Role of Trade, External Debt, Labor Force and Education in Economic Growth Empirical Evidence from Pakistan by using ARDL Approach

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Abstract

This paper examines the determinants of economic growth for Pakistan over a period of 1975-2005, using Autoregressive Regressive Distributed Lag (ARDL) approach to Cointegration. The relationship between economic growth, trade, external debt, labor force and education has been discussed in long term and short term. And it is found that labor force and trade have significant impact on economic growth whereas external debt has no association with economic growth in long term or short term indicating that it has not been used efficiently and productively. An appropriate policy to educate and develop the human resources of the country coupled with export oriented policies can help in accelerating the process of economic development and growth and that in turn can have multidimensional positive effects on the economy and economic conditions of common man.

Keywords: Pakistan, exports, human capital, causality, ARDL
JEL Classification Codes: C12, C22

1. Introduction
Pakistan’s economy has shown various ups and downs during last 30 years. This study explores the various factors that have impact on the long-term economic growth of the country. Some of the factors that affect the economic growth of a country include human capital, total trade external debt and education. An examination of the role of said factors in economic growth is more important for developing countries like Pakistan that are fighting against poverty.

Human capital has been considered as one of the primary engines of economic growth and development. Economic theory suggests that human capital is an important determinant of growth. Various theoretical models include human capital as a factor of production and consider the accumulation of human capital as an element of the growth process and empirical evidence for number of countries also confirms this relationship. Thus we can say that human resource development and its efficient management plays vital role in the economic growth of economy.

In emerging economies like Pakistan export can play a pivotal role in accelerating the process of economic growth. The export led hypothesis assumes that export expansion leads to better resource
allocation and improves production efficiency. This is possible through technological development, new capital formation and employment creation which are prerequisites for accelerated economic growth. During last few decades, Pakistan has shifted from import substitution policy to export oriented policy. Economic reforms in the last five years have done much to boost Pakistan’s merchandise trade/GDP ratio. Evidence on relationship between trade and economic growth is mixed.

Capital is an important factor of production. Capital inflows in the form of external debt can play a vital role in increasing the national output. However, excess use of such capital may have negative impact as it increases the debt servicing costs and can affect balance of payments. Empirical evidence suggests bidirectional causality between external debt and growth. Higher external debt lowers growth but at the same time low growth increases indebtedness. Higher debt operates through a strong negative effect on physical capital accumulation and on total factor productivity. Lower growth reduces revenues and primary surpluses. If these are not addressed and adjusted timely these can affect debt ratios. Reducing debt levels would therefore, contribute to growth by boosting both capital accumulation and productivity growth.

This study analyzes the relationship between economic growth, human capital, trade and external debt and education for the period 1995-2005. The paper is organized as follows.

The section II provides an overview of the existing literature about the relationship between economic growth, exports, human capital external debt and education. The data employed and methodology adopted has been explained in section III. Empirical results have been discussed in section IV. Section V deals with conclusion and policy implications.

2. Literature Review

2.1. Human Capital and Economic Growth

Lucas (1993) argues that accumulation of human capital serves as an engine of growth. Human capital accumulation takes place in schools, in research organizations, and in the course of producing goods and engaging in trade. He investigates the reasons of diversity in the quality of life among nations and finds that major source of difference is the dissimilarity in human capital. Mankiw (1992) further extends the theory and considers human capital as an additional accumulable factor. He provides evidence that changes in human capital ultimately translates into significant changes of growth rates.

Relationship between economic growth and human capital has been examined extensively. Many theoretical models of economic growth exist which include Nelson and Phelps (1966), Lucas (1988), Becker, Murphy, and Tamura (1990), Rebelo (1992), and Mulligan and Sala-i-Martin (1992). Many empirical researchers which include Romer (1990), Barro (1991), Benhabib and Spiegel (1994) provide evidence that economic growth and schooling are correlated across countries and time.

Studies that examine the relationship between economic growth and human capital accumulation are divided into two broader categories. First group of studies uses growth accounting framework. The growth accounting framework assumes that education, increases the human capital stock of individuals that improves their productivity and ultimately contributes to growth. This group includes the studies of Baumol (1986), Barro (1991), Barro and Lee (1993). Other group of studies employs endogenous growth model. The endogenous growth models assume that human capital creates new ideas which is transformed into scientific knowledge and ultimately leads to accelerate the process of economic growth. This group includes Lucas (1988), Romer (1990), Grossman (1991).

Barro (1991), Barro and Lee (1993), Benhabib and Spiegel (1994) provide evidence that human capital accumulation promotes economic growth. Bils and Klenow (2000) take up the matter differently and find that levels of schooling are positively correlated with growth rates. But they find that direction of relation is debatable. Here question arises whether increased schooling results in accelerated economic growth or accelerated economic growth leads to attainment of higher schooling due to better allocation of resources for education in the country. However, relatively few studies have
tested for causality between human capital formation and economic growth. Studies which test for causality between human capital and growth within a bivariate framework are De Meulemeester and Rochat (1995), In and Doucouliagos (1997) and Asteriou and Agiomirgianakis (2001).

2.2. Trade and Economic Growth

Relationship between trade and economic growth has been examined extensively. There are number of studies that empirically investigate the relationship between exports and growth. These studies either use correlation analysis or employ causality techniques. The empirical evidence on the export growth nexus is mixed with no clear consensus. Ahmad (2001) reviews approximately 40 studies conducted during 1970-1990 and finds that empirical support for the export led growth in developing and developed countries is considerably weaker in more recent studies. Results for studies that use cointegration and causality analysis are significantly different from those studies which are based on correlation analysis. Summers (1997) examines the relationship between total trade and growth for Australian and Canadian market and finds that imports and exports trade play different roles on economic growth. Summers finds that import trade has a significance role in Canada. However no evidence of in support of export led growth is found for Australian economy. Strydom (2003) studies the role of foreign sector in economy and finds that international trade does not play a significant role in economic growth. One possible reason for this ambiguity is the lack of understanding of the diffusion system that links trade with economic growth. The evidence shows that the channels through which trade generates growth have asymmetric growth effects. Therefore economic policies should be structured to eliminate the impeding effects for such channels and to augment the efficiency of less efficient mechanism.

Human capital accumulation increases the quality of labor, which in turn, enhances the productivity of the workforce and stimulates further exports and economic growth (Chuang 2000). Hanson and Harrison (1995), Stokey(1996) and many other Empirical studies suggest that trade promotes human capital accumulation and vice-versa. Support for said argument is wide spread covering range of countries and time periods.

2.3. External Debt and Economic Growth

External debt serves as catalyst to mobilize other factors of production. In many countries, external debt has been used as main source of capital investment for development of the physical infrastructure. However, there has been a concern regarding the proper utilization of external debt in poverty alleviation and overall economic growth of the country.

The relationship between external debt and economic growth has been examined extensively in recent years. These studies have largely focused on the harmful effects of a country’s “debt overhang”. It is meant that debt is accumulated to such a high level that becomes a threat for the borrower country and it faces problems in servicing the debts. The empirical findings suggest that debt overhang depresses growth by increasing investors’ uncertainty about actions the government might take to meet its onerous debt-servicing obligations. Debt overhang may also affect the efforts of the government to carry out structural and fiscal reforms which are necessary to accelerate the economic growth process of the country. Governments also feel pressures to retire foreign debts. Pakistan’s external debt situation of the 1990s is consistent with the findings of the recent literature on the relationship between debt and economic growth. If take an overview of the last decade we find that large current account deficit (almost 5.0percent of GDP) for an extended period of one decade, the irresponsible use of borrowed funds, mounting real cost of borrowing and stagnant exports have contributed significantly in quick accumulation of external debt.

A number of studies have examined the relationship between external debt and economic growth. The majority of these studies have found that debt variables are significantly and negatively correlated with growth. Maureen (2001) analyses the magnitude and structure of Kenya's external debt and examines its impact on economic growth and private investment using time series data for the
period 1970-1995. The empirical results show that external debt accumulation has a negative impact on economic growth of Kenya. Karagol (1999) examines the relationship between economic growth, external debt service and capital inflow using the time series data for Turkey and employing simultaneous equations. The result suggests that the rise in the debt-servicing ratio adversely affects economic growth, whereas the decrease in the rate of growth reduces the ability of an economy to service its debt. This study further provides that the direct impact of external debt on the economic growth is negative. However favorable indirect effects of it exceed the direct effects. Chowdhury (1994) investigates the direct, indirect of the external debt on economic growth of seven countries by using panel data for the period of 1970-1988. These countries include Bangladesh, Indonesia, Malaysia, Philippines, South Korea, Sri Lanka and Thailand. Results suggest that the external debt of developing countries is not a primary cause of economic slow down. Schclarek (2004) examines the probability of existence of both linear and nonlinear relationship between debt and economic growth for developing and industrial countries. Evidence here is mixed. In case of developing countries, a significant negative relationship has been observed between external debt and economic growth. However, no such relationship has been observed in case of industrial countries.

The literature survey shows that a number of studies have examined the role of external debt, labor force and trade in economic growth separately. But there is no single study examining the role of these variables in the economy in an integrated way. In this regard, this study attempts to bridge this gap.

3. Data Description and Methodology
3.1. Data Description and Definition of Variables

This study examines the relationship between economic growth, trade, external debt, human capital and education. Data on all variables is taken from various publications of State Bank of Pakistan, Bureau of Statistics, Economic Survey of Pakistan and Lee and Barro’s database on human capital measures. The study uses annual data that cover the period from 1975-2005.

3.2. Dependent variable

The economic growth is used as the dependent variable in the model. Gross domestic product (GDP) is employed as the proxy of the economic growth

3.3. Independent variables

The independent variables are Education, Total Trade, External Debt and Labor Force.

Education

A review empirical work on the relationship between human capital and growth reveals that various proxies have been used to measure the human capital stock. Alternative proxies for human capital includes school enrolment ratios, adult literacy rates, levels of education attainment and average years of schooling, monetary value of human capital stock and international test scores of students. These are very diversified but all have limitations in one way or other.

School enrolment ratios, adult literacy rates are extensively used in growth regressions due to their easy availability and broad coverage. Adult literacy rates ignore most of the investments made in human capital as they do not include qualifications obtained above the basic levels of education so it seems to be a poor measure of human capital available for current production. Enrolment ratios are flow variables, and the children currently enrolled in schools are not yet part of the labor force. Therefore, enrolment ratios do not accurately represent changes in human capital stock. Levels of education and average years of schooling are most popular and commonly used measures today. This
study uses average years of schooling of the working age population as a proxy for Education. It is hypothesized that there exists a positive relationship between education and economic growth.

**Total Trade**
Trade plays an important role in increasing the production of goods and services. Total trade is the sum of total exports and imports. All data has been converted into Pakistani rupees and it is transformed at constant prices of 2000 to adjust the impact of exchange rate variations. It is hypothesized that there exists a positive relationship between trade and economic growth.

**External Debt**
External debt is one of the major sources of financing the development programs. These programs generally focus on infrastructure development that is necessary to lay down the foundations of sustainable economic growth. It is hypothesized that there exists a positive relationship between external debt and economic growth. For this study External debt has been translated into Pakistani rupees at constant prices of 2000 and then logarithm of External debt is taken to construct the variable. It is hypothesized that there exists a negative relationship between external debt and economic growth.

**Labor Force**
Labor force is directly involved in the production process and large labor force can help to enhance production of goods and services. For purpose of this study Labor force of the age between 15 and 64 has been taken from Economic Survey of Pakistan. It is hypothesized that there exists a positive relationship between labor force and economic growth.

3.4. Methodology
To examine the impact of human capital, trade, external debt and education on economic growth following model has been tested

\[
\ln GDP_t = \beta_0 + \beta_1 \ln TT_t + \beta_2 \ln LF_t + \beta_3 \ln TD_t + \beta_4 Edu_t + \mu_t
\]

Where

- GDP = gross domestic product (in constant terms for year 2000)
- TT = total trade
- LF = labor force in the age range of 15-64
- TD = total debt at constant Rate
- Education = average year of schooling

Existence of the long run equilibrium relationship among chronological variables can be investigated by using several methods. The most widely used methods include Engle and Granger (1987) test, fully modified OLS procedure of Phillips and Hansen’s (1990), maximum likelihood based Johansen (1988, 1991) and Johansen-Juselius (1990) tests. All these methods require that the variables in the system are integrated of order one I (1). Further, these methods are considered as weak as these methods do not provide robust results for small samples or structural breaks. Due to these problems, a newly developed autoregressive distributed lag (ARDL) approach to cointegration has become popular in recent years.

The ARDL modeling approach was originally introduced by Pesaran and Shin (1999) and further extended by Pesaran (2001). This approach has numerous econometric advantages in comparison to other cointegration methods. One major advantage of ARDL approach is that it can be applied irrespective of degree of integration. Secondly, ARDL approach provides robust results in small sample sizes and estimates of the long-run coefficients are well consistent in small sample sizes (Pesaran and Shin 1999).

Furthermore, a dynamic error correction model (ECM) can be derived from ARDL that integrates the short-run dynamic with the long-run equilibrium without losing long run information. In view of the above advantages, we use ARDL approach for cointegration analysis and the resulting ECM.
An ARDL representation of above equation is as below:
\[
\Delta \ln GDP_t = \beta_0 + \sum \beta_i \Delta \ln GDP_{t-i} + \sum \beta_i \Delta \ln TT_{t-i} + \sum \beta_i \Delta \ln LF_{t-i} + \sum \beta_i \Delta \ln TD_{t-i} + \sum \beta_i \Delta \ln Edu_{t-i} + \mu_t \]
where \(i\) ranges from 1 to \(p\) (2)

The ARDL method estimates number of regressions to determine the optimal lag length for each variable. The appropriate lag length for each variable is selected using Schwartz-Bayesian Criteria (SBC).

The underlying assumption of ARDL procedure is that each variable should be integrated of orders zero or one i.e. I(0) or I(1). If any variable is integrated of higher order then the procedure is not applicable. Therefore first step is to perform unit root tests to ensure that none of the variable in equation (1) is I(2) or higher order.

In the second step of ARDL model, the long-run relationship and the resulting error correction model is estimated. A general error correction representation of equation (2) is given below:
\[
\Delta \ln GDP_t = \beta_0 + \sum \beta_i \Delta \ln GDP_{t-i} + \sum \lambda_i \Delta \ln TT_{t-i} + \sum \delta_i \Delta \ln LF_{t-i} + \sum \phi_i \Delta \ln TD_{t-i} + \sum \eta_i \Delta \ln Edu_{t-i} + \text{ECM} + \mu_t \]

As external debt, total trade and labor force and education are expected to have a positive effect on economic growth, the coefficients \(\beta\), \(\delta\) and \(\phi\) are expected to be positive, i.e. \(\beta > 0\), \(\lambda > 0\), \(\delta > 0\), \(\phi > 0\) and \(\eta > 0\).

Finally, we examine the stability of short-run and long-run coefficients by using cumulative (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bounds of 5% level of significance, the null hypothesis of all coefficients in the given regression are stable can not be rejected.

### 4. Empirical Results

Table 1 exhibits the results of unit-root test. Augmented Dickey-Fuller (ADF) and Phillip Parren procedures have been used to test the stationarity of time series. ADF test assumes that time series is independently and identically distributed which may not be the case for some of the data so PP-Test has also been applied which permits the data to be heterogeneously distributed.

<table>
<thead>
<tr>
<th></th>
<th>ADF-level</th>
<th>ADF-Ist Diff</th>
<th>PP-level</th>
<th>PP-Ist Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln GDP</td>
<td>0.2578</td>
<td>-5.6013</td>
<td>0.5908</td>
<td>-5.981</td>
</tr>
<tr>
<td>Ln TT</td>
<td>-0.1582</td>
<td>-3.0468</td>
<td>-0.5617</td>
<td>-5.7437</td>
</tr>
<tr>
<td>Ln ED</td>
<td>-1.0521</td>
<td>-3.3468</td>
<td>-1.0521</td>
<td>-3.1421</td>
</tr>
<tr>
<td>Edu</td>
<td>-1.7318</td>
<td>-3.0972</td>
<td>-2.7568</td>
<td>-4.4379</td>
</tr>
<tr>
<td>Ln LF</td>
<td>-0.43</td>
<td>-3.5870</td>
<td>-0.7625</td>
<td>-5.2623</td>
</tr>
<tr>
<td>Critical Value 5%</td>
<td>-2.9640</td>
<td>-2.9678</td>
<td>-2.9640</td>
<td>-2.9678</td>
</tr>
</tbody>
</table>

Results presented in above table indicate that variables are integrated of order one or lower, so ARDL methodology can be used to investigate the presence of long term relationship among variables. The first step in the ARDL procedure is to estimate equation (2).
**Table 2a:** Autoregressive Distributed Lag Estimates
ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficient</th>
<th>S. E</th>
<th>t Statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ln GDP&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.5487</td>
<td>0.2005</td>
<td>2.7363</td>
<td>0.01</td>
</tr>
<tr>
<td>lnTT&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.2830</td>
<td>0.1500</td>
<td>1.8862</td>
<td>0.07</td>
</tr>
<tr>
<td>lnTT&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.2688</td>
<td>0.1190</td>
<td>-2.2584</td>
<td>0.03</td>
</tr>
<tr>
<td>lnTD&lt;sub&gt;t&lt;/sub&gt;</td>
<td>-0.0810</td>
<td>0.1931</td>
<td>-0.4643</td>
<td>0.65</td>
</tr>
<tr>
<td>Edu&lt;sub&gt;t&lt;/sub&gt;</td>
<td>0.0032</td>
<td>0.0405</td>
<td>0.0785</td>
<td>0.94</td>
</tr>
<tr>
<td>lnLF&lt;sub&gt;t&lt;/sub&gt;</td>
<td>1.2120</td>
<td>0.4637</td>
<td>2.6141</td>
<td>0.01</td>
</tr>
<tr>
<td>C</td>
<td>1.2949</td>
<td>0.8583</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2b:**

<table>
<thead>
<tr>
<th></th>
<th>R-Squared</th>
<th>R-Bar-Squared</th>
<th>S.E. of Regression</th>
<th>S.D. of Dependent Variable</th>
<th>DW-statistic</th>
<th>F-stat. F(6, 22)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Table 2 (a & b) indicates that total trade and labor force has significant relationship with economic growth whereas total debt and education have insignificant relationship. The value of R-Bar-Squared is 0.98 which indicates a high degree of correlation among variables. F statistics is also significant at 1% which indicates overall goodness of fit. The test for the presence of long-run relationship amongst the variables of equation (1) highlights the following results. Bahmani-Oskooee and Bohal (2000) have shown that the results of this first step are sensitive to lag length selected in equation (2). As we are using annual data so a shorter lag length is considered.

**Table 3:** ARDL (1,1,0,0,0) Model Long Run Results Dependent variable log (GDP)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTT</td>
<td>0.0313</td>
<td>0.2344</td>
<td>0.1333</td>
<td>0.89</td>
</tr>
<tr>
<td>LLF</td>
<td>2.6859</td>
<td>0.8924</td>
<td>3.0098</td>
<td>0.00</td>
</tr>
<tr>
<td>LED</td>
<td>-0.1987</td>
<td>0.4316</td>
<td>-0.4603</td>
<td>0.65</td>
</tr>
<tr>
<td>Edu</td>
<td>0.0070</td>
<td>0.0894</td>
<td>0.0786</td>
<td>0.93</td>
</tr>
<tr>
<td>C</td>
<td>2.8694</td>
<td>1.6401</td>
<td>1.7495</td>
<td>0.09</td>
</tr>
</tbody>
</table>

A careful examination of results in Table 3 reveals that Labor Force has significant long term relationship with economic growth. External debt has insignificant negative association with economic growth. Similarly total trade and education have no significant impact in economic growth. Short-run dynamics of the relationship has also been examined by employing ARDL error correction representation. Estimates of error correction representation of ARDL model are given table below.
The ECM equation is given as
\[
ECM = \text{Ln GDP}_t -0.031266\times \text{lnTT}_t +0.19869\times \text{lnTD}_t + 0.0070366\times \text{Edu}_t -2.6859\times \text{lnLF}_t -2.8694*C
\]

Examination of error correction model in Table 4 shows that labor force has the strongest effect on economic growth in the short run which is followed by total trade. The short-run effect of total external debt on economic growth in Pakistan is weak and statistically insignificant at even 10% level of significance. The coefficient of ECM term has correct sign and significant at 10 %. It confirms the presence of relationship between the variables. The Coefficient of the ECM term suggests that adjustment process is quite fast and 45% of the previous year’s disequilibrium in economic growth from its equilibrium path will be corrected in the current year. Thus, the evidence presented in this section suggests that economic growth in Pakistan is mainly determined by fluctuations in labor force, and trade both in the short run and the long run. Total debt is not an important determinant of economic growth either in the short-run or the long-run.

The CUSUM and CUSUMSQ plots to check the stability of short run and long run coefficients in the ARDL error correction model are given below in figure 1:

**Figure 1:**

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
Figure 1 shows that both statistics CUSUM and CUSUMSQ are with in the critical bounds of 5% indicating that the model is structurally stable.

5. Conclusion
This paper attempts to examine the determinants of economic growth for Pakistan over the period of 1975-2005, using ARDL approach to Cointegration. The results indicate that labor force and trade are important determinant of economic growth in short run and long run. The results indicate a positive relationship between labour force and economic growth which in line with the general assertion that the labour force is a key factor of production and hence it is positively associated with the economic growth of a nation. The external debt is found to not to have any relationship with economic growth. This result indicates that the external debt has not been used productively and efficiently in Pakistan which may be one of the reasons behind the slow economic growth. An appropriate combination of a suitable flow of external debt, an educated and highly productive labor force and a properly balanced external trade can lead to economic development and accelerate the growth process. An integrated policy covering human resource development frame work and export friendly trade strategy can have multidimensional positive effects on the nation’s march towards growth and prosperity.
References


