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INVESTIGATING THE IMPACT OF IT DEVELOPMENT AND EDUCATION ON ECONOMIC DEVELOPMENT OF ASIAN COUNTRIES

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Abstract

This study presented an approach to investigate the impact of information technology development on economic growth. In this model, the sum of product trade flow logarithms, real business flow logarithm and an error correction term that has a normal distribution are considered. Asian countries are investigated in presented study. The results indicate that the information technology variable in the studied Asian countries, considering fixed effects model has negative effects on economic integration for Iran and India. Although, information technology in China has positive coefficient, but it is not significant; however, it is positive and significant in countries such as Japan, Taiwan, etc. In the least integrated squares model, all coefficients of the countries involving China, Saudi Arabia and Nepal are positive and from the point of view of being significant, the coefficient of information technology can be considered significant. Therefore, to reduce the created distance between Asian countries considering economic growth, as well as the reduction of this distance with European and American countries, the governments of these countries should invest in the field of information technology infrastructure and develop both hardware and software platforms, while allocating more financial resources in this regard.

Keywords: Information Technology, Economic Growth, Asian Countries, Economic Trades.

INTRODUCTION

Undoubtedly, creating a sustainable economic growth is considered as one of the main goals in economic policies of each country. IT has also been considered as a basic requirement not only in developed countries, but also in developing countries, especially in recent years. Investigating the role of information technology in advancing the economic goals of 50 countries in the 1990s illustrated its positive impact on economic growth and development. Therefore, the attention and emphasis of countries and governments in using the potential of this technology to increase the speed of economic growth and, consequently, to improve the quality of life of people has also increased significantly. Considering all electronic affairs and increasing speed of operations, this process can be done at a lower cost, which this rapid growth needs to be organized and people should be updated and culturalized in this regard [1]. The tremendous impact of technology growth on different levels and sectors of a country is undeniable, but what differentiates countries from each other is the type of strategy adopted around the growth of information technology. However, different policies of countries to use information technology can fundamentally change their

economic growth. Entrepreneurial activities in the context of information technology, as a driving force of economic growth have the potential for higher growth. In Asian countries, which are mainly developing countries, the choice of strategies and approaches based on information technology can play a vital role in the economic development of the country and it is believed that in these approaches, if more attention is allocated to the domestic use of information technology, it will contribute significantly to the economic development of the country [2].

Generally, many studies have been conducted on the relationship between information technology and economic growth, which will be reviewed and analyzed below.

Research background

In the reference [3], the aim is to examine the impact of investment in the information technology sector on the economic growth of developing countries in the period of 2003-2019. This research has been done by descriptive-scientific method and its statistical population includes all developing Asian countries. Research data were obtained from financial statements and analyzed using regression-based models. The results show that there is a significant relationship between investment in information technology development and economic growth in developing countries. From a theoretical and experimental point of view, many studies have examined the relationship between information technology development and economic growth. In this regard, the reference [4], using the data and information of member countries in the Organization of the Islamic Conference in the period of 1990 to 2017, has studied the effects of information technology on economic growth. In this regard, four criteria are considered involving the amount of capital inventory of stock market, the amount of market liquidity, turnover of transactions, and the amount of credits paid to the private sector. Findings from the implementation of the proposed model indicated the positive and significant effects of information technology development on the economic growth of the studied countries. The four criteria of financial development also showed a positive impact on economic growth at a significant level of 5%. One of the main growth factors in various countries is the development and growth of their financial markets in which information technology has facilitated and increased the growth rate by simplifying financial exchanges, especially in the last decade. In reference [5], the aim is to investigate the impact of stock exchange volume on economic growth by adjusting information technology in developing and developed countries between 2011-2016. The fitting approach of the proposed model is the panel data method, which is implemented using Eviews software. Findings show that information technology affects the relationship between stock exchange volume and economic growth in developed countries, which is due to the development of technology. Findings revealed that information technology affects the relationship between stock exchange volume and economic growth in developed countries, which is due to the development of technology. It has been suggested that developing countries should be equipped with information technology to achieve higher economic development. Also, the reference [6] has been done with the main purpose of studying the effect of information technology on economic growth in Asian and European countries. The importance of this research is that increasing the amount of investment in information technology, in the long run, has a high potential to increase production efficiency through changes in production organization, management and networking. Also, the relationships between various parameters such as GDP and information technology are addressed in this regard. The proposed research method in this research is the data panel model and EViews software is used for data analysis. Findings from the research indicate that information technology has a positive effect on the economic growth of the studied countries. In addition, there is a huge difference between the impact of information technology and its relationship with economic growth in Asian and European countries. Moreover, in the

reference [7], the causality between information technology and economic growth in developed countries is examined. In the empirical estimation of economic growth, data of investment in the IT sector and the GMM method have been used to examine and test the relationship. The findings showed a positive and significant two-way impact between economic growth and information technology in these countries. In the reference [8], the impact of information technology on economic growth is examined and compared according to Quah 2003 and Pojola 2002 studies. In estimating the empirical plan and model of economic growth of developing and developed countries, various data such as investments in the field of information technology, labor force, etc. have been used. The method used is the panel-data method. Findings from the implementation of this method showed the positive and significant impact of information technology on economic growth, which is even more obvious in developed countries. Also, the purpose of the reference [9] is to investigate the relationship between economic growth and income inequality under the influence of information technology. A static panel has been used to estimate the model presented in developing and developed countries. Findings indicate that for developed countries, the effect of IT criteria and income inequality on economic growth is positive and significant, but the effect of these two on each other is not significant. For developing countries, the effect of income inequality criterion on economic growth is negative and significant, but the IT criteria does not have a significant impact on economic growth in these countries. The interaction effect of information technology and income distribution on the economic growth of this group is negative and significant, which reduces the effect of information technology on growth and worsens the effect of income inequality on economic growth in these countries. In addition, the aim of the reference [10] is to examine the relationship between access to information technology and connection to information technology and its relationship with economic growth in all countries through multivariate linear regression and virtual variables. Findings have shown that in the three groups of countries, which includes 156 countries, the variable of connection to information technology has a significant and positive linear relationship with the dependent variable per capita GDP. In cases where both independent variables have a significant linear relationship with the dependent variable of the research. In cases where both independent variables have a significant linear relationship with the dependent variable of the research.

Studies regarding the impact of information technology on economic growth in developed countries have provided a positive and significant relationship between these two. Then, this relationship is also shown in some developing countries. However, considering its effects in countries that do not have the necessary competitive environment needs further discussion.

With the development and growth of information technology and its impact on economic growth, efficiency and income inequality, endogenous growth theories and the imbalanced relationship between income and economic growth are also affected. New theories state that people are different from each other in terms of assets and initial blessing, and this is due to differences in skills, on-the-job learning and knowledge overflow, which affect the relationship between income inequality and economic growth.

Also, not confirming of the positive relationship or discovering the negative relationship between information technology and economic growth in the 80s, and the report on the positive relationship between investment in information technology and various indicators of economic performance since the 90s, on the one hand, and the rapid discovery of this relationship in developed countries compared to developing countries on the other hand, indicate the necessity and importance of the essential but insufficient infrastructure for information technology to be effective in the economic growth of countries.

Problems of IT growth and development

Asian countries are generally developing countries. Developing countries face challenges and problems in the field of technology development and growth, which in order to enjoy the benefits of technology development, including economic growth, must first identify and solve these obstacles and problems.

The purpose of technology development is to strengthen capabilities, create technology and upgrade and improve its level in one country.

Technology development includes various stages, the most important of which are the following [11]:

Complete design of the product, system or creation of a superior new situation and also conditions.

Creation of designed samples

Experimental production at the micro level to achieve the desired results and use it at the macro level.

The most important problems and challenges of Asian countries in the field of technology development can be mentioned as follows:

Lack of favorable orientation to link industrial development approach and development and growth of innovative capabilities.

Lack of motivation to use existing technologies to improve the value of manufactured products.

Lack of legal indicators to evaluate and measure the amount of value created by technology.

Lack of understanding of the fact that the effective use of technologies imported from other countries requires the ability and ability to succeed in them.

Lack of attention to the fact that the growth of technology requires that the amount of their share and dominance increase systematically compared to modern technologies.

Lack of attention and efforts to eliminate deficiencies and obstacles related to the necessary legal infrastructure.

Lack of necessary laws and regulations in the field of standards and issues related to quality control.

Lack of a proper system for patent inventions or modern technologies.

Lack of continuous and stable communication between industry and research centers and the university.

Research method

Gravity Models have been used in most of the studies that have examined the factors affecting economic growth. In this article, the factor under consideration is information technology. The main problem with gravity-based methods is that they have no basis in microeconomics. Hence, they are not very practical. Therefore, in this paper, a method based on Anderson and van wincoop model is presented to investigate the impact of information technology development on economic growth.

This method is based on the hypotheses that will be mentioned below.

Hypothesis 1: The world economy has N regions and N products are assumed that each product belongs to a specific region.

Hypothesis 2: Consumers in every region, such as j, are faced with the expectations and preferences of a fixed elasticity of substitution, and by maximizing the desirability considering the budget constraint, we have a set of conditions that, by solving it, the nominal two-way business flow request is obtained from i to j, (X_ij):

$$X_{ij} = \left(\frac{P_i t_{ij}}{P_j} \right)^{1-\sigma} y_i \qquad (1)$$

Where P_i is the price of products exported from the region or country i, t_ij is the gross expenditure of exporting products from the

region or country i to j. In addition, y_i, is the GDP of country number j, and P_j, is the price criterion of the fixed substitution elasticity preferences, which is calculated as follows.

$$P_j = \left[\sum_{i=1}^{N} \left(P_i t_{ij} \right) \left(1 - \sigma \right) \right]^{1/(1-\sigma)} \quad (2)$$

Third hypothesis: market transparency and a set of algebraic calculations are considered as the third hypothesis of this research, which after simplification, finally, the following relation is obtained.

$$X_{ij} = \left(\frac{Y_i Y_j}{y^T} \right) \left(\frac{t_{ij}}{\pi_i p_j} \right)^{1-\sigma} \quad (3)$$

in which:

$$n_i = \left[\sum_{j=1}^{N} \left(q_j / t_{ij}^{\sigma-1} \right) P_j^{\sigma-1} \right]^{1/(1-\sigma)} \quad (4)$$

$$P_j = \left[\sum_{j=1}^{v} \left(q_j / t_{ij}^{\sigma-1} \right) p_j^{\sigma-1} \right]^{1/(1-\sigma)} \quad (5)$$

In addition, y^T represents the income earned in all regions.

Hypothesis 4: For country i, the economic density of trading partner j indicates the amount of economic activity in j relative to the trade cost between i and j.

According to the recent hypothesis, this model becomes a simple equation system with N^2 [12].

Econometric approach

The proposed model considers the sum of product trade flow logarithms, real business flow logarithm and an error correction term that has a normal distribution 〖(ε)〗_ij). Y_i is also determined in practice by the 〖GDP〗_i of countries. There is no acceptable indicator for bilateral trade costs, ti. The gross trade expenditure factor is a linear function of variables such as two-way distance 〖(DIS)〗_ij) and the virtual variable (e^(-α〖EIA〗_ij)(.

$$t_{ij} = DIS_{ij}^{\rho} e^{-\alpha EIA_{ij}} \quad (6)$$

If two regions have an agreement for economic integration, e^(-α〖EIA〗_ij) is equal to e^(-α), the value of which is less than 1.

By minimizing the sum of all squares of the waste, the following equation is obtained.

$$Ln\left[X_{ij} / \left(GDPi.GDPj \right) \right] = a_0 + a_1 LnDIS_{ij} + a_2 EIA_{ij} - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} + \varepsilon_{ij} \quad (7)$$

in which, $J = 1، \ldots، n$, is the number of regions. In addition, two-way trade costs are assumed to be symmetric, $t_{ij} = t_{ji}$.

If we assume the amount of imports from region i to j (m_ij) as a representative for all trade exchanges between countries, then the corrected econometric model is obtained from the following equation.

$$t_{ij} = pop_i^P . pop_j^P . e^{-\alpha\left(ICT_j\right)} \quad (8)$$

$$Ln\left[m_{ij} / \left(GDPi.GDPj \right) \right] = a_0 + a_1 lnpop_i + a_2 \ln pop_j + a_3 ICT_j \quad (9)$$

Using the integrated data method, the econometric model can be fitted as follows.

$$Ln\, m_{ijt} = C_0 + \beta_0 \ln GDP_i^t + \beta_1 \ln GDP_j^t + \beta_2 \ln pop_i^t + \beta_3 \ln pop_j^t + \beta_4 l\, ICT_j^t + \varepsilon_{ij} \quad (10)$$

In which i and j represent countries, t is the time period. Also, m_ij is the volume of products imported from country i to j and GDPi and GDPj are the volume of Gross Domestic Product of countries i and j, respectively.

In addition, popi and popj also represent the populations of countries i and j. 〖ICT〗_j is the value of an indicator or measure related to the growth of information technology.

In addition, the coefficients β_0 and β_1must be positive according to theories of international trade and the coefficients β_2and β_3 must be negative. As the IT indexes increase, which reduces trade costs and trade barriers between countries, so does the amount of trade. Therefore, the coefficient β_4 is also positive.

Findings

In this study, 10 Asian countries including Iran, China, India, Japan, South Korea, Iraq, Saudi Arabia, Syria, Taiwan and Nepal have been studied. The results of applying the model estimation are shown in Table (1). In addition, the results for fitting the least squares model are shown in Table (2).

Table (1): Fixed effects model

Variable		*Coefficient*	*Standard error*	*T Statistic*	*Probability*
$Log(CDPi)$		2/05421	0/1547	12/6713	0/0000
$Log(CDPj)$		1/7116	0/1422	11/7921	0/0000
$Log(POPi)$		-5/3895	0/5788	-9/2692	0/0000
$Log(POPj)$		-1/0749	0/6190	-1/8334	0/0901
IT	*Iran*	-0/167	0/04	-3/72	0/0002
	China	0/067	0/05	1/23	0/245
	India	-0/791	0/06	6/07	0/0000
	Korea	0/118	0/05	-6/62	0/0000
	Japan	0/127	0/01	-6/67	0/0000
	Saudi Arabia	0/043	0/02	5/49	0/0000
	Iraq	-1/463	0/04	6/61	0/0000
	Syria	-1/767	0/11	5/685	0/0000
	Taiwan	0/321	0/06	-6/631	0/0000
	Nepal	0/211	0/04	5/456	0/0000

Table (2): Fitting the least squares model

Variable		*Coefficient*	*Standard error*	*T Statistic*	*Probability*
$Log(CDPi)$		2/05421	0/1547	12/6713	0/0000
$Log(CDPj)$		1/7116	0/1422	11/7921	0/0000
$Log(POPi)$		-5/3895	0/5788	-9/2692	0/0000
$Log(POPj)$		-1/0749	0/6190	-1/8334	0/0901
IT	*Iran*	-0/167	0/04	-3/72	0/0002
	China	0/067	0/05	1/23	0/245
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	Korea	0/118	0/05	-6/62	0/0000
	Japan	0/127	0/01	-6/67	0/0000
	Saudi Arabia	0/043	0/02	5/49	0/0000
	Iraq	-1/463	0/04	6/61	0/0000
	Syria	-1/767	0/11	5/685	0/0000
	Taiwan	0/321	0/06	-6/631	0/0000
	Nepal	0/211	0/04	5/456	0/0000

The results indicated that the variable of GDP for importing and exporting countries has positive and significant effects on the volume of imported products of countries. In fact, the increase in GDP has positive effects on the amount of international trade, which this increase in the amount of trade means higher economic growth.

The variable of information technology in Asian countries studied in the model of fixed effects, for Iran and India, indicates negative effects on economic integration. In addition, information technology in China, despite having a positive coefficient, is not significant. But in Japan, Taiwan, etc., it is positive and significant. In the least integrated squares model, all coefficients of the countries involving China, Saudi Arabia and Nepal are positive and from the point of view of being significant, the coefficient of information technology can be considered significant.

Information technology affects both supply and demand in the field of economics and product and financial exchanges. The effects of information technology on the supply side is considered by the production function and on the demand side it is considered by the desirability function. Information technology, along with factors such as proper legislation, policies and favorable economic structure, is considered as a capital in the function of production and leads to the development of technology by deepening capital. The development of information technology has affected the economic growth of Asian countries. Apart from information technology, the coefficient of physical capital on economic growth was also significant, which indicates the impact of other investments on the economic growth of the countries under study.

Human capital has a positive impact on economic growth but is not statistically significant. In other words, the lack of assets such as basic knowledge structure to support technology development in Asian countries is one of the main problems in improving the economic conditions of these countries. Due to the impact of information technology development on economic growth, the studied countries should increase the level of their use considering this technology in order to improve their economic conditions.

A comparison of economic growth in different Asian countries shows that East Asian countries, especially China and South Korea, are leading compared to West Asian countries. Therefore, to reduce the created distance between Asian countries considering economic growth, as well as the reduction of this distance with European and American countries, the governments of these countries should invest in the field of information technology infrastructure, while allocating more financial resources in this regard.

In order to facilitate the process of IT development, countries should create more trade freedom to develop these resources by reducing customs and non-customs barriers and improving relations with other countries so that one country can benefit from other countries economic benefits.

Another important point is that the development of technology requires the preparation of infrastructure in both hardware and software, and in order to achieve the desired goals, especially in the economic field, there must be a balance between software and hardware platform growth.

Conclusion

Considering the growth of information technology and the improvement of economic conditions in some Asian countries, especially in recent years and the increase of government investment in the field of technology development, this article examines the impact and role of information technology development on economic growth. In this regard, a model is presented in which the sum of product trade flow logarithms, real business flow logarithm and an error correction term that has a normal distribution are considered. In this study, ten Asian countries including Iran, China, India, Japan, South Korea, Iraq, Saudi Arabia, Syria, Taiwan and Nepal are studied. The results indicate that the variable of GDP for importing and exporting countries has positive and significant effects on the volume of imported products of countries. The variable of information technology in Asian countries studied in the model of fixed effects for Iran and India indicates negative effects on economic integration. In addition, information technology in China, despite having a positive coefficient, is not significant, but in Japan,

Taiwan, etc. is positive and significant. In the least integrated squares model, all coefficients of the countries involving China, Saudi Arabia and Nepal are positive and from the point of view of being significant, the coefficient of information technology can be considered significant. Moreover, to reduce the created distance between Asian countries considering economic growth, as well as the reduction of this distance with European and American countries, the governments of these countries should invest in the field of information technology infrastructure, while allocating more financial resources in this regard.

References

[1] Abedini, Hamid and Gholi Nejad Aliki, Muslim and Biki Akbarabad, Elham, 2020, The Impact of Information and Communication Technology on the Economic Development and Growth of Iran, 8th National Conference on Electrical, Computer and Mechanical Engineering, Shirvan.

[2] Hashemi Asl, Seyedeh Maryam, 2020, The importance of managing information and communication technology strategy with economic growth and development in countries, the 5th International Conference on Management, Accounting, Economics and Social Sciences, Hamedan.

[3] Memariyan, Erfan and Kashefi Pouramiri, Seyedeh Tahereh, 2019, Mechanism of the Impact of Information and Communication Technology Investment and Human Resource Development on Economic Growth, Case Study: Selected Developing Countries, Sixth International Conference on Research in Management, Economics and Development.

[4] Abolhassani Hastiani, Asghar and Aghamalizadeh, Rabab, 2019, The effects of financial development and information and communication technology (ICT) infrastructure on economic growth in selected countries of the Islamic Conference, the third national conference on modern accounting and management research in the third millennium, Karaj.

[5] Mahfouzi, Gholamreza and Akbari, Mohsen and Farkhondeh, Mahsa and Ayagh, Zahra, 2019, Stock market volume and economic growth: The moderating role of information and communication technology according to the development of countries.

[6] Asongu, S. A., & Odhiambo, N. M. (2020). Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa. Telecommunications Policy, 44(1), 101838.

[7] Pradhan, R. P., Mallik, G., & Bagchi, T. P. (2018). Information communication technology (ICT) infrastructure and economic growth: A causality evinced by cross-country panel data. IIMB Management Review, 30(1), 91-103.

[8] Nordhaus, W. D. (2021). Are we approaching an economic singularity? information technology and the future of economic growth. American Economic Journal: Macroeconomics, 13(1), 299-332.

[9] Majeed, M. T., & Ayub, T. (2018). Information and communication technology (ICT) and economic growth nexus: A comparative global analysis. Pakistan Journal of Commerce and Social Sciences (PJCSS), 12(2), 443-476.

[10] Sharma, G. D., Rahman, M. M., Jain, M., & Chopra, R. (2021). Nexus between energy consumption, information and communications technology, and economic growth: an enquiry into emerging Asian countries. Journal of Public Affairs, 21(2), e2172.

[11] Appiah-Otoo, I., & Song, N. (2021). The impact of ICT on economic growth-Comparing rich and poor countries. Telecommunications Policy, 45(2), 102082.

[12] Saidi, K., Toumi, H., & Zaidi, S. (2017). Impact of information communication technology and economic growth on the electricity consumption: Empirical evidence from 67 countries. Journal of the Knowledge Economy, 8(3), 789-803