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TELECOMMUNICATIONS REVOLUTION AND ITS EFFECTS ON ECONOMIC DEVELOPMENT: AN APPLIED STUDY OF DEVELOPING ECONOMIES SUCH AS EGYPT, SAUDI ARABIA AND INDIA.

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ABSTRACT: *This paper examines econometrically the relationship between Telecommunication Revolution (TR) and economic development in three developing countries (Egypt, Saudi Arabia, and India) through period from 1990 to 2011. It measured (TR) by three variables ((Mobile Cellular Telephone Subscribers, Internet Subscribers, Fixed Telephone Connections) as independent variables and took five indicators for economic development as Dependent Variables {Gross Domestic Product (GDP) Growth Rate (GR), Rate of Inflation (consumer prices, annual %) (IR), Rate of Unemployment (% of total labor force) (UR), Growth Rate of Exports (XR), and Exchange Rate (ER)}, and used Factor analysis technique to obtain command factor: Principal Component Values (PCV) as a proxy variable for economic development, which consists of total sum of component matrix multiply by each of five variables of economic development ((GR, IR, UR, XR, and ER) in the three countries. The result of estimation shows that telecom revolution has a positive and significant effect on economic development in both Egypt and India, but the relationship is weak in Saudi Arabia, except with the effect of mobile cellular telephone subscribers having a positive effect on some economic development indicators such as Growth Rate of GDP, and Exchange Rate, and Command Factor and negative relation with unemployment and inflation rate). This in turn supports the hypotheses of the paper. Where telecom revolution leads to reduce unemployment and inflation in Saudi Arabia, but this result is not achieved in other two countries of the study.*

KEYWORDS: Telecom Revolution, Economic Development, Information and Communications Technology, Knowledge Economy.

INTRODUCTION

In the past few decades there has been a revolution in computing and communications, and all indications are that technological progress and use of information technology will continue at a rapid pace. The ongoing computing and communications revolution has numerous economic and social impacts on modern society and requires serious social science investigation in order to manage its risks and dangers. Such work would be valuable for both social policy and technology design. Decisions have to be taken carefully by the world

countries. Many choices being made now will be costly or difficult to modify in the future.[1] Access to information and communications technologies has become crucial to a sustainable agenda of economic development and poverty reduction, and yet access remains concentrated in a few regions and population groups, with the contours of this new 'digital divide' closely following and supplementing existing income and economic divides. Remembering that the technological innovations, economic pressures, and regulatory reforms are making access to information and communications technologies more affordable and providing opportunities to close the digital divide.

There is a significant social and economic impact of the information and communications revolution and the threat of a widening digital divide as a key dimension of poverty have prompted policymakers and development institutions worldwide to take measures to ensure that all have access to communications, information, and ultimately knowledge. Under liberalized conditions, the telecommunications market has proved remarkably effective in extending the communications network to large territories, including in many instances, poor rural and remote areas.[2] Telecommunications Revolution (TR) started at the end quarter of the twentieth century, without a doubt, one of the single greatest changes in society in the last 50 years has been the telecommunications revolution.[3] It encouraged the information technology revolution, and it made knowledge available for economic development. Knowledge economies and trade in services and information became great part in GDP in all countries (developed and developing countries). So the present study examines the effect of telecom revolution on economic development of three developing countries such as Egypt, Saudi Arabia and India. The effects of TR is measured in terms of GDP growth rate, rate of inflation, rate of unemployment, growth rate of exports, and foreign exchange rate of currency in selected countries.

Assumptions

We assume that TR can be measured in terms of increase in the number of mobile cellular telephone subscribers, the number of internet subscribers which include the fixed wired and broad band connections, and the number of fixed telephone connections in the selected countries. The main variable to measure economic development is economic growth rate or growth rate of GDP. This paper uses these variables in three developing countries such as Egypt, Saudi Arabia, and India through the period from 1990 to 2011.

Hypotheses

The main hypothesis is that economic development has improved by telecommunication revolution through its effects on all variables of economic development. This hypothesis is

[1] Konsbruck Robert Lee (2009), "Impacts of Information Technology on Society in the New Century", Route de Chavannes, Switzerland., http://www.zurich.ibm.com/pdf/news/Konsbruck.pdf

[2] Juan Navas., Sabater et.al, "Telecommunication and the Information Services for the Poor: Towards a Strategy for Universal Action", World Bank Discussion Paper No. 432, The World Bank, Washington D.C. April2002.http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/telecoms_for_the_poor.pdf

[3] Stages of the Telecommunication Revolution eHow.com, http://www.ehow.com/info_8546888_stages-telecommunication-revolution.html#ixzz252I4Qn2u.

divided to many hypotheses like the telecommunication revolution will lead to improve in growth rate of GDP, and decrease in inflation rate, and it reduces the unemployment rate, increases growth rate of exports, and it improves the foreign exchange rate of a country's currency.

METHODOLOGY

This paper depends on econometrical approach by using time series data analysis, it uses SPSS package in estimating the effects of telecommunication revolution variables on economic development variables.

Objectives

Telecommunication and information technology revolution has been affected on economic development in all its aspects, so this paper aims to estimate the effects of telecom revolution on economic growth, inflation rate, unemployment rate, growth rate of exports, and foreign exchange rate of currency in Egypt, Saudi Arabia and India. It explains the role of telecommunication revolution in economic development and building knowledge economy in the selected countries.

Definition of telecommunications revolution

In recent years, the word *telecommunications* has been used so often, and applied in so many situations, that it has become part of our daily lexicon, yet its definition remains elusive. So, let's start with a definition. The word *telecommunications* has its roots in Greek: *tele* means "over a distance," and *communicara* means "the ability to share." Hence, *telecommunications* literally means "the sharing of information over a distance." Telecommunications is more than a set of technologies, it's more than an enormous global industry (estimated to be US$2.5 trillion), it's more than twenty-first-century business and law that is being re-created to accommodate a virtual world, and it's more than a creator and destroyer of the state of the economy. Telecommunications is a way of life. Telecommunications affects how and where you do everything—live, work, play, socialize, entertain, serve, study, teach rest, heal, and protect. Telecommunications has served a critical role in shaping society and culture, as well as in shaping business and economics.[4]

Telecommunications Revolution (TR) which in recent times has experienced a phenomenal growth both as an industry and in applications may be characterized by the use of computers, the internet, cellular phones, e-business or commerce, video-conferencing, etc.[5] The question now is to what extent Information and Communication Technology (ICT) or Telecommunications Revolution (TR) has impacted our world. In fact, what solutions has TR provided to the prevailing problems in our world which we may refer to as development and at the same time what problems has TR created in effect.

[4] Goleniewski, L,(2001), " ***Understanding the Telecommunications Revolution***" in http://www.informit.com/articles/article.aspx?p=24667

[5] Idowu , Sunday A. and Oludele A.(2010)," Information and Communication Technology (ICT) Revolution: Its Environmental Impact and Sustainable Development" ***(IJCSE) International Journal on Computer Science and Engineering,*** Vol. 02, No.01S, 2010,P.30.

To answer the main question of this study, what is the effect of (TR) on economic development? The present paper with this introduction completes in total five sections: section 2 reviews previous studies on the relationships between economic development and telecommunications revolution (TR), section 3 presents the methodology and definitions of data variables, section 4 has the empirical findings, and section 5 provides conclusions and policy implications based on findings of the study.

REVIEW OF LITERATURE

Tom Farley[6] describes how the telecom revolution happens in the history, he did mention that how mobile telephones, for decades a near dormant technology became the dynamic and perhaps most important communication tool of our lives. He remembered that the commercial mobile telephony began in 1946. The cellular radio concept was published in 1947. But only since 1995 have mobiles become low cost, rich in features, and used worldwide. As mentioned by Alberts and Daniel,[7] complexity and change are the two defining characteristics of the Information Age. With the fall of communism in Eastern Europe and the dissolution of the Soviet Union, the Cold War ended, and the half-century-old bipolar international system disappeared. These were earthshaking events that rightly received and are receiving extensive study and analysis. They occurred for a host of reasons, many of which were related to the drastic changes in the communication systems and high speed revolution in data transfer and usage systems.

According to Vineet Kaul,[8] we are living at the crest of a communications revolution. In his article he studied on different aspects of communication systems by covering some basic ideas, approaches, and methodologies and gauges the degree of the current state of digital communication studies together with its research into mass communication. He opined that the very essence of the technological revolution is the radical development in digital communication and computing. As mentioned in the NEPAD,[9] the current economic revolution has, in part, been made possible by advances in information and communications technology (ICT), which have reduced the cost of and increased the speed of communications across the globe, abolishing pre-existing barriers of time and space, and affecting all areas of social and economic life. Rapid advances in technology and the diminishing cost of acquiring the new ICT tools have opened new windows of opportunity for world countries to accelerate their economic growth and development. A.R.Thurik, Panteia Zoetermeer and Jena[10] in their

[6] Tom Farley, Freelance Telecom Writer, Telektronikk, West Sacramento, California, April, 2005. http://www.telecomwriting.com/archive/TelenorPage_022-034.pdf

[7] "The Information Age: An Anthology on Its Impact and Consequences" Edited by David S Alberts and Daniel S Papp., CCRP Publication Series 1997. http://www.dodccrp.org/files/Alberts_Anthology_I.pdf

[8] Vineet Kaul, "The Digital Communications Revolution", Online Journal of Communications and Media Technologies, Vol.2, Issue 3, July 2012. http://www.ojcmt.net/articles/23/237.pdf

[9] The New Partnership for Africa's Development, NEPAD, October 2001. http://www.nepad.org/system/files/framework_0.pdf

[10] A.R.Thurik, Erasmus University Rotterdam, EIM/Panteia Zoetermeer, Max Planck Institute of Economics, Jena, Free University Amsterdam, "The 'Managed' and the 'Entrepreneurial' Economy", World Entrepreneurship Forum, 2008 Edition.
http://www.google.com.sa/url?sa=t&rct=j&q=pdf+files+of+telecommunications+revolution+and+its+impact+on+economic+development&source=web&cd=13&cad=rja&ved=0CD0QFjACOAo&

paper mentioned how the model of the managed economy brought unprecedented growth. They identified that on the one hand there is the advent of new competition from low-cost, but relatively high educated and skill intensive, countries in Central and Eastern Europe as well as in Asia. They concluded that the joint effect of the computer and telecommunications revolution and globalization not only changed the fundaments of modern economies.

According to the report produced by Rockefeller Foundation[11] we would see a more integrated global economy with high trade volumes, which enables access to a wider range of goods and services through imports and exports, and the increasing specialization of exports. The potential for economic development in the developing world would be reduced by the fragility of the overall global economy, thereby hindering agreement on and implementation of large scale, interconnected telecommunication solutions to pressing global challenges. On the other side of the fact that as mentioned in the ICT Development Report,[12] telecommunication and cellular networks already cover close to 90 per cent of the world population, and we expect coverage to reach 100 per cent by 2015. The report is also confident that by 2015 more than half of the world population will be using a mobile telephone. It is widely recognized that ICTs are increasingly important for economic and social development. Darrel West[13] identified that the telecommunications technology has expanded dramatically around the world. According to the Cisco Visual Networking Index, global mobile data traffic has doubled for the fourth year in a row. And looking toward the future, the report estimates that "global mobile data traffic will increase 18-fold between 2011 and 2016". By the end of that time period, it is projected that there will be 10 billion mobile devices in use around the world. Along with 3G and 4G, these advances have had a huge impact on many walks of life.

Hence, an overview of literature on how some of the countries got benefited to the early ages of information technologies and results of such advancements in communication networks has been discussed further in this section of review of literature. Anne K. Bingaman[14] of United States of America (USA) explained that the telecommunications and information

url=http%3A%2F%2Fwww.world-entrepreneurship-forum.com%2Fcontent%2Fdownload%2F1697%2F39642%2Fversion%2F2%2Ffile%2FThurik_Managed%2520and%2520Entrepreneurial%2520Economy.pdf&ei=ZtAbUe_TKYXKsgae_YHYDg&usg=AFQjCNHufXukFdFuGT20ogQarcsao0YeuA

[11] "Scenarios for the Future of Technology and International Development", Report produced by The Rockefeller Foundation and Global Business Network, May 2010. http://www.rockefellerfoundation.org/uploads/files/bba493f7-cc97-4da3-add6-3deb007cc719.pdf

[12] Dr Hamadoun I. Touré, Secretary-General, International Telecommunication Union speech in the Report of "World Telecommunication/ICT Development Report 2010: Monitoring The WSIS Targets, A mid-term review", 2010. http://www.uis.unesco.org/Communication/Documents/WTDR2010_e.pdf

[13] Darrell West, "How Mobile Devices are Transforming Healthcare", Journal of Issues in Technology Innovation, Centre for Technology Innovations at Brookings, Number 18, May 2012. http://www.brookings.edu/~/media/research/files/papers/2012/5/22%20mobile%20health%20west/22%20mobile%20health%20west.pdf

[14] Anne K. Bingaman, Assistant Attorney General, Antitrust Division, U.S. Department of Justice before the Networked Economy Conference, USA, presented the document titled "Competition Policy and the Telecommunications Revolution" on September 26, 1994. http://www.justice.gov/atr/public/speeches/0113.pdf

sector of economy, which already accounts for nine percent of the USA's Gross Domestic Product (GDP), which could double over the next decade, according to a recent study by the President's Council of Economic Advisers. However, Bingaman, Mc Chesney and Schiller[15] opined that it is imperative that citizens organize to create new communication policies in order to preserve and promote democratic values. Few industries, indeed, have been as changed by capitalist globalization as communications. Prior to the 1980s, national media systems were typified by domestically owned radio, television and print media. Jeffrey D. Sachs[16] specified that the intervention focuses on regional integration as a sine qua non for economic growth. The fifteen of the forty-nine countries in sub-Saharan Africa that are landlocked have little chance to develop unless they have ready access to the coast with efficient, low-cost telecommunication infrastructure. Regional integration is also important in achieving scale economies in infrastructure networks and telecommunications; hence a regional backbone of information and communications infrastructure is required.

From another study conducted by Williams and Mayer,[17] it is understood that the information and communication technologies (ICTs) have been a remarkable success in Africa. Across the continent, the availability and quality of service have gone up and the cost has gone down. In just 10 years dating from the end of the 1990s mobile network coverage rose from 16 percent to 90 percent of the urban population; by 2009, rural coverage stood at just under 50 percent of the population. The authors described the financial side of the telecommunications revolution in Africa and details how the massive investments have been financed and which companies have most influenced the sector. In an interview[18] with Saud Bin Majed Al-Daweesh, CEO, STC Group, Kingdom of Saudi Arabia, told that "many countries is witnessing the socio-economic impact of the ICT revolution". He described that this revolution has happened because of the rapid development of ICT infrastructure and usage in the Kingdom. Domestic broadband penetration has increased from nothing in 2005 to more than 44% today, while mobile penetration increased from 60% to 191% over the same period. One of the economic development objectives in the country's ninth economic plan is to evolve into a knowledge economy, of which ICT is a crucial component as it enables the expedient storage, transmission and processing of vast amounts of information around the world.

[15] Robert W. Mc Chesney and Dan Schiller, "The Political Economy of International Communications", Foundations for the Emerging Global Debate about Media Ownership and Regulation, Technology, Business and Society Programme, United Nations Research Institute for Social Development (UNRISD), Paper Number 11, October 2003. http://www.unrisd.org/unrisd/website/document.nsf/462fc27bd1fce00880256b4a0060d2af/c9dcba6c7db78c2ac1256bdf0049a774/$FILE/mcchesne.pdf

[16] Jeffrey D. Sachs, "Ending Africa's Poverty Trap", Columbia University and UN Millennium Project, Brookings Papers on Economic Activity, 1:2004. http://www.unmillenniumproject.org/documents/BPEAEndingAfricasPovertyTrapFINAL.pdf

[17] Williams Mark D. J and Mayer, Rebecca Michael., "Africa's ICT Infrastructure: Building on the Mobile Revolution", 2011. https://openknowledge.worldbank.org/handle/10986/2325

[18] Foreword of Saud Bin Majed Al-Daweesh, STC Group CEO in the report on ICT in Saudi Arabia, A socio-economic impact of the ICT revolution, October 2011. http://www.enlightenmenteconomics.com/Reports/assets/ICTinSaudi%20Arabia.pdf

It is also mentioned in the remarks[19] of Dr Mohammed Al Suwaiyel; Governor of the Communications and Information Technology Commission (CITC), Kingdom of Saudi Arabia, one sector in particular is showing some of the most promising developments modern Saudi Arabia has witnessed that we are on the threshold of an ICT revolution. "Since being set up in 2002, the CITC has granted three mobile provider licenses, two for 3G services, two for data services as well as four VSAT provider licenses", he added. According to the memorandum of USAID's,[20] in Egypt, with USAID and other donor assistance, the number of telephone lines in Egypt increased from 0.5 million in 1977 to 4.5 million in 1997. It is also planned to conclude infrastructure activities in the power and telecommunications sectors in 2001 but will continue sector activities related to policy reforms and institution building after that time. Another report of Baker & McKenzie,[21] telecommunication services in Egypt have been extensively upgraded and are considered relatively modern. Main lines telephone services are provided by the government-controlled Telecom Egypt, with an estimate of 10.313 million lines in 2009. According to the report, there are three main mobile cellular service providers, Mobinil, Vodafone Egypt and Etisalat Egypt, with an estimated total number of 55.352 million users in 2009.

Priya Mach[22] mentioned that India has witnessed what many describe as a telecommunication revolution during the last decade. The entire Indian telecommunication industry and government policies related to this sector have undergone a sea of change, going a long way in bridging the digital divide. In just ten years, once a luxury item, the telephone has now become a necessary commodity in the country. Efforts are currently underway to connect every corner of the country to the Internet, thereby ushering India in a new information revolution. Ashok Jhunjhunwala et.al,[23] mentioned in their case study that the telecommunications had been the sunshine industry of the 1990s in India and has since continued its dominant role in the growth of the Indian economy. It has witnessed robust growth rates boosted by an especially strong performance in the mobile telephony market. The significant growth, the tele-density levels of India (27.02) are still very low when

[19] "The Kingdom of Saudi Arabia: Strategic Powerhouse, Global Strength", Part II, Special Report prepared by Strategic Media, KSA, 2012. http://www.sagia.gov.sa/Documents/Download%20center/International%20Media%20%20Publications/saudi_arabia_2.pdf

[20] Memorandum of United States of America Agency for International Development (USAID), Office of the Regional Inspector General/Audit, Cairo, Egypt, Report No. 6-263-99-004-P, July 20, 1999. http://oig.usaid.gov/sites/default/files/audit-reports/6-263-99-004-p.pdf

[21] Doing Business in Egypt, 2011, Baker & McKenzie Report prepared by Hazim Rizkana, Suzan Farid, Tamer ElHennawy, Sherif El Hosseny, Hatem Darweesh, Waleed Shoukry, Amr Baggatto, Mahmoud Sabry, Farida Mortada and Mohamed Yehia. http://www.bakermckenzie.com/files/Publication/0b7a4e3f-6947-4266-9c34-34fed229a0f1/Presentation/PublicationAttachment/5358c82d-982a-4ce5-a73e-386b876e4e21/bk_egypt_dbi_11.pdf

[22] Priya Mach, "Telecommunication Revolution in India", Report on status and policies of India's Telecom Sector, 2010, Scribd.com. http://www.scribd.com/doc/38582798/Telecommunication-Revolution-in-India

[23] Ashok Jhunjhunwala, Sudhalakshmi Narasimhan and Anuradha Ramachandran, "Enabling rural India with information and Communication technology initiatives: Case Study: India", Published by International telecommunication union and Korea agency for digital opportunity and Promotion, Symposium on Building Digital Bridges, Busan, republic of Korea, 10-11 September 2004. http://www.itu.int/osg/spu/ni/digitalbridges/docs/casestudies/India.pdf

compared to other developing countries like china (42.3) and Brazil (42.38) in 2004. However, there is an increase in spending on information and communication technology (ICT) as a percent of GDP from 2.1 percent in 1995 to 3.9 percent in 2001.

Review on Present Status of Telecom Sector in Egypt, Saudi Arabia and India.

Fueled by rapid technological innovations, the past two decades have witnessed dramatic transformations of telecommunications regulation around the world.[24] More than 150 countries have introduced new telecommunications legislation. Currently, the telecommunications sector's revenue from services alone accounts for approximately two to three percent of GDP in most countries. In many developing countries, regulators now oversee a wide range of regulatory functions. Their responsibilities include setting capacity expansion targets, approving tariffs including interconnection charges, setting technical standards, facilitating technology transfers and licensing, arbitrating disputes among operators and users, allocating spectrum frequencies, monitoring service quality, and others. In the light of these issues the status of telecom sector in Egypt, Saudi Arabia and India selected for the present study has extended further this section of review of literature.

Egypt[25]

In light of the national policy towards enhancing cooperation with Africa, MCIT has made successful steps towards achieving this goal. The number of fixed line and mobile subscriptions was 100.49 million at the end of Q1 2012, compared to 83.52 million at the end of Q1 2011, with an annual increase of 16.97 million subscriptions and an annual growth rate of 20.32%. The number of mobile subscriptions was 91.92 million at the end of Q1 2012, compared to 73.87 million at the end of Q1 2011. This represents an annual increase of 18.05 million subscriptions and an annual growth rate of 24.43%. Mobile subscriptions accounted for 91.5% of total telephone service subscriptions at the end of Q1 2012. Total number of fixed line subscriptions has reached 8.57million subscriptions at the end of Q1 2012 compared to 9.65 million subscriptions at the end of Q1 2011. Estimated number of Internet users increased to 30.90 million at end of Q1 2012, compared to 24.15 million at the end of Q1 2011, representing an annual increase of 6.75 million users and an annual growth rate of 27.96%. Internet penetration increased to 37.88% at the end of Q1 2012, compared to 30.77% at the end of Q1 2011, representing an annual growth rate of 7.11%.

Saudi Arabia[26]

Because of the growing role of information technology in the nations' economies, the government of the Kingdom of Saudi Arabia has given it top priority. The total number of

[24] Wei Li, University of Virginia, CEPR and Lixin Colin Xu, The World Bank, Working Paper on "Deregulating the Telecommunications Sector in Developing Countries: The Role of Democracy and Private Interests". http://cepr.org.uk/meets/wkcn/7/753/papers/wei_li.pdf

[25] Information and Communications Technology Indicators Bulletin: March, 2012, Arab Republic of Egypt, Ministry of Communications and Information Technology (MCIT), Egypt, March 2012, Quarterly Issue. http://www.mcit.gov.eg/Upcont/Documents/Publications_2022013000_ICT_Indicators_Quarterly_Bulletin_Q1_EN.pdf

[26] Sector Indicators, ICT Indicators in K.S.A, 2012, Ministry of Communications and Information Technology (MCIT), Kingdom of Saudi Arabia. http://www.mcit.gov.sa/english/Development/SectorIndices/

mobile subscriptions grew to around 53.1 million by end of M9 2012, with penetration standing at 181.2%. Fixed telephone lines stood at 4.74 million by the end of M9 2012, of which around 3.4 million or 71% were residential lines. The population teledensity is around 16 %. Fixed Broadband subscriptions including DSL subscriptions, Fixed Wireless (Wimax) subscriptions and other fixed lines have grown to around 2.21 million at the end of H1 2012. The Fixed Broadband penetration rate stood at around 36.4% of households at the end H1 2012. Total subscriptions to mobile broadband reached 11.73 million by the end of M9 2012, representing a penetration percentage of 40% of the population. Mobile broadband market continues to gain momentum and is becoming an increasingly exciting market. The number of Internet users grew from around 1 million in 2001 to an estimated 15.2 million by the end of M9 2012. Internet penetration increased to 52% of the population by the end of M9 2012.

India[27]

Indian Telecommunication sector maintained the impressive growth rate during the year 2011-12. Indian telecom network has 926.55 million connections at the end of December'11 with 893.86 million wireless connections and is the second largest network in the world after China. The one billion mark also appears to be achievable. The penetration of internet and broadband has also improved with 20.99 million internet subscribers and 13.30 million broadband subscribers across the country. Telecom sector has witnessed a continuous rising trend in the total number of telephone subscribers. From a mere 22.81 million telephone subscribers in 1999, the number increased to 846.33 million at the end of March, 2011. Wireless telephone connections have contributed to this growth as their number rose from 165.09 million in 2007 to 893.86 million at the end of December'11. The wire line connections have however, declined from 40.77 million in 2007 to 32.69 million in December'11.

METHODOLOGY AND DATA

The entire study follows the model of multi-regression with a develop command factor representing the economic development of a country by using the independent and dependent variables for factor analysis processed in SPSS computer programming and therefore provides the econometric analysis of results related to three countries selected for the present study such as Egypt, Saudi Arabia, and India. The descriptions of variables and model of the study are as follow. *Independent variables:* include number of mobile cellular telephone subscribers (NM), number of internet subscribers (NI), number of fixed telephone connections (NT). *Dependent variables:* include GDP growth rate (GR), rate of inflation (IR), rate of unemployment (UR), growth rate of exports (XR), and foreign exchange rate of currency (ER). *Command factor:* This consists of dependent variable through factor analysis as a Principal Component Values (PCV*),* indicator as (*proxy variable*) of economic development. The estimation of the parameters shows the relationship between independent

[27] Annual Report 2011-12, Department of Telecommunications (DOT), Ministry of Communications & Information Technology (MCIT), Government of India (GOI), New Delhi. http://www.dot.gov.in/annualreport/AR%20Englsih%2011-12.pdf

variables, dependent variables and command factor through the following multy regression model.

Model of the Study

The study tests the main hypothesis, which is economic development of a country has improved by telecommunication revolution through its effects on all variables of economic development, hence the model is specified and formulated as follows:

$$GR_J = f(NM_J, NI_J, NT_J) \qquad (1)$$

$$IR_J = f(NM_J, NI_J, NT_J) \qquad (2)$$

$$UR_J = f(NM_J, NI_J, NT_J) \qquad (3)$$

$$XR_J = f(NM_J, NI_J, NT_J) \qquad (4)$$

$$ER_J = f(NM_J, NI_J, NT_J) \qquad (5)$$

$$\prod_J = f(NM_J, NI_J, NT_J) \qquad (6)$$

Where (J) represents to the country (Egypt, or Saudi Arabia, or India), ($\prod_J$) represents to the command factor (PCV), which is driven from the five variables of economic development (GR, IR, UR, XR, and ER), so we can formulate the econometrical model as follow:

$$GR_J = \alpha_0 + \alpha_1 NM_J + \alpha_2 NI_J + \alpha_3 NT_J + \varepsilon \qquad (7)$$

$$IR_J = \beta_0 + \beta_1 NM_J + \beta_2 NI_J + \beta_3 NT_J + \varepsilon \qquad (8)$$

$$UR_J = \chi_0 + \chi_1 NM_J + \chi_2 NI_J + \chi_3 NT_J + \varepsilon \qquad (9)$$

$$XR_J = \delta_0 + \delta_1 NM_J + \delta_2 NI_J + \delta_3 NT_J + \varepsilon \qquad (10)$$

$$ER_J = \phi_0 + \phi_1 NM_J + \phi_2 NI_J + \phi_3 NT_J + \varepsilon \qquad (11)$$

$$\prod_J = \gamma_0 + \gamma_1 NM_J + \gamma_2 NI_J + \gamma_3 NT_J + \varepsilon \qquad (12)$$

Where:

$\alpha_0, \beta_0, \chi_0, \delta_0, \phi_0, \gamma_0$ are intercepts for equations 1, 2, 3, 4, 5 and 6 respectively.

$\alpha_1, \beta_1, \chi_1, \delta_1, \phi_1, \gamma_1$ are parameters of NM in equations 7, 8, 9, 10 ,11, and 12 respectively.

$\alpha_2, \beta_2, \chi_2, \delta_2, \phi_2, \gamma_2$ are parameters of NI in equations 7, 8, 9, 10 ,11, and 12 respectively.

$\alpha_3, \beta_3, \chi_3, \delta_3, \phi_3, \gamma_3$ are parameters of NT in equations 7, 8, 9, 10 ,11, and 12 respectively.

$\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4, \varepsilon_5, \varepsilon_6$ are random variables or error terms in equations 7, 8, 9, 10 ,11, and 12 respectively.

Data Variables

Our empirical work relies on several major sources of data, which we describe more detail in the tables and references appended last. Reflecting the fact that economic development of a country and the telecommunication revolution are multi-faceted, multiple variables are available in time series model of the study. Our research for information of telecommunication revolution indicators (independent variables) as well economic development indicators (dependent variables) of three developing countries selected for the present study are ***Independent Variables***[28] (*Mobile Cellular Telephone Subscribers, Internet Subscribers, Fixed Telephone Connections) and* ***Dependent Variables***[29]***,*** {*Gross Domestic Product (GDP) Growth Rate, Rate of Inflation (consumer prices, annual %), Rate of Unemployment (% of total labor force), Growth Rate of Exports, and Exchange Rate****}, and Command Factor*** *:* Principal Component Values as a proxy variable for economic development, which consists of total sum of component matrix multiply by each of five variables of economic development *(*(GR, IR, UR, XR, and ER) in three countries (Egypt, Saudi Arabia, and India) depending on driving component matrix from processing data in factor analysis by using SPSS package.

Empirical Findings

Three countries are undertaken to determine the effects of telecommunication revolution on economic development. The dependent and independent variables are characterized the effecting factors of telecommunication evolution on economies of selected countries. However a significant effect is being identified throughout the study and the results are analyzed with all such factors involved in the study. The potential effect of telecom revolution on economies of the selected countries has been evaluated throughout the study. Hence all the intercept points and parameters and other dependent and independent variables are supposed to be identified the importance in the present study. Therefore, for the significance of effects of these variables and their comparison between the selected countries are presented in the results in which all the independent variables are determined by dependent variables. The estimated intercept and parameter values, R – Square values, F – Value and t - Value of Statistical Model Equations (equations from 7 to 12 in the methodology section) are presented in Tables numbered from 1 to 6 in this section. The results provided in each table of this section are based on the data processed related to each variable of the model equations (equations from 1 to 6 in methodology section) of all the three countries selected for the study.

[28]Telecom information and communication technology (ICT) indicators definitions, International Telecommunication Union (ITU), Geneva, Switzerland. http://www.itu.int/ITU-D/ict/material/TelecomICT_Indicators_Definition_March2010_for_web.pdf

[29] Data Indicators, The World Bank, United States of America. Visit: www.worldbank.org.

Table 1 Intercept and parameter values, r – square, f – value and t – value of model equation (7) for the estimation of effects of telecommunication revolution on GDP growth rate of selected countries.

Country / *Values*	$GR_J = \alpha_0 + \alpha_1 NM_J + \alpha_2 NI_J + \alpha_3 NT_J + \varepsilon$ (7)						
	α_0	α_1	α_2	α_3	*R Square*	*F Value*	*t Test*
Egypt	4.163	-0.077	1.285	-0.012	0.224	1.731	4.865
Saudi Arabia	3.307	0.348	-4.651	0.222	0.060	0.385	1.188
India	5.323	-0.024	0.550	-0.007	0.318	2.797	5.215

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

In the results of statistical model equation no.7 (Table 1), there is a significant impact of independent variables on dependent variables of all the three countries (α_0 values are more than 1). Whereas a significant and positive but weakness relationship is being identified in the three countries economies with regard to the number of internet users, especially in the Saudi Arabia (R Square is nearer to 0.05). There is a little variance among the three countries in terms of the effect of independent variables on economic growth rate. With a very strong economic growth rate, all the three countries are shown a positive relationship (F values) in the development of economy with a positive impact of independent variables. The value of t test indicates that there is a goodness of fit in the data of three countries depicted a positive relationship among the variables (t values are more than 1). The intercept values of two countries Egypt and India to the number of mobile subscribers ($\alpha_1 \& \alpha_3$) have shown a negative relationship among the two variables. It is otherwise residual and reversing relationship in case of number of internet users of three countries (α_2).

Table 2 Intercept and parameter values, r – square, f – value and t – value of model equation (8) for the estimation of effects of telecommunication revolution on Inflation Rate of selected countries.

Country / *Values*	$IR_J = \beta_0 + \beta_1 NM_J + \beta_2 NI_J + \beta_3 NT_J + \varepsilon$ (8)						
	β_0	β_1	β_2	β_3	*R Square*	*F Value*	*t Test*
Egypt	14.890	-0.081	4.894	-1.617	0.336	3.036	5.676
Saudi Arabia	5.903	-0.233	6.785	-2.731	0.698	13.891	3.842
India	12.009	-0.004	0.267	-0.209	0.607	9.268	10.806

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

Obviously the rate of inflation of any country does effect the consumption of all kinds of goods or services in its' economy. Inflation in Egypt and India has a significant relationship with negative sign and the usage of mobile phones (β_1 almost nearer to 0), where as the number of internet users in Saudi Arabia has been shown much effect (β_2 value is comparatively more) on the rate of inflation as such the country have some negative inflation rates in some of the years undertaken in the study. However, the economies of Egypt and India are severely effect by the world economic turmoil during 1990 – 1993 and 2006 – 2008, hence there is a double digit inflation identified in these two economies during the periods of economic recessions. The change in inflation due to the change in telephone subscribers (β_3 values) is comparatively more positive in India, where as a little impact in relationship of dependent and independent variables are being observed in the case of Egypt and Saudi Arabian telecom subscribers.

The economic reforms in the telecom sector of India were started in the early 1990s and it was began in Egypt and Saudi Arabia during 2003 which has made the public in these three economies to overhaul the usage of telecommunications and hence there is a significant relationship is being observed among the two variables. The R squared fraction values of three countries are almost nearer to 0.5 (standard value at 50 %) and hence the variance of dependent variables (Table 2, Equation 8) has completely transformed by the independent variable, i.e. there is a systematic development in the telecom sector during the study period is being observed which in turn shows an effect on rate of inflation in all the three countries. F values of the model equation clearly represent the economies of Egypt (3.036) and India (9.268) has under the constant pressure of inflation and therefore the NM, NI and NT variables are less weighted than Saudi Arabia (13.891). There is a little difference in the relationship among all the variables is being observed between India and the two other countries (t values). Therefore, observational or expected values of constant incept β_0 reflects that there is always a positive relationship among the dependent and independent variables of the study.

Table 3 Intercept and parameter values, r – square, f – value and t – value of model equation (9) for the estimation of effects of telecommunication revolution on Unemployment Rate of selected countries.

Country / *Values*	$UR_J = \chi_0 + \chi_1 NM_J + \chi_2 NI_J + \chi_3 NT_J + \varepsilon$ (9)						
	χ_0	χ_1	χ_2	χ_3	*R Square*	*F Value*	*t Test*
Egypt	9.724	-0.013	0.484	-0.054	0.097	0.645	15.565
Saudi Arabia	-0.924	-0.241	2.938	1.565	0.938	90.998	-2.174
India	2.182	0.000	-0.015	0.053	0.600	8.995	6.837

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

Unemployment rate does have a severe impact due to lack of communication facilities and services among the people in an economy. With an assumption in the hypothesis that there is a decrease in unemployment rate by the development in telecommunication sector of an economy, the results obtained for the model equation no. 9 are presented in Table 3 above. It is revealed that except the Saudi Arabia, the two other countries (Egypt and India) have a weak positive relationship in their variables. There is a significant and a highly positive relationship effect is being identified among the dependent and independent variables of Saudi Arabia (χ_2 and χ_3 value show high value) and Egypt and India (χ_0 value shows higher values). However, there is a linear impact (χ_1, χ_2, χ_3 values) of all the independent variables on unemployment rate of three countries. The rate of unemployment in Egypt throughout the study period is being observed positively (R Square value is nearer to 0.1) with an effect of increasing number of subscribers for mobile phone and internet as well as fixed telephone users. The variance of unemployment in Saudi Arabia is comparatively does not have any relationship with independent variables, where F value (90.998) is much greater than expected values (1.000). Hence the goodness of fit in t test has a negative value in case of the Saudi Arabia (-2.174) during the entire study period. Therefore, the unemployment rate has been decreased highly due to the developments in the telecom sector of two other countries such as Egypt and India, and in Saudi Arabia in relationship with number of subscribers for mobile phone.

Table 4 Intercept and parameter values, r – square, f – value and t – value of model equation (10) for the estimation of effects of telecommunication revolution on Growth Rate of Exports of selected countries.

Country / *Values*	$XR_J = \delta_0 + \delta_1 NM_J + \delta_2 NI_J + \delta_3 NT_J + \varepsilon$ (10)						
	δ_0	δ_1	δ_2	δ_3	*R Square*	*F Value*	*t Test*
Egypt	1.359	-0.714	8.780	0.998	0.486	5.675	0.293
Saudi Arabia	1.613	-0.269	3.294	0.746	0.021	0.127	0.256
India	9.919	-0.029	0.499	0.125	0.080	0.519	2.090

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

The export of commodities in any economy does have a severe impact on its trading between the host country and other destinations because of lack of proper communication facilities. Interestingly, it is a very good positive sign in the three countries economies (except the sign of δ_1 is negative) that have developed their exports by improving the telecommunication

facilities in their respective countries (model equation 10 in Table 4). Egypt and Saudi Arabia does have a little positive effect of telecom revolution on their exports growth rate (δ_0 tends to reach more than just 1.500), where are a highly positive relationship is being observed in case of India (δ_0 is comparatively more than 1.500). The R squared value is also depicts the same kind of relationship between the variables of three countries. The F value is little more in case of Egypt meaning that there is a significant impact of telecommunication on the country's exports growth rate. The t test is indicating the little higher differential in the date for the period of the study among the three countries. It is observed that there is a linear combination between Egypt and Saudi Arabia in terms of the effects of telecommunication revolution on these countries exports, where as it is reluctantly determined a high level impact of this factor in case of India (t test values are much higher than other two countries).

Table 5 Intercept and parameter values, r – square, f – value and t – value of model equation (11) for the estimation of effects of telecommunication revolution on Currency Foreign Exchange Rate of selected countries.

Country / *Values*	$ER_J = \phi_0 + \phi_1 NM_J + \phi_2 NI_J + \phi_3 NT_J + \varepsilon$ (11)						
	ϕ_0	ϕ_1	ϕ_2	ϕ_3	*R Square*	*F Value*	*t Test*
Egypt	2.365	0.000	0.108	0.291	0.851	34.291	7.829
Saudi Arabia	101.458	1.062	-0.934	-32.160	0.096	0.640	1.382
India	23.694	0.044	-0.849	0.611	0.823	27.906	11.732

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

The intercept and parameter values of three countries are highly arbitrary, where the distribution of ϕ_0 values is observed to be varied at a great extent among each other. As shown in Table 5 containing the static values for model equation 11, it seems to randomly pivot around the observed values meaning that the dependent variable has a lot of deviation through a particular position of standard (ϕ_0 to be even standard at 1.000). The results of other intercepts have a little positional displacements (ϕ_1, ϕ_2, ϕ_3) in terms of their relationship effects. The detailed positions of the sample date (22 years) when jumping evenly from one year to another and even equally spaced between one year to another has been distributed with high variance of intercept regression line (between negative value of ϕ_3 at -32.160 and a positive value of ϕ_0 at 101.458). The fact is that the effect of telecom revolution in the three countries does have a similar effect with one or more independent variables are having a strong relationship with Egypt and India. It means that, in a country like Egypt and India .

The R squared values (more than 0.80) also supporting the data and its arbitrary values. A favorable variance is observed with Saudi Arabia in comparison to the other two countries, as such, the economy of Saudi Arabia is much stronger than the other two developing countries. The rate of exchange value of currency of Saudi Arabia (little more than 3.5 times to equals an US dollar) is very much nearer to the international currency value of US dollar, and hence having shown a little displacement.

Table 6 Intercept and parameter values, r – square, f – value and t – value of model equation (12) for the estimation of effects of telecommunication revolution on Command Factor of selected countries.

Country / *Values*	$\prod_J = \gamma_0 + \gamma_1 NM_J + \gamma_2 NI_J + \gamma_3 NT_J + \varepsilon$ (12)						
	γ_0	γ_1	γ_2	γ_3	*R Square*	*F Value*	*t Test*
Egypt	11.727	-0.509	7.125	0.667	0.510	6.246	3.433
Saudi Arabia	3.579	0.070	-2.451	2.171	0.058	0.372	0.755
India	33.934	0.011	-0.028	0.370	0.623	9.935	12.062

Source: Authors' calculations of data from Table a, b and c in Appendix processed in SPSS Software.

The command factor of the study model also indicates that if the dependent variables in the regression model of the present study have already been transformed in some way with the effects of independent variables, it is because of that much of the variance has already been explained in previous model equations (model equations 7 to 11) which are merely by the choice of an appropriate transformation in the three countries economies in general. In particular to the model equation 12 as shown in Table 6, the results of estimation shows that as we expect the significant and strong positive relationship between all three independent variable and economic development in both Egypt and India (except the sign of γ_1 in case of Egypt and γ_2 in case of india). However, if we fit model equations to the command factor of the study model, it is meaningful to speak of the fraction of 0.058 (R squared value of Saudi Arabia is weak) that we have also managed to explain in the earlier analysis. Consequently, the study would expect the little deviation of the intercepts (γ_1 = -0.509 for Egypt, γ_2=-2.451, -0.028 for Saudi Arabia and India, γ_3 values are positive for three countries).

Upon noticing the static results (R square, F value and t Test) in the model equation of the command factor, everything else being equally affected by the telecom revolution of three countries. This situation is similar to that of a direction in relationship among the dependent

variables and independent variables. Therefore the command factor of the study model does depend on the parameters of the present study and hence the effect of relationship remains constant in all of the model equations.

CONCLUSIONS AND POLICY IMPLICATIONS

From testing the main hypotheses of this paper we can conclude that economic development has improved in the three countries (Egypt, Saudi Arabia and India), but with deferent degrees of improvement in the five variables of economic development (GR, IR, UR, XR, and ER) and command factor (PCV). Where the three independent variables (NM, NI, and NT) have deferent effects on the previous dependent variables as follow: In Egypt GDP Growth Rate(GR) has improved from 5.7 % to 7.2 % through period 1990 to 2008 with improvement in indicators of telecom revolution, but it dropped after 2008, because world financial crisis in the end of 2008, and Egyptian Revolution in 25 Jan. 2011, which affect strongly on (GR) until reach 1.8% at the end of 2011. As this two events (financial crisis and Egyptian revolution) effect on economic growth, they effect on other economic development variables, so the result of regression of three independent variables (NM, NI, and NT) on economic development measured by command factor (PCV) comes as we expected in case of Egypt (with Internet Subscribers, Fixed Telephone Connections), but unexpected especially with the number of mobile subscriptions (NM) by negative sign with low R square at 51% in spite of signifying this relation in equation (12) in table (6).

However in Saudi Arabia all variables of telecom revolution improved, the economic development variables were not improve, where economic development indicators in this country are related with world oil market and affected by wars in Gulf area from 2 august 1990 to 19 march 2003, and world financial crisis in 2008. Where (GR) in equation (7) has very low explanatory power for independent variables (R square was 6%) and sign of parameter (α_2) was negative in spite of signifying this relation, and Unemployment Rate (UR) increased through the period of study from 8.6% to 11.3%, and the effect of three independent variables on economic development in equation (12) insignificant with very low R square (5%) with negative sign for internet users.

India is the second largest network in the world after China, and has witness improvement in all variables of telecom revolution through the period of study, it is also the highest R square in equation (12) in table (6), and the effect of telecom revolution on economic development (PCV) is significant although the sign of (NI) is negative in equation (12), India has the highest export growth rate (XR) in selected three countries, (XR) was increase from 11.1% to 15.3% through the period of study, and reach to 27.2% in 2004. It also has the lowest unemployment rate (UR) less than 5.7% through the period of study.

Policy Implications

Policymakers of various countries around the world recognize the importance and pervasiveness of telecommunications in today's world economy, but a glance at the many outdated and burdensome policies would lead the casual observer to think otherwise. Let us discuss some of the policy implications of the telecom sector in the three countries involved in the present study. Egypt, as one of the largest telecom markets in Africa and the Arab

world, has all the potential and the necessary assets to change in this digital era. In Egypt, currently there is a universal service policy: the provision of affordable basic telecommunication services to all citizens. The aim is to provide access to local, national and international services in the light of total technology neutral and competitive environment. The National Telecom Regulatory Authority of Egypt (NTRA) established in 2003, has undertaken its role to reform the ICT sector and to promote private sector contributions, which is helping establish a promising competitive market. Policy makers in Egypt consider broadband as the engine for development, especially after the recent political and social reform waves. This vision is in accordance with the increasing dependence of citizens' on broadband. On the other hand, challenges that face the Egyptian society on an economic level require adopting a strategy across different sectors that is mainly dependent on ICT. This overall investment on ICT is expected to have a positive impact on the Egyptian economy in terms of productivity (GDP) and job creation (Employment). It is estimated that ICT sector will create 6,650 to 17,500 direct jobs on average per year, and will result in an incremental cumulative contribution to GDP of EGP 24.9 billion (USD 4.17 billion) by the end of 2015. There is also a spillover effect on the other sectors of the economy, but this depends on the political harmonization among other sectors in the country.

In Saudi Arabia, the Ninth Development Plan prioritizes the role of the communications sector, but does not articulate a detailed timeline and plan for increasing the role of ICT in the country's economy. This in itself suggests that ICT could be given greater priority in the national development agenda. Developing a better understanding of the status of ICT adoption and usage in Saudi Arabia would represent a very valuable starting point to encourage ICT adoption and maximize the social returns of investing in ICT. The reason is simple as in the rest of the world; telecommunications demand in the Gulf is exploding. In 1994, the Saudi Telecommunications Company (STC, State owned player) installed 80,000 lines per year. In 2005 it installed 80,000 per month. According to press reports in 2012, the latest Saudi offer in World Trade Organization (WTO) negotiations with the USA includes a sale of a 20–40% share in Saudi Telecommunications Company to a single foreign partner. The competitive trends for the two current players in the Saudi market (STC and Mobily) showing difference in pricing since competition was allowed for foreign players.

India's telecommunication sector has undergone a spectacular policy transformation during the last decade emerging from a highly regulated, state-owned monopoly to a moderately competitive fairly deregulated sector. Today, India possesses the world's fifth largest public sector telecommunications network and Asia's third largest, behind only China and South Korea. Much of the country's telecommunications infrastructure is archaic by international standards. Many of the world's leading multinational telecommunications firms have been drawn to India because of its enormous market potential. The opening of the telecommunications sector created one of the fastest growing and hottest markets for equipment and services in the world. Today vendors from the United States and other countries dominate India's $12.3 billion annual equipment market. Country has achieved the ambitious goals set by the government in the National Telecom Policy (NTP) of 1994 and 1999; as such India has installed approximately 250 million telephones by the end of 2010 at a cost of $106 billion investment. Most of the funds for the expansion came from the United States and other foreign investors.

In conclusion, the effective tax rate imposed on telecommunications firms makes the industry one of the most heavily taxed industries in several nations. With the explosion of new telecommunications technologies and numerous companies all vying to provide similar services, the current patchwork of industry-specific taxes has become obsolete. As part of their economic development strategy for the developing economies like Egypt, Saudi Arabia and India, state policymakers should thoroughly review their current telecommunications tax structures, using the fundamental tax principles of equity, efficiency and simplicity to guide their work. It is essential that future tax laws be flexible enough to respond to the changes taking place in the industry and broad enough to capture future economic activities.

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APPENDIX

Table a: Component Matrix 1: Principal Component Values (PCV) of Dependent Variables with reference to Egypt during the period from 1990 to 2011.

*PCV of Egypt = 0.064*GR-0.136*IR-0.670*UR+0.679*XR+0.845*ER*

Year	Extracted Value of GR	Extracted Value of IR	Extracted Value of UR	Extracted Value of XR	Extracted Value of ER	PCV
1990	0.365	2.285	5.762	4.821	1.310	14.542
1991	0.070	2.679	6.432	2.241	2.653	14.076
1992	0.282	1.850	6.030	8.759	2.805	19.726
1993	0.186	1.646	7.303	0.883	2.831	12.848
1994	0.256	1.115	7.370	0.340	2.865	11.945
1995	0.294	2.135	7.571	7.741	2.865	20.606
1996	0.320	0.979	6.030	1.154	2.865	11.348
1997	0.352	0.626	5.628	-0.679	2.865	8.791
1998	0.256	0.530	5.494	-2.444	2.865	6.701
1999	0.390	0.422	5.427	6.179	2.873	15.291
2000	0.346	0.367	6.030	2.580	2.932	12.255
2001	0.224	0.313	6.298	2.241	3.355	12.430
2002	0.154	0.367	6.834	3.938	3.803	15.096
2003	0.205	0.612	6.968	9.370	4.943	22.098
2004	0.262	1.537	7.169	17.179	5.239	31.386
2005	0.288	0.666	7.504	13.716	4.859	27.033
2006	0.435	1.034	7.102	14.463	4.842	27.875
2007	0.454	1.265	5.963	15.821	4.766	28.269
2008	0.461	2.489	5.829	19.555	4.588	32.922
2009	0.301	1.605	6.298	-9.846	4.681	3.039
2010	0.326	1.537	7.236	-2.037	4.749	11.811
2011	0.115	1.374	7.571	1.765	5.011	15.836

Note: GR – Growth Rate of GDP, IR – Inflation Rate, UR – Unemployment Rate, XR – Exports Growth Rate, ER – Exchange Rate.

Sources:

1. Extracted values are of authors' calculation using SPSS computer programming.

2. PCV is sum of functional equation values calculated in Excel spread sheet application.

Table b: Component Matrix 2: Principal Component Values (PCV) of Dependent Variables with reference to Saudi Arabia during the period from 1990 to 2011.

*PCV of Saudi Arabia = 0.898*GR-0.458*IR-0.115*UR+0.679*XR+0.583*ER*

Year	Extracted Value of GR	Extracted Value of IR	Extracted Value of UR	Extracted Value of XR	Extracted Value of ER	PCV
1990	7.453	0.962	-0.138	1.086	2.186	9.902
1991	8.172	2.244	-0.242	1.765	2.186	10.121
1992	4.131	-0.046	-0.150	5.839	2.186	12.352
1993	0.000	0.504	-0.115	1.630	2.186	3.427
1994	0.629	0.275	-0.242	2.580	2.186	5.362
1995	0.180	2.244	-0.184	3.463	2.186	3.769
1996	3.053	0.550	-0.207	2.512	2.186	7.409
1997	2.335	0.046	-0.242	1.969	2.186	6.686
1998	2.514	-0.183	-0.265	1.426	2.186	6.574
1999	-0.629	-0.595	-0.495	-5.296	2.186	2.649
2000	4.400	-0.504	-0.529	4.006	2.186	11.625
2001	0.449	-0.504	-0.529	-0.747	2.186	2.921
2002	0.090	0.092	-0.598	-4.889	2.186	2.106
2003	6.915	0.275	-0.495	12.833	2.186	22.154
2004	4.759	0.137	-0.552	6.179	2.186	13.539
2005	5.029	0.321	-0.679	9.506	2.186	17.079
2006	2.874	1.008	-0.725	2.309	2.186	7.085
2007	1.796	1.924	-0.644	2.037	2.186	4.740
2008	3.772	4.534	-0.575	8.216	2.186	10.215
2009	0.090	2.336	-0.621	-5.093	2.186	4.531
2010	4.131	2.427	-0.552	3.802	2.186	8.244
2011	6.106	2.290	-0.449	2.105	2.186	8.556

Note: GR – Growth Rate of GDP, IR – Inflation Rate, UR – Unemployment Rate, XR – Exports Growth Rate, ER – Exchange Rate.

Sources:

1. Extracted values are of authors' calculation using SPSS computer programming.

2. PCV is sum of functional equation values calculated in Excel spread sheet application.

Table c: Component Matrix 3: Principal Component Values (PCV) of Dependent Variables with reference to India during the period from 1990 to 2011.

*PCV of India = 0.558*GR-0.733*IR-0.801*UR+0.368*XR+0.855*ER*

Year	Extracted Value of GR	Extracted Value of IR	Extracted Value of UR	Extracted Value of XR	Extracted Value of ER	PCV
1990	3.069	-6.597	1.842	4.085	14.963	26.871
1991	0.614	-10.189	2.083	3.570	19.443	31.732
1992	3.069	-8.649	2.323	1.803	22.162	33.360
1993	2.678	-4.691	1.922	5.078	26.069	36.595
1994	3.739	-7.477	2.964	4.784	26.821	39.857
1995	4.241	-7.477	1.762	11.555	27.728	49.238
1996	4.185	-6.597	1.682	2.318	30.293	41.711
1997	2.232	-5.278	2.083	-0.846	31.045	35.626
1998	3.460	-9.676	2.884	5.115	35.277	50.644
1999	4.743	-3.445	3.124	6.624	36.816	48.505
2000	2.232	-2.932	3.444	6.698	38.424	46.841
2001	2.734	-2.712	3.044	1.582	40.347	44.332
2002	2.176	-3.225	3.284	7.765	41.562	51.444
2003	4.408	-2.785	3.444	3.533	39.826	47.108
2004	4.352	-2.785	3.524	10.010	38.749	52.372
2005	5.189	-3.079	3.524	9.605	37.706	52.054
2006	5.189	-4.471	2.884	7.507	38.740	53.024
2007	5.468	-4.691	4.486	2.171	35.354	43.199
2008	2.176	-6.157	3.925	5.373	37.201	46.982
2009	4.576	-7.990	3.044	-1.766	41.391	49.146
2010	5.357	-8.796	2.323	8.354	39.099	59.283
2011	3.850	-6.524	2.804	5.630	39.903	53.104

Note: GR – Growth Rate of GDP, IR – Inflation Rate, UR – Unemployment Rate, XR – Exports Growth Rate, ER – Exchange Rate.

Sources:

1. Extracted values are of authors' calculation using SPSS computer programming.

2. PCV is sum of functional equation values calculated in Excel spread sheet application.