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An Economic Analysis of Information and Communication Technology Effects on International Trade

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Abstract

The rapid development of information and communication technology (ICT), is one of the main factors in increasing the efficiency, productivity and overall performance of a system, has encouraged a growing number of researchers to study and measure the effects of this technology on economic growth. This research work aims to explore the increasing importance of ICT usage in international trade which is one of the key factors in economic growth. Different indexes in measuring ICT usage are reviewed with their pillars and the top country rankings. Taking the Global Competitiveness Index 2019 as the source, this study also examines the effects of ICT on the integration of countries in international trade by considering the Trade/GDP ratio as an indicator of their integration. The results show that there is a significant positive relationship between ICT usage and a country's Trade/GDP ratio. Especially, the Individuals using the internet, University-industry collaboration in research and development (R&D), and Availability of scientists and engineers are seen to be three of the most influential factors to affect the Trade/GDP ratio positively, while on the other hand, Firms, FDI, Technology transfer and Government procurement of advanced technology products are the most negatively sub-pillars of ICT usage.

Keywords: *Economic Growth, ICT, International Trade, Statistical Analyses.*

Introduction

Until 1960, communication was used only between one to another person. But over the past decade, ICT had eye-catching growth in the global arena (Leon & Leon, 1999), which made it researchers, merchants, students and academic personals easy to access required data, the data which are processed and collected from various sources using different computer languages such as C, C++, Java, etc. and called computer-based data which can be easily stored.

Computer-based information is used in solving intricate scientific problems in some sectors such as art, cultural, historical, accounting, financial, domestic sector and medical sector. Hence, we can say that all dimensions of our day-to-day life got impacted by computers with ICT. UNESCO defines ICT Diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs, and emails), live broadcasting technologies (radio, television, and webcasting), recorded broadcasting technologies (podcasting, audio, and video players and storage devices), and Telephony (fixed or mobile, satellite, Visio/video-conferencing, etc.) (UNESCO, n.d.).

For centuries humans used to exchange their necessities with each other where people exchange something they had extra for something which they don't have which formed the trade but after centuries the form of these exchanges changed, nowadays people can easily exchange their good with people abroad which is called international trade, in the simple way international trade is export or import of capital, services, and goods across the globe.

In the past exchange of goods between countries was not that easy it used to take months to trip a country and sell or buy, merchants needed to travel overseas and visit countries one by one to find the goods they need and sell the good they carry with, but these days with ICT and computers help people don't need to travel overseas and visit countries one by one, because they can find whatever they need from a place called the internet and also they can sell easily their goods and services, it also helps customers and merchants to contact and track their goods easily in simple words we can say that international trade has got fully affected by ICT. Every country is ranked by its capabilities and there are too many pillars to compare a country's capability with another and ICT capability is also one of these pillars, we will compare all pillars and ICT with Trade to GDP ratio to know how ICT impacts the trade to GDP ratio of countries and up to which level.

Purpose and Significance of the Study

From the 1st day of ICT usage, it has taken attention of many researchers, merchants, academic personals and students attention on it because of its importance and growth in usage and many researchers, academic personals and the student did researches and wrote about its importance on almost every sector, however bypassing time and invention of new technologies and methods it gains to its importance, in this paper the importance of ICT in international trade explained, unlike other studies this study strived to go deeper and tried to introduce the high potential and effective sub-pillars of ICT and other pillars which has a direct effect on international trade. thus, the main purpose of this study is to know that, is there any relationship between ICT and international trade or not and if there is a relationship then which sub-pillar of ICT has more effect on international trade?

Scope and Methodology

In this research work, the data were derived from the Global Competitiveness Index including developed and developing countries from (2009 to 2019) in order to maintain consistency in the data, as well as to form our independent variables, the dependent variables and trade to GDP ratio, to know and remove, high correlated pillars a Pearson correlation has taken which could cause confusion, then Hausman test is applied for developed and developing countries separately to know which panel analysis is appropriate for the research and for all these analyses STATA is used as analyzing software.

The Study Outline

A brief introduction about ICT, International trade and the relation between ICT and international trade is presented in Section I. Review of existing literature and explanations of the variables studied by other researchers is discussed In Section II. Section III presented the research design and methodology. Section IV provides the results using STATA 13 software for descriptive analysis and scale measurement. And the last Section examines the results of the statistical analysis and discusses important findings.

Review of Literature

ICT: The first studies on the impact of ICT usage in international exports and trade date back to the late 1990s and early 2000s. Freund and Winold (2004) mainly examine the impact of the Internet on international trade. The study claims that companies and individuals from around the world are beginning to transform their business models from local to international operations. The researchers found that the use and development of the Internet help explain the growth of international trade (Freund & Weinhold, 2004).

ICT is a way to capture data, store information, Data processing, data transfer, data retrieval, data display and Results by model or feature or by combination via Computer, Thus ICT is a collective form of combining the context of computers and various information systems to find the desired solutions for users, and this has affected every stage of human life at the local, national and global levels. If a person or organization strives to achieve specific goals, it cannot be far from the impact of the development of information and communication technology. In such situations, the role of ICT varies from place to place, person to person, and organization to organization at different levels. Its nature, function, and impact depend on the personal or organizational need for information (Prasad & Prasad, 2009).

ICT has revolutionized the whole range in which people live and work. It has changed all aspects of human life and lifestyle. The digital revolution has enabled the processing of data related to a variety of information with greater accuracy Manipulation and simulation. These capabilities are creating a complete world in and around the physical world. Computers and communications are becoming a staple of our lives. Until 1960, people-to-person communication was used. But over the past decade, the global arena has seen tremendous growth in ICT (Leon & Leon, 1999).

Rapid advances in communication media technologies such as television, computers, the Internet, printing, and publishing enable us to quickly access the information we need. Computers with different computer languages such as C, C ++, Java, .Net, etc. make it easier to process data collected from different sources. Government agencies, business organizations, scientists, and academics retrieve all computer-based information. Computer-based information is used to solve complex scientific problems in the artistic, cultural, historical, accounting, financial, medical, and even domestic fields. Therefore, computers with information and communication technology have a significant impact on all aspects of our daily lives, for example, booking plane and railway tickets, buying and selling items on the Internet, e-marketplace, online banking, entertainment, education, Communications, reservations, and so on (Toader, Firtescu, Roman, & Anton, 2018).

Information and communication technology is a combination of a computing system, communication technologies, and the process of information production and dissemination. This synergistic combination is achieved by convergence for computer and electronic communications. Hence, information and communication technology are not only a single technology but also a comprehensive approach to the use of computing and communication technologies. Computers represent computing technologies and other processing systems, while communication technologies are represented by a combination of methods and modes for the transmission of electronic data (Gupta & Srivastava, 2008).

Information and communication technology can help identify important areas of competitive advantage for business organizations. Competitive advantages may be achieved with the help of various techniques in business and with the help of information and communication technology. This can help manage the value chain by strategically aligning the critical business process. Assists managers in decision-making and operational control.

Measuring the Information Society (MIS) used to be published yearly since 2009, until 2017 after last publication board members wanted to change the way to calculate the IDI for 2018 publication but because of some problems even after having an election to change or not the way the of calculation it didn't publish, in addition to the IDI facts and data, ICT Price Basket (IPB) has been presented in 2017 edition with the latest results along with the first complete price data set for mobile and fixed prepaid and after-paid broadband services (MIS, 2017).

Network Readiness Index (NRI) which offers a comprehensive assessment of the present state of network readiness in the world published together by INSEAD Business School and WEF, NRI plays an important role in publishing The World Economic Forum's (WEF) Global Information Technology Report and presents the state of network readiness in the world by putting together a detailed inquiry about the relationship of ICT and growth (GITR, 2014).

The ICT benefits will be fully beneficial when a country implements and uses a new and unique strategy to which aims to create conditions and opportunities for entrepreneurship and skill innovation to make and achieve modern infrastructure (NRI, 2019).

International Trade: Trade is an economic organization or system in which goods and services are exchanged with each other or with money. Every transaction requires some kind of investment and a sufficient number of customers that can be produced to sell to him on a regular basis for profit. Don B. & Wendell M. (1999) defined international trade as all business activities, including the creation and transfer of resources, goods, services, knowledge, skills, and information that transcend national borders. Resources may include raw materials, energy, technical knowledge and patents, capital, and organizational skills. Goods include manufactured parts, subsets, and assemblies. Services may include accounting, finance, law, consulting, import and export, healthcare, and transportation. Technical knowledge may include product, process, copyright, trademark, and brand technology innovations. Skills may include organizational and managerial skills. Information includes databases as well as information networks.

Colecchia and Schreyer (2001) emphasize that economic growth is achieved by increasing the use of capital and labor by improving multi-factor productivity. With the increasing use of information and communication technology, a new factor of productivity has been formed. In their study, they compared the impact of ICT capital accumulation on manufacturing growth in France, Australia, the United Kingdom, Canada, Finland, Germany, Italy, Japan, and the United States. The results show that over the past two decades, ICT, depending on the country, has contributed between 20/100 to 50/100 percent per year in economic growth. In the second half of the 1990s, this share rose to 30/100 to 90/100 percent per year (Colecchia & Schreyer, 2001).

International trade is a trade whose activities include crossing national borders. This definition includes not only international trade and foreign products, but also the growing service industry in areas such as transportation, tourism, banking, advertising, construction, retail, wholesale, and mass communications (Don B. and Wendell M.1999).

Three forms of international trade (based on three kinds of trade strategies) (Donald, Geringer, Frantz, & Minor, 2005)

Expanding the domestic market with exports: Companies that follow this strategy find all production performance and, as far as possible, marketing performance in their own country.

Multi-house company: An organization looking for companies affiliated with several countries that understand their business strategies based on market differences. Similar to a Holding Company - Strict financial control of the workplace, but its subsidiaries have considerable independence in formulating their business strategies based on perceived differences in the market, with central office managers retaining a veto.

Global company: An organization that strives to perform standardization and integration operations worldwide in all areas of operation. Global corporate governance views the global economy as a single market. There is a strong central authority with global executives in performance areas such as marketing and manufacturing, etc. who try to standardize their activities around the world and there is no international division. Management functions such as strategic planning and budgeting are performed globally.

In addition, Scupola (2003) emphasizes the positive impact of using Internet-based technologies on increasing market power and competitiveness of SMEs (Scupla, 2003).

Scopula (2009), after studying Italian SMEs, continued to research in Denmark and Australia and their e-commerce usage. As a result, both studies showed that the availability and quality/ of ICT consulting services have a significant impact on the acceptance of e-commerce from medium and medium-sized companies (Scopla, 2009).

According to Özkanli, Benek, and Akdeve (2006), while high-tech companies tend to move internationally, the enormous impact of ICT use on exports has led to Companies with lower technology levels should demand in domestic markets or less from foreign markets (Ozkanli, Benek, & Adeve, 2006).

Banomyung (2010) argues that the development of communication technologies and logistics services has created a global market and transformed supply chain management. Supply chain management shows the easiest way and guides the manufacturers, suppliers, and distribution centers to deliver all the products under the right conditions to the right place at the right time (Christopher & Towill, 2001).

In addition, Kotnik and Hagsten (2013), in their study of countries ICT and export capabilities, show that in a number of European countries there is a positive relationship between ICT use and corporate exports - where the use of information and communication technology is measured by online presence, the use of online transactions, the intensive human capital of information and communication technology and the ratio of employees with quick access to Internet capacity (Kotnik & Hagsten, 2013).

ICT and International Trade Relation

The importance and high position of new technologies and the important role of communication in various social categories, has turned the current era into a "communication era". New technologies in various cultural, political, and economic fields have now emerged to the point, where not considering or less considering them today will cause backwardness.

On the other hand, new technology is based on information and communication, which today has left amazing and unique effects in the information and communication industry for various purposes. Now the innovations of scientists and researchers are based on these new technologies of collecting, accumulating, and disseminating information, in the meantime, any media that has the ability to transmit and move information and aims to communicate is in the realm of communication technology.

From the beginning Information and communication technologies (ICT) had importance in human development history, through this history ICT played a role by implicating the economic, social and cultural interaction among human, from collecting, producing, exchanging, and storing to distributing and supplying, especially after 1990 with the increase of internet usage ICT started being used in all type of human activities especially in economic activities from infant industries to advanced production process by public and private production. Because of the mentioned reasons and based the opportunities which give countries and companies access to bigger and larger markets, let them extend their customer support, increase their productivity and raise profit ICT has known one of the most considered factors for increasing productivity, efficiency, and overall performance of a system, new information and communication technologies have created a great change in the economy and network of commercial markets, and has facilitated trade exchanges and the achievement of goals and the development of business plans; as a large part of business transactions are now done online.

The development of information and communication technology has accelerated dramatically in the last decade globally, and according to this event, the "global economy" has accelerated and on the other hand, has fueled the leap of information and communication technology (Ahmad & Ridzuan, 2013).

ICT has extremely changed and reshaped every system and activities which operate under it, ICT has made a huge impact on trade which is part of economic activities, especially on international trade which is an important and valuable factor key for economic growth, providing employment, raising living standards and giving citizens or consumers enjoyment by providing a greater variety of products, by giving local companies easy and faster access to bigger and broad markets, this strange phenomenon of the present century has accelerated the process of globalization and increased the desire to invest in this technology in developed and developing countries.

This study mainly examines the impact of the use of information and communication technology (ICT) on the integration of countries with global trade and investigates a model that examines the relationship between the use of information and communication technology (ICT) countries and their Trade/GDP ratio.

Conclusion and Discussion

The main purpose of this study is to investigate the effect of ICT on the Trades to GDP ratio and the possible reasons for these effects. To understand this, GCI data for the past ten years were examined. In the end, it can be seen that apart from other pillars, a country's Trade/GDP ratio also depends on the country's health and primary education, Macroeconomy environment, financial market development, technological readiness, and innovation capability, which is highly related to it.

To go deeper, a new analysis was applied to the ICT-related sub-pillars which are Technology readiness and innovation and it is observed that among the ICT-related sub-pillars, the following are very influential in the Trade/GDP ratio, if not Intended a time lag:

- Availability of latest technologies
- FDI and technology transfer
- Individuals Using internet
- Government procurement of advanced tech products
- Availability of scientists and engineers

The FDI and technology transfer and Government procurement of advanced technological products are the negatively related sub-pillars with the Trade/GDP ratio of a country. It is obvious that investing in advanced technology and absorbing the technology of companies in many countries reduces the country's Trade surplus, because it increases imports, especially in the short term. Similarly, government purchases of high-tech products increase a country's imports and, consequently, reduce its Trade surplus. In fact, both sub-pillars can be considered as the main factors for a country's technology imports.

On the other hand, it can be seen that three sub-pillars significantly affect a country's export positively, which are Individuals using the internet, the University-industry collaboration in R&D (as well as Quality of scientific research institutions pillar, which is highly correlated with it) and the availability of scientists and engineers. These three sub-pillars represent the quality of ICT usage in a country. the University-industry collaboration in R&D and the quality of the scientific research institutions may be considered as one of the drivers of the ICT usage efficiency as the increased quality in these institutions probably represents an increase in Research and Development (R&D) activities, which is closely related with the efficiency usage (World Bank, 2012; WEF, 2015).

This study is mainly done on the relationship between the use of Information and Communication Technology and the ratio of Trades/GDP of 21 countries including developed and developing countries. Unlike other studies in the literature, the main focus of this study was to identify the significant factors related to ICT in internationalization and to present an idea of the place of investment, and to show the possible bottlenecks and areas for improvement.

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