complementarity distinction between ICT conjecture and

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reconstruction in order to understand how in the service division, ICT positively affect the labor effectiveness.

Numerous research have looked at the connection between ICT and economic development, as this part has demonstrated. These results have different outcomes in various economics. The majority of these works have established a connection between ICT and GDP, while some have shown a negative association, others a positive correlation, and yet others claim there is no direct connection among the variables.

3. Data and Methodology

3.1 Data

For the empirical analysis of my research on the link between domestic product growth and ICT employment, ICT manufacturing and ICT service. I have employed ARDL approach, and the secondary data annually was used for the period of 2000-2020.The dependent variable in this paper was (GDP) that have been obtained from World Bank, which is accessible at: databank.worldbank.org. And also the independent variables were ICT employment, ICT manufacturing and ICT service. Which have been obtained from 2020 PREDICT Dataset, Eurostat and WEF as the main sources.

3.2 The model

Based on the economic theory, the link between ICT and economic growth is evaluated by estimating the following model:

$GDP = \beta_0 + \beta_1 ICT\ m + \beta_2 ICTs + \beta_3 ICT\ Em + D_1 + \varepsilon_t$ 1

Where:

GDP= growth domestic product

ICT m= stands for information and communication technology (manufacturing industries, productivity per person employed;

ICT s = stands for information and communication technology (service industries, productivity per person employed;

ICT Em = Employment;

D_1=Dummy variable, 2008 world financial crisis.

εt= is the error term (Or other variables affecting Economic growth)

To summarize, the following procedures are used in this study to calculate the connection between ICT and economic development in EU for the years 2010 to 2020:

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4. The Empirical Results

Table (1): Descriptive statistics

Variables	Minimum	Maximum	Mean	Std. Deviation
GDP (trillion)	7.26	16.24	13.24	2.88
ICT employment	115	161	131.14	14.58
ICT manufacturing	180	380	295.76	65.93
ICT service	150	216	188.04	21.65

As shown in the Table (1) the average of GDP and standard deviation is (13.24, 2.88) respectively as dependent variable. In independent variables, the mean and standard deviation are ICT manufacturing (295.76, 65.93) following by ICT service (188.04, 21.65) and for ICT employment is (131.44, 14.58) respectively**.**

2- Test of unit root (through augmented dickey fuller and person)

Table (2): ADF test

Variables		Level		1st difference	
		C	C&T	C	C&T
GDP	ADF (T-test)	-2.79683	-1.3484	-3.0586	-4.0864
	p- value	0.0765	0.8445	0.0473	0.0233
ICT employment	ADF (T-test)	1.4483	-1.0316	-2.6790	-3.4098
	p- value	0.9984	0.9160	0.0953	0.0798
ICT manufacturing	ADF (T-test)	-1.5592	-1.0316	-4.2305	-3.3095
	p- value	0.4840	0.9160	0.0044	0.1024
ICT service	ADF (T-test)	-5.8372	-2.7537	-3.4164	-5.5437
	p- value	0.0003	0.2312	0.0251	0.0023

C: intercept, T: trend

As shown in the Table (2) Due to the p-values for both being more than 0.05 and the non-stationary nature of GDP in the first differences, the level for intercept, trend, and intercept are non-stationary. In addition, the majority of factors were non-stationary at the level for (intercept, trend, and intercept) since this p-value for both was larger than 0.05, while it is stationary at the first distinction in (intercept, trend, and intercept) since the p-value for both was smaller than 0.05.

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Table (3): pp. Test

Variables	Level		First difference	
	Intercept	Intercept -Tend	Intercept	Intercept –trend
GDP	0.0041	0.8737	0.0475	0.0195
ICTe	0.9981	0.9968	0.0991	0.0798
ICTm	0.4627	0.7980	0.0015	0.0001
ICTs	0.4056	0.6606	0.0009	.0024

table (3) shows that GDP is stationary at the level for intercept and no stationary for intercept and trend since this p-value for both was larger than 0.05, while it is stationary at the first difference for (intercept, trend, and intercept) since the p-value for both was smaller than 0.05. Furthermore, in ICTs, ICTM and ICTe are not stationary in the level for (intercept, trend, and intercept) since both of their p-values were larger than 0.05, whereas in the first difference, their p-values were both smaller than 0.05 and they were stationary in the level for (intercept, trend, and intercept). The result shows that we can use ARDL since in first difference all factors are stationary.

3- Co-integration test

Table (4) Co-integration test

Trend assumption: No deterministic trend				
Series: GDP ICTE ICTM ICTS				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
GDP	0.735539	46.52580	40.17493	0.0101
ICTe	0.486193	21.25460	24.27596	0.1147
ICTm	0.286858	8.602348	12.32090	0.1936
ICTs	0.108349	2.178925	4.129906	0.1650
Test of Unrestricted Cointegration Rank (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
GDP	0.735539	25.27120	24.15921	0.0353
ICTe	0.486193	12.65225	17.79730	0.2511
ICTm	0.286858	6.423423	11.22480	0.3040
ICTs	0.108349	2.178925	4.129906	0.1650

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The trace statistics in Table (4) demonstrate that there are one co-integrating equations at the 5% levels, this indicates that the hypothesis that there is no co-integration among the series has been rejected (Mackin- non-Haug-Michelis, 1999). Likewise Eigenvalue also has one co-integrating equations at the (5%) levels. As a result, it is acknowledged that the variables have a long-term link, which is the alternate hypothesis.

4- Estimation by using ARDL

Table (5) Results of ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	0.831074	0.183475	4.529633	0.0019
LICTE	-1.383328	0.372087	-3.717751	0.0059
LICTM	0.847831	0.203562	4.164974	0.0031
LICTS(-1)	1.446743	0.620416	2.331892	0.0480
D1	0.406773	0.097227	4.183733	0.0031
C	-19.70268	4.973998	-3.961135	0.0042
R-squared	0.981698	Mean dependent var		2.615311
Adjusted R-squared	0.958820	S.D. dependent var		0.183518
S.E. of regression	0.037241	Akaike info criterion		-3.449918
Sum squared resid	0.011095	Schwarz criterion		-2.903138
Log likelihood	43.77423	Hannan-Quinn criter.		-3.357382
F-statistic	42.91091	Durbin-Watson stat		2.529590
Prob(F-statistic)	0.000007			

After establishing the long-run Co-integration relation, Table (5) shows the findings of ARDL model. According to table 5, there is a negative and significant effects ICT employment rate on GDP in EU. However, there is a statistically positive and substantial effect (ICTM, ICTS) on GDP in EU that is a 1% increase of (ICTM, ICTS) lead to increase the rate of GDP by (0.84%and 1.44%) respectively. Moreover, the world financial crisis of 2008(D1) also has a statistically positive and substantial impact on GDP in EU, that is one percent increase of D1 lead to increase of GDP by 0.40%.

Table 5 also shows the goodness of fit for the applied model: adjusted R squared and R-squared are quit great which indicate a good fit for the model, furthermore, S.E is small which is 0.03, the F-statistic is 42.91 and it is statistically significant.

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5- Problem tests

a- Jargu -Berra

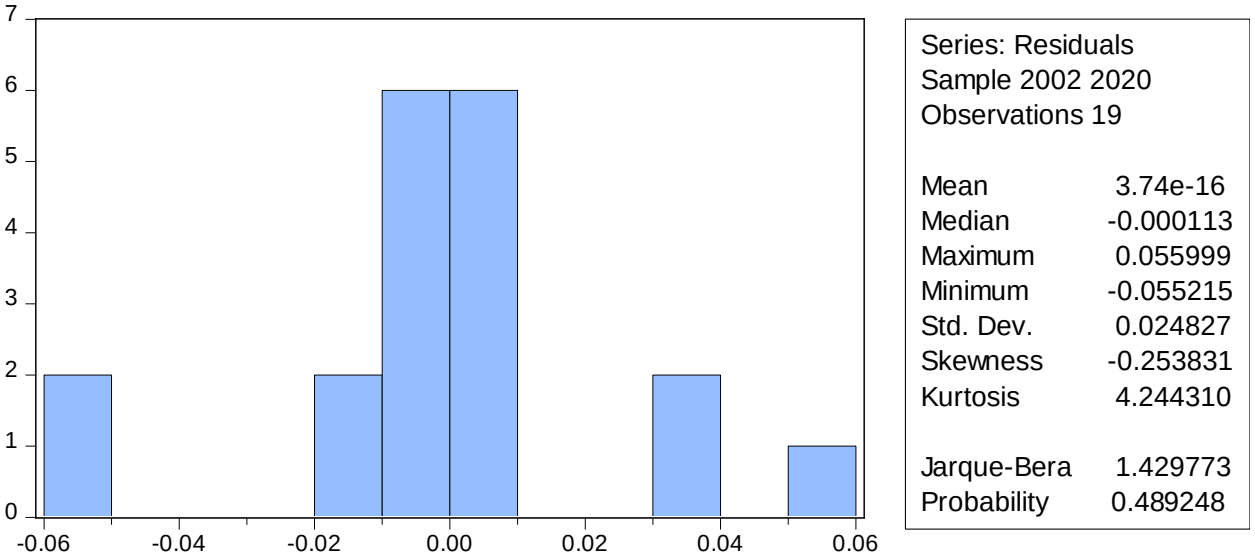

Figure (1) shows normal distribution of the residuals.

Figure (1) shows that the value of Jarque- Bera is 1.429873, and its probability is 0.489248, and that is higher than the standard alpha of 0.05. Residuals are thus regularly distributed.

b- VIF

Table (6) VIF test

Variance Inflation Factors
Date: 11/09/22 Time: 22:21
Sample: 2000 2020
Included observations: 20

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LGDP(-1)	0.005770	135.1398	1.331243
LICTE	0.034090	2892.234	1.331243
C	0.674028	2405.223	NA

The multicollinearity issue was not present in the data, as indicated in table (6), since the values of VIF in the center of all explanatory variables (LGDP, LICTE) were (1.331243, 1.331243) and less than 10. Therefore, the model doesn't have any significant multicollinearity.

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c- Correlation LM test

Test of Breusch-Godfrey Serial Correlation LM:

F-statistic	3.004866	Prob. F(3,5)	0.1335
Obs*R-squared	12.22135	Prob. Chi-Square(3)	0.0067

The table (7) clearly shows that the alternative hypothesis was accepted and the null hypothesis (no serial correlation exist in the model) was rejected since the p-value of the Obs*R-squared was smaller than the standard alpha 0.05. (a serial correlation exists in the model). In sum, the model has serial correlation.

d- Test of Heteroskedasticity

Test of Heteroskedasticity: Breusch-Pagan-Godfrey

F-statistic	1.756507	Prob. F(10,8)	0.2182
Obs*R-squared	13.05439	Prob. Chi-Square(10)	0.2206
Scaled explained SS	3.754236	Prob. Chi-Square(10)	0.9578

The table (8) makes it evident that the model does not have a heteroskedasticity issue since the prob. Chi squar (10) of Obs*R-squared was more than 0.05.

6- Diagnostics of Stability

A- Test of Ramsey RESET

Table (9) Test of ramsey RESET

Test of Ramsey RESET
Equation: UNTITLED
Specification: LGDP LGDP(-1) LICTE LICTM LICTS C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.519928	14	0.1508
F-statistic	2.310181	(1, 14)	0.1508

Based on the table (9) since the P Value of (F-statistic =2.310181), the estimated model`s equation shape is accurate that is more than the substantial level (%5).

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B- The model Stability: Estimates of Recursive, Test of Cusum

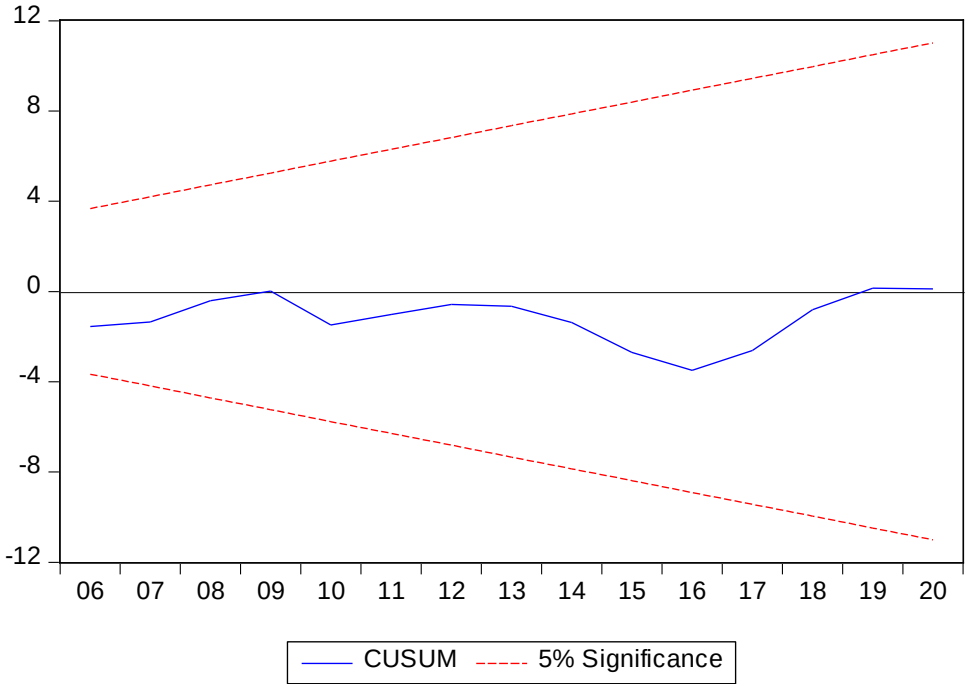

Figure (2) Test of Cusum

Figure (2) illustrates how the cusum test may be used to determine whether the coefficients of regression are consistently alerting. The alternative hypothesis is that factors are not stable, whereas the null hypothesis is that factors are stable. Because of this, the blue line is contained by the red lines, indicating that these factors will remain constant.

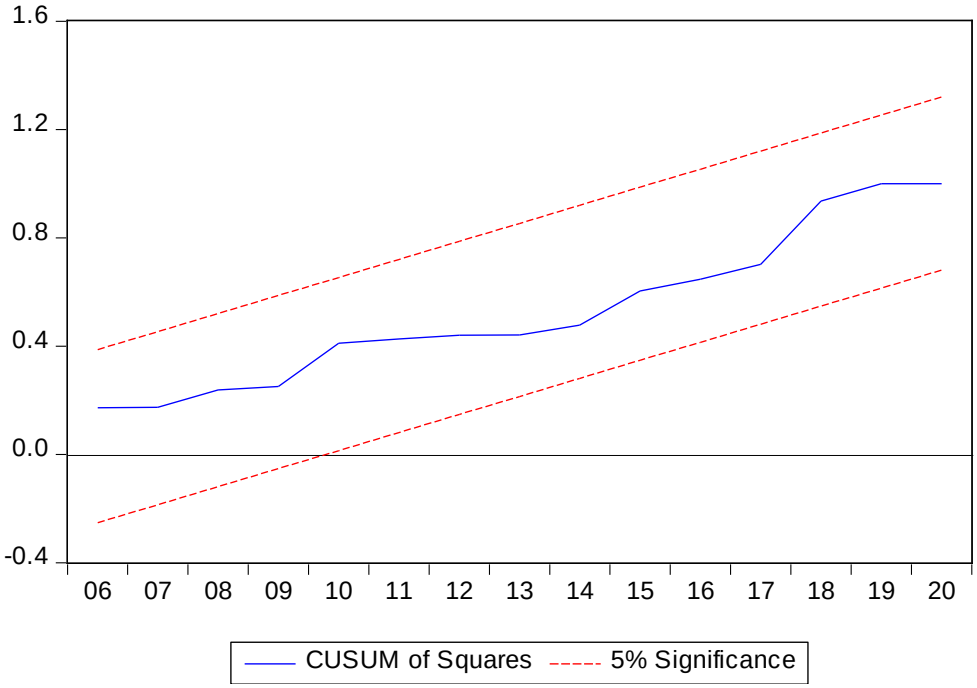

Figure (3), Cusum of square

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The cusum of square test, as shown in the figure (3), is helpful for demonstrating if the regression coefficients changing suddenly. The alternative hypothesis is that factors are unstable, whereas the null hypothesis is that factors are stable. In the case the blue line was within red lines in the first which means that the null hypothesis were accepted.

In summery we can say that ICT advancement and economic growth are truly **interrelated.** Economic development is also significantly influenced by TCT levels.

5. Conclusion

In today's increasingly digital global economy, the advancement of Information and Communication Technologies (ICT) is necessary for competitiveness of Europe. It is well known that ICT has a significant function in boosting economic improvement and acts as a strong engine for prosperous economies. This study analyzes the connections between various forms of innovation, such as ICT, and national economic development in the EU. The majority of scientific works confirm that information and communication technology has a favorable effect on development of economic. Contrarily, many studies indicate that this influence is minimal and even null, i.e., there are conflicting findings. Addressing the significance of ICT and growth connection this research investigates the relationship between ICT and economic growth applying secondary data sets for EU countries. The estimations is based on following econometrics ARDL approach and the secondary data during 2000-2020 were utilized. The findings reveals a long-run and substantial association between the response and explanatory variables.

Because there is not enough study on emerging economies, any prospective research on this topic would benefit from focusing on increasing the number of nations being investigated. Additionally, include ICT in Iraq was originally one of the study's goals in order to examine how political instability affected economic progress. Nevertheless, owing to a lack of data, this was disregarded. As soon as precise data is available, I want to analyze this matter in more detail.

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