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Full Length Research Paper

Substantial factors that can influence the Economic growth of Pakistan

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How Economic Growth can be stimulated? This question has called the attention of every policy maker and economist to find the answer. What factors can affect the economic growth? The answer of this question is unclear so far. After the endogenous growth theory as given by Romer (1986, 1990), Lucas (1988) and Grossman and Helpman (1991) Knowledge is being considered as an important and endogenous determinant of Economic growth. The latest knowledge (Technology) is essential for developing countries to catch-up with developed economies. Economic liberalization refers to both trade liberalization and financial liberalization. Trade liberalization means reduction in trade restrictions like tariff, quota or other trade barriers which discourage the international trade. On the other hand, more capital inflow and outflow as a result of Foreign Direct Investment (FDI), portfolio investment or worker remittances show that the country is financially integrating with rest of the world. How the economic liberalization affect the Economy of any particular country. Whether this economic liberalization is good or bad for developing country has become a huge policy debate.

Key words: Technology transmission, Liberalization, R&D Spillovers, Foreign direct investment (FDI).

INTRODUCTION

Almost all developing economies face the scarcity of technology. Technology is very essential to enhance the productivity of factor of production and economic growth. That's why developing countries have low economic growth than developed countries, because the developing countries spend less on research and development while developed countries heavily spend on R & D. Furthermore, high concentration of technology is in the hands of developed counties. According to the Global Competitiveness Report 2011 to 2012, Pakistan ranks at 93 number in term of Availability of latest technology index while India ranks at 47, Turkey 52 and Sri Lanka 63. These figures clearly show Pakistan's weak R&D base as compared to countries of her region. So dependence on foreign source of Technology is very crucial and important for Pakistan. Similarly, World Economic forum which have ranked all the counties to see at what extent business of a country can absorb new technology. According to report (2011 to 12), Pakistan's rank is 92 while India`s rank is 41, Sri Lanka`s 42 and Turkey has ranked at 44. The index which evaluates the capacity of FDI for the transmission of new technology into a country has ranked Pakistan in the rank of 121, India in 38 and Sri Lanka in 45. There are many channels through which Technology

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can be transferred from developed countries. The direct import of Technology embodied machinery and intermediate goods is one channel of transmission of Technology. Foreign direct investment by multinational companies (MNCs) is another source of international Technology transmission. The MNCs import not only Technological modern machinery but also the Ideas and knowledge generated through R & D carried out in parent country. In addition there is movement of employees or managerial talent from developed economies to low and middle income economies when these countries open their economies. Kortum (Many studies have identified the different channels of technology transformation like Eaton 1996) considered licensing agreements as a direct channel of transfer but according to World Investigation Report (2010), the licensing agreement cannot bring the valuable and latest technology.

To absorb the foreign technology brought by foreign investors, the absorption capacity of host country matters a lot. Most studies use an appropriate level of human capital as a measure of absorption capacity[1]. Because, without minimum level of skill or knowledge (absorptive capacity), local firms cannot get knowledge benefit of technology transmission via foreign direct investment (UNCTAD, 2010).[2] To absorb the foreign technology brought by foreign investor, the absorption capacity of host country matters. Most studies use level of human capital as measure of absorption capacity[3]. The negative relationship between foreign direct investment and economic growths indicates the lack of high skilled labor force and basic infrastructure to absorb the foreign technology which comes through foreign direct investment. This lack of capabilities and inefficiencies in technological learning prevent spillover impact of MNC's on economic growth of Pakistan. As without minimum level of skill or knowledge (absorptive capacity) the local firms cannot get knowledge benefit of technology transmission through foreign direct investment (UNCTAD, 2010).[4] Many studies have shown that foreign sources of Technology are important contributor to productivity growth for the developed economies. Less developed economies spend less on R & D and face scarcity of modern Technology. The import of Technology or trans-mission of Technology from developed countries is a key question for their economic growth. There is a lot of controversy regarding the Technology transmission whether it is good or bad for developing countries. Some Economist argues that more open economies have more ability to absorb technology generated in advanced countries. Some economist like Coe and Helpman (1995) showed that transmission of technology and related knowledge from developed counties to developing countries through export and import will be more effective in economies with better and advanced education.

Several economists favor the hypothesis of "learning by exporting". There is a lot of literature which shows that exporters are more productive on average as compared to non-exporters[5]. The question is whether the productivity increases because of "learning by exporting" or productivity leads to more export? Most evidences are in the favor that when any country starts exporting, the firms of that country get benefit from interacting with customer of the world. These customer demand higher quality products and in this way impose condition to produce higher standard products as compared to domestic customer demand. After entering into the foreign markets, firms gain new knowledge and latest technical expertise which facilitate to improve their efficiency level. Other positive contribution of economic liberalization through trade openness to growth can be that liberalization increases specialization and division of the labor thereby improving productivity and export capability. Expansion production of exportable products can lead to production growth by adoption and transmission of modern method of production. Many theorists also are in the view that gains from trade can be in the form that the reduction of trade restriction increase the economic efficiency by making consumers and producers able to buy items at lowest cost. Openness is an important issue but little research has been done on the significance of inter-national Technology transmission for the low and middle income economies like Pakistan.

Trade and investment policies of Pakistan are fairly liberal since the late 80s the average tariff rate come down to just 20% in 2001 to 02 which is only half as compared to the mid-1990s. In the foreign investment policy 1997 Pakistan has opened most sectors of economy to FDI, by giving 100% foreign ownership except some conditionality like the provision of national treatment to foreign companies by following the WTO obligations by giving some incentives such as duty and tax exemptions and some other concessions. Pakistan has taken many steps for inward FDI but is not able to attract large FDI. FDI is very important for Pakistan but it has played a small role in Pakistan economy. In most year of the ratio of FDI to GDP is less than 1%. After independence FDI was very crucial for the success of both import substitution and infant industry.

According to the latest ranking year 2011 given in Table 1, China is the major trade partner of Pakistan by replacing US which remain largest trade partner and now is at third position in the list of top ten trade partners of Pakistan. On the other hand Japan is not in this list. This shows that Pakistan's dependence on American and European markets is declining and trade within the Asia is increasing. In recession of 2008 to 09, Asia has helped to save the world because of huge markets provided by

[1] Nelson and Phelps (1966), Benhabib and Spiegel (1994).
[2] United Nation Conference on Trade and Development, 2010.
[3] Nelson and Phelps (1966), Benhabib and Spiegel (1994).
[4] United Nation Conference on Trade and Development, 2010.
[5] (Bernard and Jensen 1999)

Table 1. latest ranking year 2011.

Countries	Bilateral Trade in the year 2011 (US Dollar)		
	Bilateral Trade	Exports	Imports
China	7.423bn	1.634bn	5.789bn
UAE	7.284bn	1.808bn	5.476bn
USA	5.767bn	3.957bn	1.810bn
Saudi-A	4.975bn	428m	4.547bn
Kuwait	3.425bn	95m	3.330bn
Malaysia	2.626bn	166m	2.460bn
Afghanistan	2.509bn	2.337bn	172m
Germany	2.210bn	1.272bn	938m
India	2.007bn	264m	1.743bn
UK	1.835bn	1.206bn	629m

Source: Basic Data Federal Bureau Statistics, Government of Pakistan

the Chinese and Indian economies. The phenomenal economic growth of India and China has shifted the direction of Pakistan's exports and imports from American and European markets to the Asian markets. After the great recession of 2008 to 09 and global financial crisis, non-western nations had felt the need of minimizing dependence on dollar as a medium of trade. China has signed Local Currency Swap Agreements (LCSA) with 14 countries including Pakistan from 2008 to 2011. After the US and EU sanctions on Iran, there are more currency swaps agreements in Asian countries. Pakistan has signed currency swap agreement with Turkey in November 2011 and with China in December 2011. Currency swap agreement with Iran is in the final stage and this is also expected with Malaysia, Russia and some central Asian states. This would help to boost the trade within the region. These new opportunities have been opened in Asia and Middle Eastern countries for Pakistan to boost economic growth by exporting to these markets and by importing the capital goods from these economies. Business experts believe that Pakistan's top bilateral trade partners are changing because of average better growth in Asia than in Europe and America and economic miracle of China. Chinese investment projects are increasing in Pakistan[6]. At the same time, our imports are increasing from India because Pakistan has given the status of most favored Nation by removing non-tariff barriers. Pakistan's trade with India and China is in deficit. Pakistan has potential to improve its trade relation with Asian countries and can increase export to these economies because of similarities of consumers in tastes and priorities. In the list of top ten largest trade partners of Pakistan, seven are from Asia. Pakistan can import machinery and other technological goods from these economies at low transportation cost as compared to American and European economies.

Pakistan is also one of those countries which allocate very minor amount on R & D and faces scarcity of Technology, so foreign sources of technology are very important for Pakistan. Main focus of this study will be to examine the long-run and short- run impact of Technology (knowledge) transmission on Economic growth of Pakistan by using bounds testing approach to co integration within an Autoregressive Distributed Lag (ARDL)[7] and thereby the importance of several channels of Economic liberalization like the direct import of technological machinery and intermediate goods, export of goods and services and transformation of modern technology, ideas, knowledge and managerial talent from developed economies through MNCs for Economic growth of Pakistan. The outline of this research is as follows. The second section will provide the comprehensive review of the literature. The third section will present the empirical analysis which includes model specification, Econometric specification result discussion and Sensitivity Analysis. The fourth and final section will provide the conclusion and policy recommendation.

OBJECTIVES OF THE STUDY

This research has been conducted for identifying different channels of foreign technology transformation and their impact on economic growth of Pakistan through long-run and short-run empirical investigation. Moreover, we aim to give policy suggestions for the promotion of Technology Transformation and effective use of this technology by developing absorption capacities of Pakistan.

LITERATURE REVIEW

Caves (1974) discovered that there might be two different

[6] "President of the federation of Pakistan Chambers of Commerce and Industry"

[7] Pesaran et al, (2001)

impacts of foreign knowledge spillovers that had competitive effect and technology diffusion effect. The result of this study confirmed that in industry where the proportion of output produced by foreign owned firms was higher, the domestic owned firms had higher value added per worker. This finding supported the view that firms had taken benefit of foreign knowledge or technology and it had increased the efficiency of domestic owned firms. Barro (1991) examined the relationship between exports and economic growth by using the data of Middle East and African countries. The simple ordinary least square regression was used. The results showed that there was positive and significant correlation between exports and economic growth. The major shortcoming of this study was that this had not shown the direction of relationship that is, either relation was from export to growth or from growth to exports. Eaton and Kortum (1996) had shown that international licensing agreements as a direct way to transfer foreign technology but according to world investment report 2000, technology transfer through this source was not important because it did not contain modern technology.

Edwards (1998) checked the relationship between trade liberalization and total factor productivity (TFP) by using indexes of openness. He used the data of 93 developed and developing countries and estimated 18 growth equations by using random effect model. From these estimates he computed TFP and then regressed TFP on income, initial labor and openness indicators. The results indicated that all the coefficient of openness had expected signs and in most of cases it is significant. The coefficient on initial labor force was significant and positive while of initial income it was negative. He concluded that trade openness had positive effect on economic growth. Xu and Wang (2000) examined the impact of Trade and Foreign direct investment as channels for technology transmission from industrialized countries to less developed countries. They also checked impact of this technology on TFP of these countries. The sample of 21 OECD[8] countries for the period from 1971 to 1990 was used. Three channels, capital goods trade, inward FDI and out ward FDI were considered for technology transmission. Ordinary least squares with white's hetero scedasticity consistent covariance estimation method were used to the Cobb-Douglas production function to estimate the required results. The results showed that the technology which comes through the imports of capital goods had a sizeable positive effect on a country's total factor productivity. That was strong empirical support for the trade as channel of foreign technology diffusion. To examine the role of FDI a sample of 13 OECD countries for the period of 1983 to 90 was used. The results showed the outward FDI brings technology back to the home country through the multinational enterprises. There were some short comings in this study. For example Cobb-Douglas production function does not take into account the endogeneity problem in the variable. There was need to develop theoretical justification for methods used and also more attention should be paid to econometric issues. Chakraborty and Basu (2002) examined the causality from GDP to FDI in Indian economy by using co-integration and error-correction models. Results showed that causality run from GDP to FDI rather from FDI to GDP in the Indian economy.

Hoekman et al. (2005) provided the theoretical analysis on Technology Transmission from developed to developing countries. This study has identified four major channels of foreign technology transformation which are trade in products, trade in knowledge or transmission of techniques and methods of production, foreign direct investment and fourth one is movement of people from one country to another. This study argued that Technological goods imported form developed counties are associated with higher total factor productivities (TFP) in developing country so there is recommendation for liberal trade policies. This study has developed certain type of policies recommendation on the basis of this argument as a guide for both home policy makers and also for WTO[9] trade related rules. Husain (2005) analyzed the impact of trade liberalization policy on Economic growth of Pakistan for the period from 1972 to 2002. He used the Johansson Co-integration test to check the long run relationship between trade liberalization and Economic growth of Pakistan. The volume of trade that is, imports plus exports were used as proxy for trade liberalization and other variables are population and investment growth. The stationary of the variables was checked by using ADF[10] test and all the variables were found to be stationary at first difference which gave support to use Johansen Co-integration test to check the long run relationship between trade liberalization and Economic growth. The result showed that trade liberalization has a negative impact on Economic growth in long run, which is 1% increase in trade volume lead to 0.19% decrease in GDP growth of Pakistan. When total trade volume was used separately in total exports and total imports, the positive but insignificant results were found. All this showed that there was no clear cut answers to the question whether trade liberalization positively affect the Economic growth or negatively.

Narayan and Smyth (2005) have examined the impact of trade liberalization on economic growth of Fiji by using Cobb Douglas production function with making little modification in order to take into account the impact of political instability and trade liberalization from 1986 to 2000. A recently developed Autoregressive Distributed Lag (ARDL) bounds testing approach was used to estimate the model. They used taxes on trade as a variable of openness and dummies for political instability.

[8] "Organization for Economic Co-operation and Development"

[9] World Trade Organization

[10] Augmented Dicky-Fuller

Long-run results were consistent to the theory and showed that there is a co integration relationship amongst the exogenous and dependent variable. But the coefficient of labor force was negative. Investment and human capital have positive signs and statistically significant at 10% of level of significance. The dummy variable which was used to capture the impact of political instability of Fiji had negative sign and significant at 1%. This is consistent with the view that political instability has bad impact on economic activities in the country. The exports variable in the long-run have positive sign but insignificant and in the short-run the results are ambiguous. Also the results of tax on trade which measure the degree of trade openness are not clear cut. The weak relationship of exports and investment with GDP is alarming for Fiji. It is necessary for Fiji to raise investment to about 20 to 25% in order to achieve 5% target of GDP growth rate. Driffield and Henry (2007) examined the importance of absorptive capacity and institutional quality of host country for making the foreign technology more effective for the economic growth of host country. The absorptive capacity of foreign technology is measured by the level of human capital which is the average level of schooling for the population of 25 years and above. Institutional quality is measured by two ways. First was measured by index of legal structure and property rights and secondly it was measured through quality of bureaucracy. The threshold regression analysis has been used to get the results for the group of 57 developing countries over the period from 1970 to 1998. The results of this study showed that in the case of trade as a channel of foreign technology the institutional quality is more effective for growth effects, while in the case of FDI a channel of foreign technology, the human capital is found to be more effective for economic growth. This means that in the case of FDI, absorptive capacity of host country matters.

Cuaresma and Scharler (2008) investigated the importance of absorptive capacity of foreign technology in effecting the productivity of the host county. A sample of 21 Organisation for Economic Co-operation and Development (OECD) countries were used from 1973 to 1997. There were assumption that there are two major channels of foreign technology that is, imports of intermediate and capital goods and FDI. Proxies of market regulation and wage bargaining were used to measure the absorption barriers. Foreign R&D stokes were constructed by their import share weighted aver-ages of the country's own R&D stock. The overall results showed that the foreign R&D have positive impact on the economic growth of the countries which have lower levels of market regulation, employment protection and lower barriers to the entrepreneurship. Krammer (2008) examined the impact of international spillovers via trade and FDI on economic growth of 27 transition and 20 western European countries over the period from 1990 to 2006 by using latest technique of panel unit root and co integration test. There were two channels of foreign R&D stocks (i) Foreign R&D stocks embodied in imports (ii) foreign R&D stocks embodied in FDI. Domestic R&D capital stocks and human capital were used as control variable. Domestic R&D capital stock is based on the gross expenditure on R&D and for human capital, the proxy of average years of secondary schooling in male population over 25 year old was used. Human capital measured the absorption capacity of host country. The finding of this study showed that both trade and FDI remains the main carrier of foreign technology both trade and FDI have significant impact on TFP but FDI have smaller impact as compare to trade in the case of both developed and developing countries. The human capital and domestic R&D stocks which were used as absorption capacity and control variable play a crucial role in TFP of these countries. On the basis of these results it can be concluded that openness to both trade and FDI is very crucial and beneficial for developing economies but to use this foreign technology more efficiently there is need of skilled educated labor force and domestic R&D stocks in order to absorb foreign technology.

Chandran and Munusamy (2009) investigated the long run impact of openness on growth of manufacturing sector of Malaysia by using the annual data from 1970 to 2003. The source of data is Malaysia Economic statistics-time series, published by the development of statistics, Malaysia. The data includes the value added output of manufacturing sector, net fixed capital, number of labor and Trade openness. To include the impact of Asian financial crisis 1997 to 1998, the dummy variable was used. To estimate the result the co-integration test was performed using the Autoregressive Distributive Lag (ARDL) method. To check the long run relationship the bond testing approach was used. The results showed that there exist long run relationship among the manufacturing value added output and all the independent variables. But short run results revealed that in the short run openness have no effect on the growth of manufacturing sector of Malaysia. The conclusion of this study showed that any country can only benefit form Economic openness if it uses openness as source of growth on long term basis. In the case of discontinuity in trade policy or opening up of economy for only short time could not encourage the Economic growth of any country. Guessan and Yue (2010) investigated the long-run impact of trade liberalization and foreign direct investment on the Economic growth of Cote d`Ivoire by using the time series data from 1980 to 2007. The variables which were used are output defined by per capita real GDP of Cote d`Ivoire, Foreign direct investment which is also in real form, openness was measured by the total sum of total export and total import as the ratio of GDP, labor measured by total labor force and for capital the proxy of real value of gross fixed capital formation was used. Data of all the variables were taken from world development indicator (WDI, 2008).

Aggregate production function was used in order to

check the relationship and this function was estimated by using bounds testing co integration procedure which is ARDL[11] bounds testing approach to investigate the long-run as well as short-run impact of all exogenous variables on the Economic growth of Cote d`Ivoire. Before estimating the model the stationary status was checked by using the unit root test and result showed that all the variables were stationary at first difference. ARDL results showed that there is long-run relationship among the explanatory and dependent variables.

The results of Causality test showed the unidirectional causal relationship exists which is from independent variables to Economic growth. In this case FDI and trade openness have significant and positive impact on Economic growth of Cote d`Ivoire.

This brings the policy recommendation for Cote d`Ivoire that the policy makers should formulate Economic policy in such a way to attract more foreign direct investment along with reducing the trade restrictions in order to achieve higher Economic growth. Brain drain means emigration of a proportion of the population which is comparatively highly educated as relative to average population. Haque and Kim (1995) concluded in their study that emigration causes brain drain which reduces the Economic growth.

Zhu Yiying (2010) tried to investigate how China has become the most attractive place for FDI and how this FDI effect the economy of China by bringing the foreign Technology into China. The author used the theoretical frame work to explain his point of view. As a result of reforms and opening up policy of China, a record FDI have come to China during the last three decades. FDI not only brings Technology to China but also there is establishment of R&D centers by MNCs which help to localize their products to create competitive environment in China`s markets. This market competition brings developing momentum in the host economy. Foreign companies provide advices and professional assistance to the local suppliers which help to accelerate the growth of local enterprises and healthy competition. In this way, FDI acts as source of positive Technology diffusion to host country. Boermans (2010) analyzed that exporting firms are more productive than non-Exporting because of "learning Exporting" by using firm level data of Africa from 1991 to 2003 collected by the survey of World Bank (RPED)[12].

The results showed that African exporting firms are more productive and significantly learning by Exporting as compared to the non-exporting firms. The exporting firms are more active and competitive internationally as compared to domestic firms. Therefore, Government should formulate such policies which help to make domestic firms more active internationally through export promotion programs.

[11] Autoregressive Distributed Lag

[12] "Regional Program on Enterprise Development"

EMPIRICAL ANALYSIS

Model specification and data sources

Many theorists are of the view that technology is key determinant of sustainable economic growth. Creation of new products which expands the knowledge and new ideas is also vital for growth. Alternatively consumers prefer more of the new products and may be willing to pay more for products which are consistent with latest fashion. As the new products come through new ideas, new knowledge, so the international trade can acts as source to transfer these new ideas or knowledge internationally. In Pakistan many studies was done on trade openness and economic growth but no one has investigated the effect of foreign technology on growth which comes from imports of goods. There are many factors which are critical about the effectiveness of foreign technology for the Economic growth of host country. If the traded goods are more R&D intensive then this type of trade will have significant positive impact on economic growth of importing country[13]. As the goods produced by developed country is R&D intensive so opening up of trade by developing country like Pakistan with developed country like Japan or USA will have significant positive impact on economic growth of Pakistan. This impact will also depend on the human capital of developing country. Although the opening up of trade is critical for developing countries but alone trade openness is not enough for Economic growth. The effectiveness of imported technology also depends on the absorptive capability and ability to adopt foreign technology, which further depend on the local circum-stances of host country[14]. Absorption of foreign technology is also affected by the distance of host country from the global frontier (Keller 2002). Hejaji and Safarian (1999) summarized theoretical argument for inward FDI and trade as channels for Technology diffusion. FDI is channel to bring the foreign capital, management expertise and production Technology[15]. Howitt (2000) and Mayer Foulkes and Howitt (2000) are of the view that flow of ideas, new method of production and management skill through the movement of peoples across the countries benefit the production growth of especially developing economies. The emigration of people of Pakistan is used as proxy to capture impact of this flow of ideas. Most of the researchers including Ahmed and Anoruo (1999-2000), Edward (1998), Edward (1992), Harrison (1996), Isean (1998), Santos (2002) and Wacziarg (2001) have used total exports and imports as independent variable in their growth models. Many studies like Coe and Helpman, (1995), Keller (2000). Xu and Wang (1999), Mayer (2001), have concluded that

[13] Coe and Helpman (2004)

[14] Evenson and Westphal (1995)

[15] (Johnson, 1972), Blomstrom and Kokko (1997), Aitken and Harrison (1999), Borensztein, De Gregorio and Lee (1998) and Blomstrom and Sjoholm (1999)

import of capital goods is a major channel of foreign technology and source of productivity for developing economies. Some economists like Clerides, Lach and Tybout (1997) are of the views that exporting to industrialized counties is a source of learning or acts as learning by exporting. Chuang (2000), Greenaway and Sapsford (1994) and Dollar (1992) have found that Exports have positive impact on growth.

There is a lot of empirical work done on the issue to examine the impact of liberalization on economic growth of Pakistan but no one examined the relative importance of several channels of transformation of Technology from developed countries to Pakistan as a result of liberalization of economy. So there is need to empirically examine importance of Technology transmission for the Economic growth of Pakistan. Pakistan is also one of those countries which allocate very minor amount on R & D and faces scarcity of Technology, so foreign sources of technology are very important for Pakistan. Main focus of this chapter is to empirically examine the significance of transmission of technology as result of liberalizing economy for economic growth of Pakistan. On the bases of literature and economic theories, the following model will be employed. As shown in Table 2.

$\ln(Y)_t = f[\ln(K)_t, \ln(L)_t, \ln(TEXP)_t, (MTEC)_t, (FDI)_t, \ln(EMG)_t]$

or

$\ln(Y)_t = \beta_0 + \beta_1 \ln(K)_t + \beta_2 \ln(L)_t + \beta_3 (MTEC)_t + \beta_4 (FDI)_t + \beta_5 \ln(TEXP)_t + \beta_6 \ln(EMG)_t + \mu_t$

MTEC[16] is technology goods import intensity defined as imports of Technology goods divided by total import[17]. FDI is the foreign direct investment to GDP ratio is used as other channel of Technology diffusion supported by lot of literature. Data of both the variables MTEC and FDI is taken from Economic Survey of Pakistan. The variables $\ln(TEXP)_t$ and $\ln(EMG)_t$ are the natural logarithm of total export and total number of emigrants annually respectively. Both are important indicators of economic liberalization and source of Technology transmission. Data of total exports in million Rupees is taken form Economic Survey of Pakistan and total number of Emigrants annually taken from Bureau of Emigrants and Overseas. Gross Capital formation and employed labor force both are important factor of production which is consistent with the models of Solow (1956), Swan (1956) and Romer (1986 and 1990). Both are used after taking the natural logarithm (lnK, lnL). Data of Gross capital formation (current US$) and Gross domestic products (GDP US$) is taken from world Development Indicator (WDI) and employed labor force taken from International Labor organization (ILO). And at the last μ_t is random error term. The natural logarithm is taken to convert the different variable with different units into percentage. MTEC and FDI are already in percentage so these both variables are used without taking natural logarithm. During the year 1971 to 72 a major change occurred caused by the separation of East wing of Pakistan that's why the data from 1972 to 2009 have been used for estimation purposes.

[16]For detail see Andreas and Marios (2003)

[17] Helpman and Grossman (1991), Wilson and Caselli (2003), and Eaton and Kortum (2001)

EMPIRICAL FINDINGS AND RESULT DISCUSSION

Augmented Dickey Fuller (ADF) is applied to check the stationary status and the results are given in table 3. The results of ADF test indicate that every variable either is stationary at level or at first difference. MTEC and ln (EMG) variables both are stationary at level because on the basis of t-statistics the null hypothesis of non-Stationarity is rejected at level. Remaining all variable are stationary at first difference because on the basis of t-statistics the null hypothesis of non-Stationarity is rejected at first difference. It is confirmed that no variable has order of integration two or I (2). So it fulfills the assumption of bounds test that no variable is having I (2). The optimal lag length is one selected by using Schwarz Bayesian and Hannan-Quinn information criterion. The value of F statistics is 3.66 reported in table 4 below. As the calculated F statistics is greater than upper bound at 10% and 5% level of significant, so the null hypothesis of no co-integration is rejected. This Bounds Testing results confirm that there is co integration relationship between dependent and independent variables of the model. Table 5 shows that import of technology goods (MTEC), exports, employed labor force and gross capital formation have positive and statistically significant impact on GDP in the long run.

The coefficient of export reveals that one percent increase in total exports leads to 0.17% increase in GDP growth in the long-run. The positive association between exports and economic growth confirm the export lead growth hypothesis for Pakistan. Export is the important contributor to the economic growth. There are number of benefit of export expansion, like it increases efficiency and improves quality of domestic production. The positive relation between exports and growth is because of the exports sector have positive externalities for non-exporting sector of the country. Expansion production of exportable products can lead to production growth by adoption and transmission of modern method of production. Most of evidences are in the favor that when any country starts exporting, the firms of that country get benefit from interacting with customers from all over the world. These customer demand higher quality products and in this way impose condition to produce higher standard products as compared to domestic customer demand. The coefficient of MTEC reveals that one percent increase in the technology goods import intensity (MTEC) leads to 0.008% increase in GDP growth in the long run. Imports of technological goods (capital,

Table 2. Data and Variable Description.

Variable	Description	Source
Y	Gross Domestic products (GDP)	WDI[18]
K	Gross Capital Formation	WDI
L	Employed Labor Force	ILO[19]
MTEC	Technology goods import intensity[20]	Economic Survey of Pakistan
TEXP	Total export	Economic Survey of Pakistan
EMG	Number of emigrants	Bureau of Emigrants & Overseas
FDI	Foreign Direct Investment to GDP ratio	Economic Survey of Pakistan

Table 3. Results of Augmented Dickey Fuller (ADF) test.

variables	Test statistics at Level		Test statistics at 1st difference	
	With intercept	With trend and intercept	With intercept	With trend and intercept
(MTEC)	-4.647363***	-4.542410		
ln(TEXP)	-2.681788	-5.510487	-4.738798***	-8.987188
ln(L)	0.122764	-1.633166	-6.614008***	-6.652551
ln(EMG)	-4.064988***	-4.142916		
ln(K)	-1.446830	-2.903182	-4.625059***	-4.525254
FDI	-1.906312	-3.580459	-4.193909***	-4.386527
ln(Y)	-1.299343	-0.677579	-5.125618***	-5.523892

*** shows significance at 1%, 5% and 10% level of significance

Table 4. Wald or F- Statistics for Testing Co-Integration.

Calculated F- statistics	At 10% level of significance		At 5% level of significance	
	Lower bound I(0)	Upper bound I(1)	Lower bound I(0)	Upper bound I(1)
3.66	2.03	3.13	2.32	3.50

Table 5. Estimated Long Run Coefficients using the ARDL Approach.
ARDL (1, 0, 1, 1, 0, 0, 1) selected based on Schwarz Bayesian Criterion.

Dependent variable is ln(Y) 38 observations used for estimation from 1972 to 2009				
Rgressor	**Coefficient**	**Standard Error**	**T- Ratio**	**Probability**
Constant	7.5033	4.6473	1.6145	[.118]
(MTEC)	.0079331	.0031764	2.4975*	[.019]
ln(TEXP)	.17237	.038716	4.4523*	[.000]
ln(L)	.64507	.31852	2.0252*	[.053]
ln(EMG)	.0015807	.032163	.049145	[.961]
ln(K)	.16849	.067285	2.5042*	[.019]
FDI	-.065644	.026417	-2.4850*	[.019]

*Denote the significance of variable at 10% and 5% of level of significant.

[18] World Development Indicators
[19] International Labor Organization
[20] The Technology goods imports shares is used rather than imports as whole

Table 6. Error Correction Representation for the Selected ARDL Model. ARDL (1,0,1,1,0,0,1) selected based on Schwarz Bayesian Criterion Dependent variable is dln(Y)38 observations used for estimation from 1972 to 2009.

Regressor	Coefficient	Standard Error	T-Ratio[prob]
C	2.0134	1.6109	1.2499[.221]
dMTEC	.0021287	.8213E-3	2.5918[.015]
dln(TEXP)	.085455	.026154	3.2674[.003]
dln(L)	-.19889	.11654	-1.7066[.098]
dln(EMG)	.4242E-3	.0085583	.049560[.961]
dln(K)	.045213	.023595	1.9162[.065]
dFDI	-.0023993	.0072560	-.33066[.743]
ecm(-1)	-.26834	.072197	-3.7168[.001]
R- Squared = .62306.		Adj R-squared = .48345	
F- stat . F(7 , 30) = 6.3757 , prob(F-stat) = [.000]			
Mean of Dependant Variable = .048924			
S.D of dependant variable = .020883			
DW – statistics = 2.3769			

machinery and parts of machinery) have positive and statistically significant impact on economic growth of Pakistan which indicates that to achieve development and to boost economic growth, it is crucial for Pakistan to import technology goods (capital, machinery and parts of machinery) and input material so that the productive capacity can be expanded. The result also confirms that excessive imports of finished goods (luxury goods) have negative relation with economic growth. This is because the excessive imports of finished (luxury goods) replace the domestic output and thereby the process of value addition in the country. The results are in contrast of the finding of Akbar and Naqvi (2000) who concluded that the imports do not have any role in economic growth of Pakistan but the results of this research show that the imports of technological goods (capital, machinery and parts of machinery) are very crucial for economic growth of Pakistan. The results of this research have also provided the clear cut answer to the study done by Husain (2005), his study could not give the clear cut answer to the question of whether the trade liberalization positively affects the economic growth or negatively.

The two important growth factors (labor and capital) are the most significant and have positive relation with growth which is consistent with the models of Solow (1956), Swan (1956), Kaldor (1961) and Romer (1986 and 1990). The coefficient of employed labor (lnL) shows that one percent increase in employed labor leads to 0.64% increase in GDP growth and co efficient of gross capital formation (lnK) shows that one percent increase in gross capital formation leads to 0.17% increase in GDP growth in the long run. The impact of emigration is not significant although the sign of coefficient of emigration is positive. On the other hand FDI has significant but negative effect on GDP. The coefficient of FDI shows that one percent increase in FDI leads to 0.06% decrease in GDP growth in the long run. The negative relationship between foreign direct investment economic growths indicates the lack of high skilled labor force and basic infrastructure to absorb the technology which comes through foreign direct investment. This lack of capabilities and inefficiencies in technological learning prevent spillover impact of MNC's on economic growth of Pakistan. FDI brings capital intensive techniques in developing economies which are labor abundant and developing countries required time for shifting form labor intensive to capital intensive techniques that is why FDI is not effective in most of developing countries like Pakistan. The results of error correction model in table 5 give information about the short-run speed of adjustment to-wards long-run equilibrium which is 27% per year. This further confirms the short-run movement of the model to-wards long-run equilibrium. As shown in Table 6.

SENSITIVITY ANALYSIS

At the end, the reliability and goodness of fit of the ARDL model is necessary condition before recommending and forecasting any policy on the basis of results obtained. So stability and diagnostic tests are performed. To examine the serial correlation the Lagrange Multiplier (LM) test are used. Heteroscedasticity are checked using test based on the regression of squared residuals on squared fitted values and for normality, the test based on skewness and Kurtosis of residuals are used. On the basis of $א^2$ Statistics or F-Statistics as given in Table 7 we fail to reject the mull hypothesis of

A. No serial correlation
B. No Heteroscedasticity
C. Normality of data.

At the end for examining of stability of coefficients

Table 7. Diagnostic Tests

Test	X^2-statistics	F - statistics
Lagrange Multiplier test to check Serial Correlation	X^2= 2.1756[.140]	F= 1.5790[.220]
Skewness & Kurtosis of Residuals test for normality	X^2 =.42725[.808]	-----
Test to check the Heteroscedasticity based on Regression of Sq. residuals.	X^2 =.76906[.381]	F= .74363[.394]

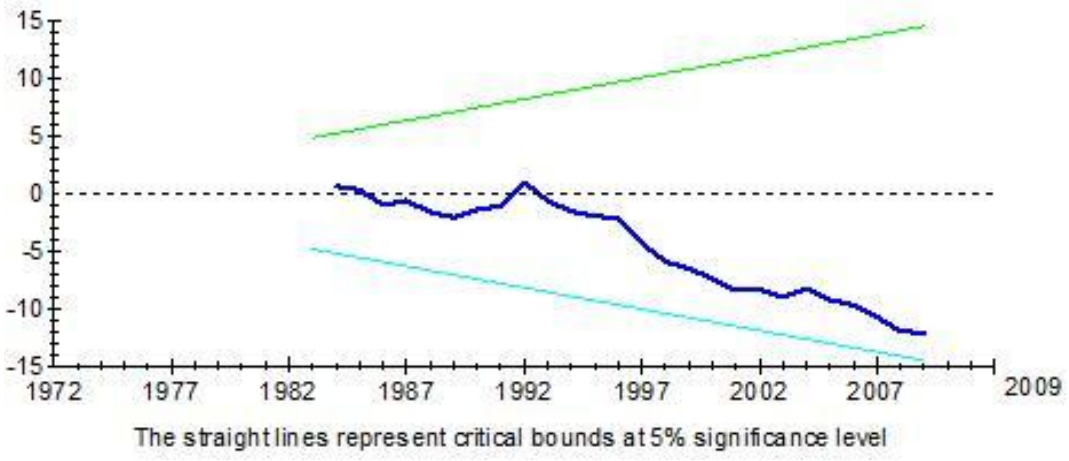

Figure1. Plot of cumulative sum of recursive residuals.

Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUM square) are used as can be seen from Figure 1 and 2 that the fitted line is within 5% critical bounds so the Null Hypothesis of coefficient cannot be rejected. It means that model is stable.

CONCLUSION AND POLICY RECOMMENDATIONS

On the basis of all the discussion on economic liberalization and estimated results of the model, it can be concluded that openness to both trade and FDI is very crucial and beneficial for Pakistan but to use foreign technology more efficiently, there is need of skilled educated labor force and domestic R&D stocks in order to absorb this technology. To promote the economic growth of Pakistan, there is need to diversify the export base and import duties should be removed from the import of technology goods (capital, machinery and parts of machinery) and input material and at the same time the imports of unnecessary and luxuries should be reduced through heavy import taxes. There are new opportunities THAT have been opened in Asia and Middle Eastern countries for Pakistan, there is need to boost economic growth by exporting to these markets and by importing the capital goods from these economies at low transportation cost. Pakistan leadership must take steps to resolve energy crisis and to improve the law and order and order situation in order to achieve the macro-economic stability which is vital in boosting economic growth and restoring foreign investor's confidence. Structural reforms that can improve investment climate and competitiveness are necessary to make both foreign direct investment and domestic investment more effective.

There is need of structural transformation through increasing the mobility of capital and labor across sectors and changing their production process in order to enable our firms and entrepreneurs to become globally competitive by diversifying their products. Government can also set up different programs like export investment support fund to transfer public investment to the selected sectors of exportable goods. Acquiring and up gradation of modern technology is necessary for Pakistan in order to move away from low value and traditional export products. This can only be achieved by providing incentives to facilitate technology adoption, acquisition and replacement. Government should formulate and implement such policies which can enhance the adaptive and absorptive capacities of economy for maximization of technology dissemination. Creation of skilled labor force not only for MNCs, but also for local firms is crucial in order to promote competitive domestic enterprises. Education policies should be changed as the demand for labor force change from industry. Along with the policies to enhance the absorptive and adoptive capacities of the economy, Government needs to target specific technologies related to the development areas. By providing fiscal or finance

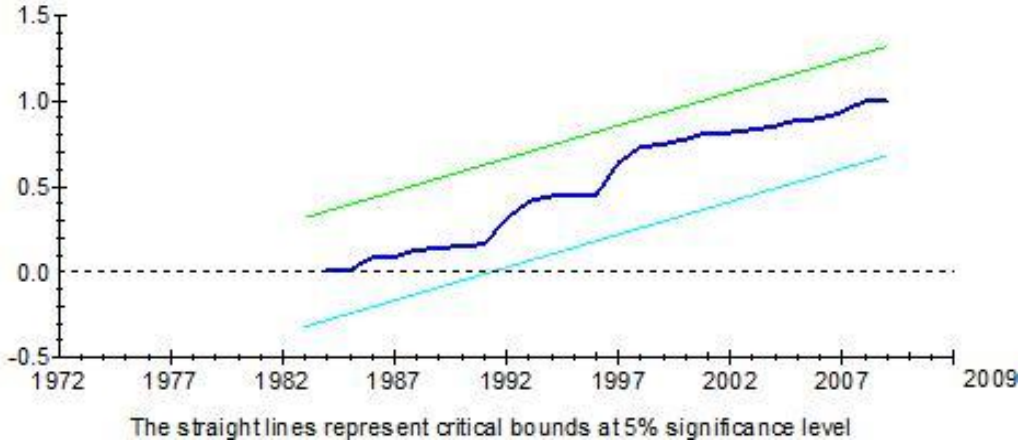

Figure 2. Plot of cumulative sum of recursive residuals.

incentives, Governmentcan attract these specific technologies into Pakistan. Establishment of Universities, Science and technology parks and other research institutions can generate environment for R & D innovation and THIS can help to attract high technology investors relevant to priority areas of development strategies. The impact of foreign research and development capital stock and domestic R&D capital stock on economic growth of Pakistan should be incorporated in the suggested model. Due to the unavailability of data, these variables have been left in this model. But future study should take into account these variables; because these are significant factors for the evaluation of impact of foreign technology and knowledge on economic growth of Pakistan.

Conflict of Interests

The authors have not declared any conflict of interests.

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