# Study of the Effects of Information and Communication Technology, Electricity Consumption and Economic Complexity on Economic Growth in Selected Developing Countries

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***Abstract***

*Inclusive growth creates equal opportunities for economic participants in economic growth so that all sectors of society benefit from growth and participate in creating growth. Inclusiveness results in economic growth that reduces poverty and inequality and benefits the marginalized. Therefore, development goals should go beyond simply increasing GDP and also reduce poverty and inequality. Considering the growth of the population and its increasing needs, without economic growth, it is not possible to respond to the needs of the growing population of countries. In fact, the growth of national production, which is known as economic growth, is one of the important economic components in the pattern of progress for any country. Growth increases income and abundance of goods available to consumers, thereby increasing welfare. Considering the importance of economic growth in countries, especially developing countries, the investigation of factors affecting economic growth is one of the requirements. Therefore, the purpose of this study is to analyze and investigate the effects of information and communication technology, electricity consumption and economic complexity on economic growth in selected developing countries during the period of 2016-2021. In this study, economic growth is the target variable, information and communication technology, electricity consumption and economic complexity are explanatory variables, and human capital and trade are control variables. In this research, the method of estimation of generalized moments (GMM) was used to investigate the subject. In general, the results indicate that information and communication technology, electricity consumption, human capital and trade have a positive and significant and economic complexity has a negative and significant effect on the economic growth of selected developing countries.*

***Keywords:*** *Information and Communication Technology, Electricity Consumption, Economic Complexity.*

## Introduction

In order to set goals and plan to improve economic growth, the factors affecting it must be accurately identified. Labor force, physical capital, and human capital are among the most important factors that have been taken into account in many studies. In the new theories of economic growth, in addition to education, they have included the impact of intangible assets such as research and development, patents, intellectual capital, and health in their economic growth models. The import of technology and technical knowledge from industrialized countries to non-

industrialized developing countries is one of the benefits of free trade that stimulates the economic growth of developing countries. With the spread of globalization, the new economy has pushed society towards progress and prosperity. The more new technology emerges, the greater the possibility of moving from an agricultural and industrial economy to a knowledge economy. In this way, knowledge and information play an important and effective role, because it is possible to move from the idea of survival of the fittest to the idea of survival of the fastest; therefore, knowledge and information technology have become complementary to capital and have become a basic factor for economic growth. The factors affecting economic growth and development have always been one of the main goals of economic policy makers. The initial growth theories based on capital and labor factors could not explain the difference in per capita income and economic growth rates in countries well, and as a result, new growth theories emerged, and by relying on the knowledge-based economy and measuring the amount of knowledge used in a country's production, such as the economic complexity index, good progress has been made in this area.

The State of Information and Communication Technology, Electricity Consumption and Economic Complexity in the World

According to the latest World Bank reports, the Internet penetration rate in developed countries is 86.6%, while it reaches 53.6% and 20% in developing and poor countries, respectively (World Bank, 2022).

The decrease in electricity demand due to the Covid-19 crisis in 2020 led to a decrease in electricity production by 0.6%. Electricity generation fell earlier in 2019 due to weather conditions as well as lower economic growth. This trend is interesting compared to an average increase of 3% per year between 2000 and 2018. Electricity production using fossil fuels (which accounted for 35% of the world's electricity in 2020) fell to 4.5%, and nuclear electricity production fell to 3.5%. Part of this decline was offset by increases in wind power (+12%), solar (+20%) and hydropower (+2%). In 2020, global electricity consumption fell by 1.1%. Despite the decline in 2019, this was the first decline since 2009. Although China accounts for 29% of global electricity consumption, it recovered quickly after the COVID-19 crisis and increased its electricity consumption by 3.1% in 2020. In other countries, the COVID-19 crisis has had effects. More serious is the volume of electricity demand, especially industrial and commercial demand in some OECD countries. These countries were previously on a downward trend in electricity demand. In the United States, this amount decreased by 3.9% for the second year in a row. Europe faced a sharp decline of 4.30% in Germany, France, Italy and Spain. Electricity demand also decreased in England, Japan, South Korea and Canada. In India, electricity demand has increased since 2000, but began to decline in 2018, and then declined further recently. This radical decline is observed in Russia, Latin American countries (especially Brazil and Mexico) and Africa, including South Africa. This trend has remained constant in the Middle East, where it increased in Iran and decreased in other countries (International Energy Agency, 2022). According to data provided by the Harvard Growth Lab on the Atlas of Economic Complexity website, Japan, Switzerland, Germany, South Korea and Singapore are the five most economically complex countries in 2019 (Islamic Parliament Research Center, 2021).

## Economic Growth

Economic growth means an increase in production or national income per capita. If the production of goods or services increases by any possible means in a country, then economic growth can be said to have occurred in that country. Economic growth, in simple terms, is the increase in a country's production in a given year compared to its value in the base year. At the aggregate level, an increase in the gross national product or gross domestic product in the given year in proportion to its value in the base year is considered economic growth. The reason for using base year prices to calculate economic growth is that the calculated increase in the gross national product is the result of an increase in the quantity of production and the effect of price increases is removed. The sources of economic growth include: an increase in production inputs (increase in capital or labor), an increase in the productivity of factors of production, and the use of potential empty capacities in the economy. Economists have always devoted the majority of their discussions to expressing theories of economic growth (Gerdon, 2016). Since the late 1980s, many studies have been conducted in the field of growth patterns, which have led to the creation of new patterns called endogenous growth patterns. These models believe that the internal mechanisms of the economy, such as education, the appropriate level of science and skill, research, etc., play a role in economic growth. Of course, the goal of endogenous growth theorists is not to ignore the factors of capital and technology, but they believe that both of these elements are essential for growth, but the use of a set of policies in addition to capital and technology will affect the growth rate of the overall economy. The new growth patterns, methods and policy requirements for achieving sustainable growth are business expansion, human capital development, productivity improvement and effective government policies. In other words, according to these studies, economic growth is based on a set of mechanisms in which other factors enter, in addition to primary production inputs. Considering this issue, if the necessary background for the work of these mechanisms is not created, sustainable economic growth cannot be expected (Mankiw, 2011). In classical economics, the theory of production and the theory of growth are based on the theoretical basis or the law of variable proportion, thus keeping one factor of production (labor or capital) constant and changing the other, and assuming that technology does not change, will produce at a decreasing rate that eventually reaches zero. Criticisms of classical growth theory are that technology, an important factor in economic growth, remains constant and economies of scale are ignored (Das, 2019). Robert Solow and Trevor Swan developed what eventually became the main model used in growth economics in the 1950s. This model assumes that there are diminishing returns to capital and labor. Capital is accumulated through investment, but its level or stock continually declines due to consumption. Due to diminishing returns to capital, with increasing capital/labor and lack of technological progress, economic output/labor will eventually reach a point where capital per worker and economic output/labor remain constant because annual capital investment equals annual consumption, and this state is called the steady state. In the Solow model, if productivity increases through technological progress, output/worker increases even when the economy is in a steady state. If productivity increases at a constant rate, output/worker will also increase at the rate corresponding to the steady state. As a result, growth in the model can occur through an increase in the share of GDP invested or through technological progress. But at any given share of GDP, capital/labor eventually converges to a steady state, and the rate of growth of output/employment is determined only by the rate of technological progress. As a result, with global technology

available to all and advancing at a constant rate, all countries have constant growth rates. Each country sets a different level of GDP/employment according to the share of GDP it invests, but the rate of economic growth in all countries is the same. Implicit in this model, rich countries are those that have invested a high share of GDP for a long time, and poor countries can become rich by increasing the share of GDP they invest. An important prediction of the model, often confirmed by the data, is conditional convergence. The idea that poor countries will grow faster and catch up with rich countries as long as they have similar investment (and saving) rates and access to the same technology (Solow, 1956). The Solow model is an exogenous growth model because it does not explain why countries invest different shares of their GDP in investment, nor why technology improves over time. Instead, the investment rate and the rate of technological progress are exogenous. The value of the model lies in its prediction of the pattern of economic growth after these two rates are determined, and its failure to account for the factors that determine this rate is one of its limitations. Although the investment rate in this model is exogenous, under certain conditions the model implicitly predicts convergence in the investment rate across countries. In a global economy with a global capital market, financial capital goes to countries with the highest returns on capital. In the Solow model, countries with less capital/labor (poor countries) have higher returns on investment because of the lower return on capital. As a result, capital/labor and product/labor in the global financial capital market should be equalized at the same level in all countries. Because financial capital has not historically flowed to countries with less capital.

Less money/labor, the basic Solow model suffers from a conceptual flaw. Since the 1990s, this shortcoming has been overcome by adding additional variables to the model that can explain why some countries are less productive than others, and thus, even if they have less (physical) capital, they do not absorb global financial capital flows (Burton, 2015). According to Harrod, the natural growth rate is the maximum rate of growth allowed by increasing variables such as population growth, technological improvement, and natural resource growth. In fact, the natural growth rate is the highest rate of growth that can be achieved and creates the most employment from the resources available in the economy (Lee, 2018). Dissatisfied with the Solow model's assumption of exogenous technological progress, economists attempted to endogenize output growth (i.e., explain it from within models) in the 1980s. Endogenous growth theory, introduced by Robert Lucas Jr. and his student Paul Romer in particular, includes a mathematical explanation of technological progress. This model also includes a new concept of human capital, i.e. the skills and knowledge that make workers productive. Unlike physical capital, human capital has an increasing rate of return. Research in this area has focused on what increases human capital (such as education) or technological change (such as innovation). A branch of endogenous growth theory was created based on Schumpeter's theory, named after the 20th-century Austrian economist Joseph Schumpeter. This approach explains growth as the result of innovation and a process of creative destruction, which embodies the dual nature of technological progress: in terms of innovation, entrepreneurs introduce new products or processes in the hope of benefiting from monopoly-like profits when they are taken over (Johansson and Koyama, 2017). Integrated growth theory was developed by O'Galver and colleagues to address the inability of endogenous growth theory to explain the basic empirical laws in the growth processes of individual economies and the global economy as a whole. In contrast to endogenous growth theory, which focuses entirely on the modern growth system and is therefore unable to explain the roots of inequality between

countries, integrated growth theory captures the key stages of the development process across human history in a single framework: 1- Malthusian period, which was prevalent throughout most of human history, 2- Escape from the Malthusian trap, 3- The emergence of human capital as a key element in the growth process, 4- The onset of fertility decline, 5- The roots of modern sustained economic growth, and 6- The roots of the disparity in per capita income between countries over the past two centuries. This theory suggests that for most of human life, technological progress has been offset by population growth, and the standard of living has been almost subsistence over time and space. However, the enhanced interaction between the rate of technological progress and the size and composition of the population gradually increases the rate of technological progress and increases the importance of education in people's ability to adapt to the changing technological environment. Increasing the allocation of resources to education reduces fertility and enables the economy to allocate a larger share of the fruits of technological progress to the continuous increase in per capita income rather than to increasing population growth, and provides the basis for the emergence of sustainable economic growth. This theory also suggests that changes in biogeographic characteristics, as well as cultural and institutional characteristics, have created a differential pace from stagnation to growth across countries, and thus variation in per capita income over the past two centuries (Berg et al., 2018).

Information and communication technology and its impact on economic growth

In the last fifty years, extensive developments in the field of computers and communications have led to significant changes in various areas of human life. Humans have always used technology, and the human life record is full of the invention of information and communication technologies, which are known as new or great technologies, and have had the greatest impact on human life. The world of communication and information production is changing rapidly, and today we have witnessed their convergence with each other more than ever before, so that data and information are transmitted to all parts of the world at an unimaginable speed and time and become available to users. There is no doubt that information and communication technology has brought about widespread changes in all social and economic fields of humanity, and its impact on human societies is so great that the world today is rapidly turning into an information society. A society in which knowledge and the level of access and useful use of knowledge play a central and decisive role. The scope of its application and its effects on various aspects of today's life and the future of human societies have become one of the most important topics in the world today and have attracted the attention of many countries in the world (Aksentijo et al., 2021). In defining information and communication technology, it can be said that technology is the collection, organization, storage and dissemination of information, including sound, image, text or number, and this is done using computer and communication tools. Regardless of the different definitions and the wide scope of application of information and communication technology in various aspects of human life, rapid access to information and doing things regardless of geographical distances and regardless of time constraints is the most important achievement of this technology. Secure and easily accessible communication can be used effectively as part of a tool for raising global problems. ICTs alone may not be able to feed the hungry, eliminate hunger, or reduce child mortality, but they are more important drivers of economic growth and social equality. ICTs enable

the efficient production, diversification and distribution of agricultural products, and provide access to basic health services.

**Electricity consumption and its impact on economic growth**

In the analysis of new growth theories, in addition to the two inputs of labor and capital, energy has also been added to growth models, but despite this, economists do not agree on the role and importance of this input in the production process. These differences in views are generally manifested in the form of two theories, neoclassical and environmental, which also have different political implications. Bandert et al. (1987), citing neoclassical economists, in reference to the possibility of substitution between factors of production, claim that the progress of knowledge and technology will reduce the need for energy consumption in the production process by increasing the productivity of capital and labor. Therefore, the process of economic growth and production is possible despite the limited energy reserves. Therefore, the relationship of energy is weak and separate from the labor force, and is not considered an effective and necessary factor in economic growth. On the other hand, environmental economists emphasize the importance of the role of energy in the process by saying that in order to form and maintain capital, large amounts of energy and matter must be consumed, as well as in the mechanism of converting matter from one form to another. They point to the importance of the role of energy in the process of producing goods, and in presenting their theories, they refer to the laws of thermodynamics, which state that energy is constant, neither created nor destroyed, but is transformed from one form to another. In response to the neoclassicals' claims about the substitution of technology and energy as production inputs, they stated that despite the improvement in productivity of labor and capital inputs, the use of these two inputs in the production process requires energy consumption because scientific and technological progress is only one of the inputs involved in production among other production inputs. According to the theory of environmentalists, energy is the driving factor for economic growth, and policies that determine energy consumption are considered factors that prevent economic growth (Haidari et al., 2019). Energy intensity increases with the beginning of the industrialization process and decreases after reaching the development stage. In the industrialization process, energy and capital (machines) factors gradually replace human labor and their role in the cost of production increases. As a result, it can be observed at first that economic growth leads to an increase in energy consumption growth, but gradually and after reaching a certain level of development, by using energy consumption improvement solutions and changing the industry approach from high-consumption industries to technological industries, the growth of energy consumption in countries is controlled to some extent and economic growth becomes at a higher rate than the increase in electricity consumption. Although per capita energy consumption in developed countries has always been increasing, the amount of energy wasted (energy consumed per unit of product) was initially increasing and after reaching a certain threshold of development, it increased at a lower rate or even went through a downward trend. In the case of developing countries, there is an expectation that such trends will be repeated, but the important thing is that the threshold for reducing energy consumption in these countries is not well defined. The important issue in developing countries is to increase economic growth to the desired level, which requires increasing energy consumption. However, energy consumption in developing countries is more than in developed countries. This fact is linked to the important issue that

reducing energy waste is a matter of development and requires crossing certain thresholds during which, due to the increase in sufficient capital, the rise in the level of technology and human capital, per capita income increases and wasted energy decreases (Bartlett and Gunder, 2010).

**Economic complexity and its impact on economic growth**

In new theories of economic growth, knowledge is presented as a major factor that creates differences in the economic growth of countries. There are different indicators to measure this variable on economic growth, but one of the most recent indicators that reflects the amount of knowledge contained in the production and economic structure of a country is the economic complexity index. The results of studies conducted in this field indicate that economic growth resulting from human capital knowledge has a positive relationship with the economic complexity index. The developments witnessed by the global economy in the past few decades have created opportunities and challenges for developing countries. While some countries have been able to adapt to new and changing conditions and take advantage of these opportunities, other countries have not been able to face the changes and maintain a positive growth rate, which is one of the components of sustainable development along with other factors. In today's more complex global economic system, it is important to adopt new production methods to enter global competition. In fact, economic complexity is a concept that analyzes a country's knowledge and production capabilities through its export products, meaning that countries with greater manufacturing capabilities are more developed and can produce more diverse and advanced products. In line with this interpretation, there is a possibility that countries with a higher level of economic complexity have achieved higher economic growth, that is, increasing economic complexity has a positive effect on the economic growth rate (Ahmadian et al., 2017).

In recent years, the concepts of export diversification and economic complexity have attracted much attention. Export diversification generally refers to the various policies implemented to change the share of different commodities in the export mix and introduce new products. In fact, knowledge means a set of existing experiences, values, information, and expert methodological positions that provide a framework for evaluating and using new experiences and information. Therefore, the level of knowledge of countries is directly related to the types of products produced in them. Economic complexity attempts to measure the level of knowledge and productive capacity in a given economy. The index of economic complexity and uniqueness measures the production structure of a country using the concepts of diversity. Diversity refers to the number of products exported by a country, and product uniqueness refers to the number of countries that export the same product. Therefore, advanced economies are those whose production and export products are more diverse and unique, and other countries do not have the ability to produce and export goods at this level. In contrast, simple economies have weak support for productive knowledge and produce limited and simple goods, and therefore do not need a wide network of transactions. Economic complexity studies the production structure embedded in the goods and services produced by an economy. This definition means that economic complexity acts as an important driver of the wealth of nations. In fact, it can be said that the difference in the level of complexity causes the difference in the rate of economic growth between countries (Azimi and Nasser Ali,

2017). Economic complexity with the creation of diverse and comprehensive products in society and advanced division of labor refers to the use of advanced technologies and innovation in the production process, which through the application of knowledge and technology in combining manufactured products by applying knowledge and technology in combining manufactured products by creating a production structure and increasing productivity and diversity of manufactured products, it leads to increased economic growth and prosperity. When the production structure of a country is more complex, the production capabilities are stronger. A country with greater capabilities will be able to participate in production activities with higher productivity and thus the country will develop faster. Economic complexity is based on export data and measures the complexity of a country's production structure by combining information related to diversity (the number of goods exported by the country) and product mix (the number of countries that produce this product). For a complex society to exist and sustain itself, people who know design, marketing, finance, technology, human resource management, operations, and business law must be able to interact and combine their knowledge to produce products. Economic complexity is expressed in the composition of manufactured products in the country and shows the structures created to preserve and combine knowledge (Sephardost et al., 2019). Economic complexity refers to the use of technology and innovation in the production process, or in other words, the application of knowledge and technology in combining production products, and through the creation of a production structure, the possibility of using unused capacities, saving resources, optimal allocation of production resources and reducing costs, where production, increased productivity and variety of manufactured products lead to an increase in GDP. A complex country is said to produce complex and diverse goods. Countries that, in addition to having a variety of products, also have complex production products, are usually more economically advanced and are expected to experience faster economic growth in the near future. Therefore, economic complexity can be used today as a very important and significant parameter with other traditional factors that affect economic growth to explain the growth rate of societies. Politicians and economic analysts can also use the economic complexity index as a valuable means of comparing countries. Therefore, today, to explain the economic growth of societies, relying on traditional growth models distances people from reality, so the main reason for positive economic growth in advanced industrial societies, apart from factors of production and capital, is the concept called knowledge which is manifested by people specialized in producing and exporting products, not only within borders but also outside borders and at the international level.

**Human Capital and Its Impact on Economic Growth**

Today, the role of human power and its impact on production is no secret, and it is recognized as the most important factor among different human societies. In recent years, the role of human power in the manufacture of tools and necessities has changed from simple labor (arm power and mechanical power) to human capital (knowledge and skills). In this regard, the issue of educating and training skilled labor is a priority for every country, which has made many people interested in studying and researching the field of human power and human capital and testing the extent of their impact on economic growth. Investing in human resources can be considered a valuable investment, because investing in human resources increases the scope for creating capabilities and skills in humans, and developing human skills improves production functions and the environment,

and provides economic growth. Most economists believe that in fact, the lack of investment in human capital is the main reason for the low level of economic growth in developing countries, and until these countries work to improve education, use science and knowledge, and increase the level of professional skills, however, the productivity and efficiency of the workforce and capital are still at a low level, and economic growth occurs slowly and at high costs. In fact, it can be said that physical capital will only be more productive when the country has the necessary amount of human capital (Take and Tanaka, 2009). Most developing countries face a double and different problem; they lack the skills and expertise needed for industrial growth, while they have a surplus of unskilled labor. The existence of a surplus of labor is largely due to the lack of necessary skills. The focus of human capital is to solve these problems by creating the necessary skills in people as productive resources and creating gainful employment opportunities for them. The need for investment in human resources in these countries is much more than just physical capital. Despite importing or creating physical capital, these countries are still unable to accelerate their economic growth because their human resources are still undeveloped. These countries import huge amounts of capital every year, but due to the lack of necessary skills, they are unable to fully utilize these resources. Although professional skills, knowledge and expertise are imported along with foreign capital; but they are not sufficient. The inability to develop human capital with the growth of material resources is one of the main reasons for the low absorptive capacity of physical capital resources in developing countries. Therefore, investment in social projects is one of the most important needs of these countries. The main reasons for the backwardness of these countries are the low rate of labor efficiency, the lack of mobility of resources, the limited skills and specializations in business and trade, the lack of creativity and traditional values and traditional social institutions that reduce the incentive for economic change. The declining growth of science and knowledge is another important factor that hinders economic growth. There are natural resources in these countries, but appropriate production methods, necessary skills, full markets, and institutional and economic factors for the effective and rational use of these resources to improve economic and social conditions are limited. Raising the level of people's knowledge and skills is a necessary condition for eliminating economic backwardness and untapped economic potential and creating the necessary incentives for progress (Torg, 2006). Today, human capital is one of the undeniable factors in the growth and development of countries. Since human capital is a prerequisite for development, the speed and pace of development depend on the quantity and quality of its effective forces. The impact of human capital on economic growth can be conceived from two areas. First, investment in human resources increases people's productivity, ceteris paribus. This is, in fact, the main focus of human capital theory. Accordingly, the more human capital is accumulated, the faster production is expected to grow. Another focus of analysis is that these investments increase production in the field of transferring new technology and its applications. Based on these considerations, the more human capital in the education sector, the more platforms are needed to use imported technology. In general, it can be said that the efficiency of the workforce provides the possibility of increasing production and added value, and neglecting this factor can be one of the reasons for underdevelopment in some developing countries. Investing in human capital and increasing its share in the total state investment leads to better exploitation of physical capital and is an important factor in the process of economic growth and development (Follia and Pisa, 2013).

In some countries, investment in human capital accelerates economic growth, while in others it has a negative effect; that is, investment in education not only does not lead to more economic growth, but also reduces it. The emergence and persistence of many educated unemployed people in South America, India and elsewhere in recent years shows that investment in human capital, based on this indicator alone, may lack the necessary efficiency like investment in anything else, and in terms of the economy it cannot be justified. Education leads to more economic growth only if educated people are used when necessary and productivity in production increases. In other words, investment in human capital leads to more economic growth when it is done in response to the ever-increasing needs of the economy to use the latest scientific achievements in production. But we must take into account that companies that are not exposed to internal and external competition do not feel the need to try to improve and use the latest production methods, and can survive and achieve their goals (Naem and Jungrais, 2012). Trade and its impact on economic growth

Expanding exports through competition in tradable goods increases the efficiency of domestic production and thus improves the quality of the said goods and reduces their prices. International trade also increases the import of capital goods, raw materials, production data and necessary intermediates in the production process, which are highly efficient. Importing technology and technical knowledge from industrialized countries to non-industrialized developing countries is one of the advantages of free trade that stimulates the economic growth of developing countries. In this way, the expansion of international trade of countries means an increase in their economic growth. On the other hand, countries today are looking to improve the quality of their human resources; because the most important decisive factor in the state of technology and competitiveness of a country is the level of education and skill of human resources to produce and export products with special advantages, but these goods can be produced, supplied or exported when the workforce has a good level of education and experience. In response to this growing need, continuous training is necessary to increase the efficiency and skill level of people, as a potential factor for change and innovation. The growth and development of any country is closely related to the quality of its human resources. Countries with more capable human resources are able to produce more and better quality goods and have a larger share in world trade (Oslati et al., 2015). Today, most economists consider trade as an engine of growth and development in developing countries. According to economic theories, free trade leads to the formation of countries' production based on comparative advantage, which encourages the production of goods and services that are produced at a lower cost according to the resources available in the country; in this way, imports replace the domestic production of more expensive goods and services in these countries due to the available resources and facilities. In the economic justification for reducing trade barriers, it can also be said that if a country reduces trade barriers, its economic benefits will not only reach the trading parties of that country, but that country itself will also benefit from this reduction. The basic principles regarding the role of foreign trade in economic growth go back to the Faculty of Commerce, and from the point of view of this school, a positive trade balance leads to prosperity and economic growth. The classical theory after this school is considered one of the most important theories supporting the positive impact of trade on economic growth. For example, Adam Smith, based on the principle of international division of labor and absolute advantage, believed that the benefits of foreign exchange for one country are not at the expense of another

country, and in practice both parties to the exchange benefit from its benefits. In the neoclassical period, the trend towards economic growth was revived through Solow's studies. Solow clearly separated the effects of economic growth from the effects of level, and as a result, foreign trade, which is ultimately considered to have a level effect and has positive effects over a transient period of time, does not affect the rate of economic growth in the long run. Therefore, it can be said in short that during the past two centuries, economists have emphasized the importance of foreign trade in economic growth. Among the classicists, Adam Smith considered foreign trade as a means of expanding the domestic market, dividing labor, and increasing production. The neoclassicals were not unaware of its impact on the economic growth of countries, and Alfred Marshall mentioned the importance of business in growth in his writings (Al-Abdali, 2013).

Growth theories based on foreign trade emphasize that foreign trade is achieved through improving the allocation of resources, access to better technology and intermediate goods, using economies of scale, increasing internal competition, and creating an environment conducive to innovation and improving productivity and economic growth. In most Islamic countries, there are free and available resources such as materials, equipment, labor, land, and capital, which, if export industries are supported, are directed and flowed into this sector, leading to increased efficiency. In fact, the expansion of exports will make the foreign exchange market come out of the government's monopoly and become closer to competitive conditions, and local producers will be able to use the capacity of their production units as much as possible. On the other hand, the development of exports makes it possible to use global facilities for the growth of local products, and in this way, the restrictions of the local market are liberated, and by developing the scale of production in order to export more to foreign markets, it provides the basis for economic growth and development (Jehani and Farahani Fard, 2019).

**References**:

Anasuya Haldar, Sanhita Sucharita, Devi Prasad Dash, Narayan Sethi, Purna Chandra Padhan(2023). The effects of ICT, electricity consumption, innovation and renewable power generation on economic growth: An income level analysis for the emerging economies, Journal of Cleaner Production 384 (2023) 135607

Appiah-Otoo, Isaa, Song, N (2021). The impact of ICT on economic growth-Comparing rich and poor countries. Telecommunications Policy.

Bartleet, M. R. & Gounder (2010), "Energy Consumption and Economic Growth in New Zealand: Results of Trivariate and Multivariate Models", Energy Polic, Vol. 36, PP.4600-4604.

Benhabib, J, Speigel, M.M (1994). The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data. Journal of Monetary Economics.

Breusch T, Pagan A.1980.The lagrange multiplier test and its application to model specification in econometrics. Review of Economic Studies, 47(1): 239-253

Cadot, O. , Carrere, C. , & StraussĞKahn, V. (2013). Trade diversification, income, and growth: what do we know?. Journal of Economic Surveys, 27 (4), 790-812.

Fernández-Portillo, Antonio, AlmodóvarGonzález, Manuel, Hernández-Mogollón, Ricardo (2020). Impact of ICT development on econmic growth. A study of OECD European union countries. Technology in Society

Fulya Tasel, E. Beyza Bayarcelik, (2013), "The Effect of Schooling Enrolment Rates on Economic Sustainability", 9th International Strategic Management Conference, Procedia - Social and Behavioral Sciences, Vol 99, pp. 104 – 111.

Hausmann, R. & Hidalgo, C. (2011). "The network structure of economic output", Journal of Economic Growth, 16, 309-342.

Irawan, T (2014). ICT and economic development: comparing ASEAN member states. Int Econ Econ Policy.

Im Pesaran M, Shin Y. 2003. Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115: 53-74.

Lapatinas, A, Garas, A, Boleti, E & Kyriakou, A (2019). Economic complexity and environmental performance: Evidence from a world sample. Munich Personal RePEc Archive journal.

Lee, Yong Suk (2018). "Government guaranteed small business loans and regional growth". Journal of Business Venturing. 33: 70–83.

Ouedraogo N. 2012. Energy consumption and economic growth: Evidence from the economic community of West African States (ECOWAS). Energy Economics xxx, article in press.

Ozturk, I. & Acaravci, A.(2011) "Electricity Consumption and Real GDP Causality Nexus: Evidence From ARDL Bounds Testing Approach For 11 MENA Countries." Applied Energy 2011.

Pesaran H. 2004. A simple panel unit root test in the presence of cross section dependence. Mimeo, University of Southern California.

Pesaran H. 2007. A simple panel unit root test in presence of cross section dependence. Journal of Applied Econometrics, 22: 265–312.