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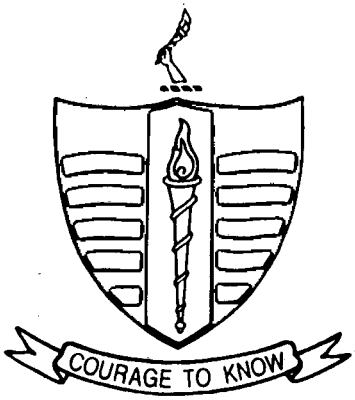


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**DEPARTMENT OF ECONOMICS**

**Government College, Lahore.**

# DO EXPECTATIONS PLAY ANY ROLE IN DETERMINING PAK-RUPEE EXCHANGE RATES?

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**ABSTRACT:** This paper presents some evidence on the role of expectations in the determination of Pak-rupee exchange rates *vis-a-vis* the dollar, pound and yen over the period 1982: 1-1993:7. Results of cointegration and coefficient restriction tests in two out of three cases are supportive of the view of exchange rate determination postulating that in efficient markets in which uncertainty and expectations about the future are dominant, the equilibrium nominal exchange rate is determined not only by current relative prices but also by the expected real exchange rate. These results suggest that the anticipated inflation rate is higher in Pakistan than in other countries, which tends to encourage the domestic residents to convert their current balances into foreign currency, to devaluation of Pak-rupee by undermining external competitiveness.

## I. INTRODUCTION

Since the advent of floating exchange rates by major industrial countries in 1973, there has been an increased interest in analyzing the process of exchange rate determination. As the earliest formal explanation of exchange rate determination, the purchasing power parity (PPP) theory emerged as a natural starting point from which to investigate economic fundamentals underlying the process of exchange rate behaviour[1]. The PPP theory, which was originally put forward by

[1] While PPP amy be considered as a theory of inflation under fixed exchange rates, it is just an equilibrium condition under flexible exchange rates. Under fixed exchange rates PPP implies that inflation rates, subject to certain reservations, must be equal in all countries of an integrated world economy (see, for example, Genberg, 1978).

Cassel (1916), postulates that under a system of freely floating exchange rates and as long as trade is free and transportation costs, capital flows and speculative expectations are absent, the actual exchange rate between two national currencies tends to be essentially determined by the ratio of the domestic price level to the foreign price level.

However, most of the studies dealing with the empirical testing of PPP have documented evidence that usually indicates the failure of the theory[2]. One reason for the failure of PPP, suggested by Roll (1979) and Adler and Lehman (1983), is that in efficient markets rational agents expect PPP to establish on *ex ante* basis such that the *ex post* deviations of the real exchange rate from the PPP level are uncorrelated over time. This implies that there is no theoretical reason for the real exchange rate to reach some constant value and therefore *ex ante* PPP can be seen as an economic explanation of the failure of conventional PPP. Moreover, PPP fails, as Bhatti and Moosa (1994) argue, because it neglects the role of uncertainty and expectations in exchange rate determination. Based on *ex ante* PPP, they put forward a new view of exchange rate determination which postulates that in efficient markets in which there is presence of uncertainty and expectations about the future, the exchange rate is determined not only by current relative prices but also by the expected real exchange rate[3]. The objective of this paper[4] is to test the validity of this view of exchange rate determination for three Pak-rupee exchange rates *vis-a-vis* the dollar, pound and yen over the period 1882:1-1993:7. The testing technique will be cointegration analysis because it provides an especially suitable framework for evaluating long-run relationships while allowing for short-run deviations. Cointegration

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2 Seee, *inter alia,* Frenkel (1981), Corbae and Ouliaris (1988), Taylor (1988), Patel (1990), Layton and Stark (199), Nachane and Chrissanthaki (1991), Fisher and Park (1991), Crowder (1992), Flynn and Boucher (1993), Sarantis and Stewart (1993), Cooper (1994), Serletis (1994) and Mossa and Bhatti (1996). For a detailed and a comprehensive survey on PPP see also Mossa and Bhatti (1997).

3 In fact, uncertainty about future prices is a central feature of the efficient markets paradigm (see Roll, 1979, p.137)

4 An earlier version of this paper was presented in National Conference on Business Administration and Economics held by IBA Karachi on May 20-22, 1996.

analysis is superior to conventional regression analysis for at least two reasons. First, it produces superconsistent estimates of the regression parameters, despite the presence of such problems as simultaneity, serial correlation and heteroscedasticity (Stock, 1987). Second, making inferences about the numerical values of the estimated coefficients of the nonstationary regressors on the basis of the conventional standard errors and *t* statistics is erroneous because they do not have limiting normal distribution (Engle and Granger, 1991). However, in cointegration analysis the *t*-statistics calculated from the OLS standard errors can be corrected along the lines suggested by West (1988) in order to give them a limiting normal distribution.

## II. THE ROLE OF EXPECTATIONS

*Ex ante* PPP assumes that market agents are uncertain about future movements in prices and exchange rates and will consequently be concerned with the expected, rather than with the current, purchasing power of their return on investment, domestic and foreign. For example, if the future inflation rate is expected to be higher at home than abroad, domestic market agents will find it worthwhile to convert their current balances into foreign currency in anticipation of gains from depreciation (appreciation) of the domestic (foreign)currency. This implies that the country with relatively high expected inflation rate will have an undervalued currency based on current purchasing power, while the country with relatively low expected inflation rate will have an overvalued currency. Consequently, the terms of trade will improve for the latter and deteriorate for the former. Moreover, this implies that while devaluation improves external competitiveness, the larger expected inflation rate at home than abroad will eventually offset much of its gains by undermining external competitiveness.

Although market agents cannot know the future precisely, they process all available information to the best of their abilities to predict future prices and exchange rates. Under the assumption that market agents efficiently process all available information relevant to predict future changes in exchange rates and prices, the actual (*ex post*) depreciation of the domestic currency will be equal to the actual (*ex post*) difference between inflation rates across countries. Therefore, if the nominal exchange rate adjusts to fully offset the expected domestic over

foreign inflation rates, then the equilibrium nominal exchange rate will be determined not only by current relative prices but also by the expected real exchange rate.

*Ex ante* PPP postulates that the expected rate of change in the nominal exchange rate tends to be exactly equal to the expected differential in inflation rates across countries over the same holding period. This relationship is given by

$$\Delta S^{e}_{t+1} = \Delta P^{e}_{t+1} - \Delta P^{*e}_{t+1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where $\Delta$ is the difference operator, $S_t$ is (the logarithm of) the nominal exchange rate (defined as the domestic currency price of one unit of the foreign currency), $P_t$ ($P^*_t$)is (the logarithm of) the domestic (foreign) price level and the superscript $e$ indicates the value of the variable expected at time $t$ to prevail at time $t + 1$.

Equation (1) may be derived by assuming either efficiency in international financial markets or efficiency in international commodity markets. Efficiency in international commodity markets obtains when the expected return to speculators engaged in intertemporal speculation on commodities, buying a domestic commodity today and selling it abroad tomorrow, is equal to zero. An implicit assumption underlying conventional PPP is that market agents are certain about the future and compete with each other to arbitrage away profit opportunities arising out of differences between domestic prices and the exchange-rate-adjusted foreign prices of goods. This arbitrage condition boils down to the PPP equation which can be written as

$$S_t = P_t - P^*_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

If transportation costs and trade barriers are absent, equation (2) implies that deviations from parity indicate the existence of profitable opportunities for commodity arbitrage. Deviations from PPP imply that the same good, after adjusting for the exchange rate, will sell at different prices between home and abroad. Simultaneously buying the good in the low-price country and selling the good in the high-price country will force the nominal exchange rate to PPP and the real exchange rate to some constant value. Therefore, conventional PPP requires the return to

speculators engaged in temporal speculation on goods, buying goods at home at the domestic price, $P_t$, and selling them abroad at the exchange-rate-adjusted foreign price, $S_t + P^*_t$, to be equal to zero.

On the other land, *ex ante* PPP stipulates that in efficient markets competition among market agents tends to arbitrage away profit opportunities arising out of the differences not only between the current but also between expected prices of domestic and foreign goods. In other words, *ex ante* PPP requires that not only the return to speculators engaged in temporal speculation on goods but also the return to speculators engaged in intertemporal speculation on goods be equal to zero. Suppose, if transaction costs are absent, then the return to speculators engaged in temporal speculation on goods is given by

$$\pi_t = S_t + P^*_t - P_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

where $\pi_t$ (representing the real exchange rate) is the profit which is made by speculator by buying goods at home and selling them abroad. On the other hand, the profit made by speculators in intertemporal speculation on goods is given by

$$\pi^e_{t+1} = S^e_{t+1} + P^{*e}_{t+1} - P^e_{t+1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Thus, the net return from temporal and intertemporal speculation on goods is given by

$$\pi^e_{t+1} - \pi_t = \Delta S^e_{t+1} + \Delta P^{*e}_{t+1} - \Delta P^e_{t+1} \quad \ldots\ldots\ldots \quad (5)$$

If markets are efficient in Fama's (1970) sense, then today prices must reflect all information available to agents, so that current prices are the best forecast of future prices. Therefore, $\pi^e_{t+1} - \pi_t = \omega_t$ where the error term, $\omega_t$, is completely random, displaying no pattern over time and as such equation (5) reduces to equation (1).

Now, if expectations about the expected rate of change of the exchange rate and expected inflation rates are rational, then the realized values of a variable are equal to the expected values plus a forecast error orthogonal to the information set $\Omega_t$ available to market agents when the forecast is made. This is shown by the following set of equations

$$\Delta S_{t+1} = \Delta S^{e}_{t+1} + \mu_{1t+1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$
$$\Delta P_{t+1} = \Delta P^{e}_{t+1} + \mu_{2t+1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$
$$\Delta P^{*}_{t+1} = \Delta P^{*e}_{t+1} + \mu_{3t+1} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$
$$E(\mu_{it+1} | \Omega_t) = 0 \forall_i \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

Substituting equations (6),(7) and (8) into (1), we obtain

$$\Delta S_{t+1} - \Delta P_{t+1} + \Delta P^{e}_{t+1} = v_{t+1} \quad \ldots\ldots\ldots\ldots \quad (10)$$

where $v_{t+1} = \mu_{1t+1} + \mu_{3t+1} - \mu_{2t+1}$ and $E(v_{t+1} | \Omega_t) = 0$. Equation (10) can be written in levels as follows

$$S_t = (P_t - P^{*}_t) + (S_{t+1} + P^{*}_{t+1} - P_{t+1}) \quad \ldots\ldots\ldots \quad (11)$$

which can be written in a testable stochastic forms as

$$S_t = \beta_0 + \beta_1 (P - P^{*})_t + \beta_2 q_{t+1} + \epsilon_t \quad \ldots\ldots\ldots \quad (12)$$

where $q_{t+1}$ is the ex post real exchange rate (defined as $q_{t+1} = S_{t+1} + P^{*}_{t+1} - P_{t+1}$) realized at time $t + 1$. Therefore, equation (12) suggests that in efficient markets in which uncertainty and expectations about the future are dominant, the nominal exchange rate is determined not only by current relative prices but also by the expected real exchange rate, implying that the omission of the latter makes the conventional PPP model misspecified. If expectations play any role in determining the exchange rate, then $\beta_2$ should be significantly different from zero. Moreover, the restrictions $\beta_0 = 0$, $\beta_1 = 1$ and $\beta_2 = 1$ can also be tested to examine if the nominal exchange rate moves in one-to-one correspondence with the relative price and expected real exchange rate.

## III. EMPIRICAL RESULTS

Testing the proposition of whether or not expectations play any role in the determination of exchange rate is carried out by estimating equation (12). For this purpose monthly data were collected on three exchange rates - rupee-dollar, rupee-pound and rupee-yen and wholesale prices over the period 1982:1-1993:7. All data were obtained from Datastream (IMF series).

Before testing for cointegration, unit root test are carried out to examine if the variables underlying equation (12) are integrated of the same order. Testing for unit root in levels and first differences of the variable $S_t$, $(p\text{-}p^*)$, and $q_{t+1}$ is conducted on the basis of three test statistics: the Dickey-Fuller (1979) $\tau_\mu$ statistic and the Phillips-Ouliaris (1990) $\hat{Z}_\alpha$ and $\hat{Z}_t$ statistics. The results obtained from the three unit-root test statistics, as shown in Table 1, are consistent in indicating that all the variables underlying equation (12) are nonstationary in levels and stationary in first differences, implying that they are $I(1)$.

**Table 1. Testing for Unit Root**

| Country | Variable | Level | | | First Difference | | |
|---|---|---|---|---|---|---|---|
| | | $\tau_\mu$ | $\hat{Z}_\alpha$ | $\hat{Z}_t$ | $\tau_\mu$ | $\hat{Z}_\alpha$ | $\hat{Z}_t$ |
| Pak-U.S. | $S_t$ | −0.0877 | −0.720 | −0.843 | −7.626 | −98.27 | −7.109 |
| | $q_{t+1}$ | −2.171 | −8.977 | −2.328 | −9.378 | −11.06 | −9.018 |
| | $(p - p^*)_t$ | 0.230 | 0.285 | 0.625 | −8.797 | −74.02 | −9.641 |
| Pak-Japan | $S_t$ | 0.074 | −0.024 | −0.029 | −10.975 | −150.97 | −11.208 |
| | $q_{t+1}$ | 0.619 | −0.889 | −0.536 | −11.766 | −134.88 | −11.854 |
| | $(p - p^*)_t$ | 0.775 | 0.231 | 0.562 | −9.937 | −114.73 | −9.771 |
| Pak-U.K. | $S_t$ | −0.495 | −0.526 | −0.430 | −10.708 | −108.58 | −10.754 |
| | $q_{t+1}$ | −1.010 | −1.736 | −0.968 | −10.572 | −105.00 | −10.583 |
| | $(p - p^*)_t$ | 0.726 | 1.135 | 1.272 | −5.573 | −66.21 | −8.312 |

* Significant at the 5% level.

Testing for cointegration is conducted on the basis of the Engle−Granger (1987) and the Phillips-Ouliaris (1990) procedures. Two test statistics are used in conjunction with each cointegration test: while *ADF* and *CRDW* statistic are used with the Engle-Granger test $\hat{Z}_\alpha$ and $\hat{Z}_t$ statistics are used with the Phillips-Ouliaris test. Results of cointegration and coefficient restrictions tests are reported in Table 2.

**Table 2.** **Testing for Cointegration** ($s_t = \beta_0 + \beta_1 (p - p^*)_t + \beta_2 q_{t+1} + \epsilon_t$)

| | Pak-U.S. | Pak-Japan | Pak-U.K. |
|---|---|---|---|
| $\beta_0$ | 0.099<br>(0.102) | −0.198<br>(0.101) | 0.177<br>(0.062) |
| $\beta_1$ | 1.012<br>(0.012) | 1.045<br>(0.027) | 1.130<br>(0.045) |
| $\beta_2$ | 0.962<br>(0.038) | 0.927<br>(0.038) | 0.941<br>(0.020) |
| $R^2$ | 0.995 | 0.996 | 0.987 |
| *CRDW* | 1.426* | 1.797* | 1.797* |
| *ADF* | −8.920* | −10.521* | −10.521* |
| $\hat{Z}_a$ | −103.65* | −104.035* | −104.487* |
| $\hat{Z}_t$ | −8.51* | −10.487* | −10.487* |
| $t^*(\beta_0 = 0)$ | 0.971 | 1.96 | 2.85* |
| $t^*(\beta_1 = 1)$ | 1.00 | 1.67 | 2.89* |
| $t^*(\beta_2 = 0)$ | 25.32* | 24.40* | 25.11 |
| $t^*(\beta_2 = 1)$ | −1.00 | −1.92 | −2.95* |

Significant at the 5% level. The West corrected standard errors are reported in parentheses $t^*$ is the corrected $t$-statistic which is calculated on the basis of the corrected standard errors.

The results from four cointegration test statistics, *CRDW, ADF* $\hat{Z}_\alpha$ and $\hat{Z}_t$ are highly consistent in lending support to the role of expectations in determining Pak-rupee exchange rates because the coefficient on the expected real exchange rate is highly significant in all cases. However, the results are not supportive of the hypothesis that the nominal exchange rate moves in one-to-one correspondence with the relative price and expected real exchange rate in all cases. Only in two cases (rupee-dollar and rupee-yen) are the restrictions $\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = 1$ accepted as judged by the West (1988) corrected *t*-statistic. These results are highly consistent with those obtained by Bhatti and Mossa (1994) who tested the validity of this view for ten major industrial countries and found favourable results in almost all cases.

## IV. CONCLUSION

This paper has tested the proposition of whether or not expectations play any role in determining three Pak-rupee exchange rates: rupee-dollar, rupee-pound and rupee-yen. Results from two residual-based cointegration tests are in line with the view that in efficient markets in which uncertainty and expectations about the future are present the nominal exchange rate is determined not by current relative prices but also by the expected real exchange rate. These results lend support to *ex ante* PPP against conventional PPP. The policy implications that can be drawn from these results are as follows. First, the inflation rate is expected to be higher in Pakistan than in other countries, which in turn is likely to cause depreciation of Pak-rupee. Second, the anticipated depreciation of Pak-rupee is expected to encourage the domestic residents to transfer their assets into foreign assets, leading to the flight of capital from Pakistan. Third, the terms of trade of Pakistan also tend to be deteriorated because of higher anticipated inflation rate at home than abroad. Finally, the tendency of larger expected inflation rate in Pakistan tends to eventually offset much of gains of the continuous devaluation of Pak-rupee by undermining external competitiveness.

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# FIVE MAJOR DISEASES OF PAKISTAN ECONOMY: A CRITICAL REVIEW

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The views expressed entirely belong to the authors.
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## INTRODUCTION

Presently, the population of Pakistan is about 140 million, spreading over 796,095 square kilometers. About two-third of population lives in rural areas. The population densities, as per 1981 census, were 230,135,148 and 13 persons per square kilometers for Punjab, Sindh, NWFP and Baluchistan[1], respectively. Current estimates indicate that the same has increased to 382, 224, 246 and 22 persons in 1997, respectively. The increase in population was over 66% during the above period; except for Baluchistan where the same increase was about 69%. Baluchistan is the most underdeveloped province but it has the largest area and only 4% of the total population. Thus the population of Pakistan is not evenly distributed across the country. The population was increasing at a rate of over 3% per annum, which has recently come down to 2.78%. The per capita income of Pakistan is $460 and Purchasing Power Parity (PPP) income is $2230 (World Development Report, 1997). Agriculture is one of the major sectors of the economy. Out of the total area of 79.61 million hectares, 24.39 million hectares are not available for cultivation. Presently, 21.6 million hectares are cultivated and still about 9 million hectares constitute as cultivable waste. Alone in Baluchistan more than one million hectares of virgin land is lying ideal, which is waiting to be exploited. From the last decade or so there is hardly any increase in the new area brought under cultivation. Pakistan was exporter of food products but, presently, it has become importer of several food items like wheat, lentils and powdered milk etc.

The increasing population pressure, slow agricultural growth and low investment in agriculture seem to result in such a situation[2].

The economic growth in Pakistan has not been stable, rather it remained unstable. The economic policies were also frequently changed. Pakistan experienced accelerated growth in the 1960s and it slowed down in the 1970s. The economy again improved in the 1980s but it ended up with deep recession in the 1990s. Economic planning did not focus on long term sustainable development. Due to this, it continues to suffer from low literacy, poor human resources, consistent deficits in the balance of payment and budget. Besides, inflation persisted over a decade or so. Poverty increased and unemployment became a threatening problem. Presently, the economy is in depression and economic policies have turned out to be ineffective. As a result, adhocism has become a part of economic policies.

Pakistan is facing hardships to meet international obligations like debt servicing. More than two-third of the budget is washed away by debt servicing and defense expenditures. As a results meager resources are left to further develop the country. On the face of this, high population growth is increasing demand for public services and basic human needs. The growth of real per capita income has become negative. More than one-third of population is below poverty line. The decrease in growth and squeeze in development expenditures have added to increase poverty. These problems seem to be emerged over long period of time and they have deep roots. Given this background, the study intends to analyze and review the literature to pin point major economic problems faced by the Pakistan economy. Based upon the analysis future economic growth prospects will be highlighted. Moreover, future policy guideline will be provided for sustainable growth. The study is organized as under. Part two is review of evidences and analysis of the pakistan economy. Major economic problems are identified in this part. Part three, consists upon the likelihood of future prospects for economic growth and recovery. Part four, is conclusion of the study. Policy guidelines are also summarized in this section.

# Part-II
## *Past Trends and Current Economic Situation*

Pakistan economy experienced an average annual growth of 6% per annum during the last three decades. However, economic growth was slightly slow during the 1970's i.e. 4.8% per annum. the same during the 1960's and 1980's was 5.8% and 6.5%, per annum, respectively. Agriculture is the backbone of the economy, its performance is reviewed below.

### Agriculture

Agriculture sector continued to be the main stay of the bulk of population and it was also one of the major contributing sector toward its GDP i.e. 24%. It contributes more than 70% towards foreign exchange earnings. One-half of the total labour force is engaged in agriculture. The agricultural growth was over 5% during the 1960s and 1980's. During the 1970's, its growth was around 2.4% per annum. During the 1990's it grew by 5.5% per annum. Recently, its growth has been one of the lowest. In 1996-97, it grew by only 0.06% (Annex I). The industrial sector is also dependent upon this sector, since major inputs for the industrial sector are drawn for agriculture. Thus, the rise and fall of the agricultural sector seems to affect the industrial sector and overall growth of the economy. Therefore, it is considered the backbone of the economy.

### Industrial Sector

The industrial sector of Pakistan has not expanded much over time. Pakistan is still far from take off stage. The share of manufacturing sector toward GDP increased from 16% to 19% during the 1960s to 1990s, respectively. It grew about 10% per annum in the 1960s. However, its growth slowed down to 5.4% per annum, during the 1970s and 1990s. During the 1980s, its growth was around 8% per annum. Recently, its growth was as low as 1.2%, during 1996-97. It may be noted that the small industries, which have employed over 70% of the industrial labor force was hardly a major focus of the policy makers. Policy makers know even today hardly its actual performance. Its growth reported by a survey carried out several years ago is repeated every year,

which is not even linked with overall economic growth. A policy to encourage large industries was followed. The large industries do not generate much jobs since these are capital intensive[3]. As a result, industrial growth did not absorb the increasing labour.

**Services Sector**

The services sector is the largest sector, which contributes about 49% toward GDP[4]. Its growth has remained constant around 6% per annum, during the last two decades. However, its growth was 4.6% during the 1990s. The above review indicated that the structural change is slow. Recently all sectors have turned to low growth. During the 1990s the economy has ended up with depression.

**Inter-linked Economic Problems**

As already mentioned above, the economy grew at an accelerated rate during the 1960s and the growth was respectable during the 1980s too. During the 1960s, public policies were focused towards export led growth. The country experienced stable political environment too. The international flow of resources was also significant. Such a healthy trend did not continue. Political situation became unstable. There was military rule for more than 10 years. Market friendly environment was not available for stable economic growth. The prolonged war in Afghanistan directly affected the economy of Pakistan. About one million refugees cross the border for shelter. Thus a policy to manage day to day economic problems was followed. The lack of resource mobilization further added to its economic instability. Over time, it ends up with accumulating foreign and domestic debt, which posed a serious threat to its growth.

Development policies were also not very stable in Pakistan. Economic priorities keep on changing without fully achieving their goals. Agricultural development was the top priority in the first and second development plans (1966-65). Thereafter, industrialization policy was followed. The country did not reach to takeoff stage and the priorities were changed again. All Heavy industries were nationalized, on the name of inequitable distribution of wealth. This action led to the loss of confidence of the businessman and industrial growth was affected badly.

After this, basic Human Needs (BHN) approach for development, was introduced, during the 1980s. The BHN failed all over the world and so did in Pakistan. It was soon discontinued. Recently, Social Action Plan (SAP) has been introduced. It focuses on the development of five social sectors like basic health, primary education, population welfare, potable water supply and sanitation. During the late 1980s privatization, deregulation and denationalization policies were introduced. So far these policies have not shown much fruitful results, rather the economy is facing economic crises. Prices keep on increasing and double-digit inflation persisted over a decade now. Unemployment is widely spread and investment is not responding to economic policies. The public policies end up with following adhocism. As pointed out above, long term real objectives for sustainable growth were not followed. As a result, the country ended up with several inter linked economic problems. These major economic problems and their linkages are explained in terms of five major economic diseases; as given in the figure one.

Figure one indicates five major economic diseases of Pakistan. Among these diseases AIDs (foreign borrowings) and Cancer i.e. inability to mobilize domestic resources, are serious diseases. These diseases have deep roots in the changing development planning priorities. The neglect of one problem or its mishandling led to the birth of the other problems. These five major diseases are as given below[5].

*i. Inconsistent Planning priorities and Policies*
*ii. Triangle of Deficit, Debt and Inflation*
*iii. Trade Instability*
*iv. Neglect of Human Resources and Unemployment*
*v. Domestic Resources Mobilization and Public Sector*

**i) Inconsistent Planning and Policies**

Pakistan has followed economic planning since 1955. Five years plans were prepared and implemented. The first and second five-year plans (1955-60) placed the highest priority to develop agriculture. More than 26% of the plan allocations were made available for this sector. Green Revolution was introduced. The sector performed well and accelerated growth was observed during the 1960s (Annex I).

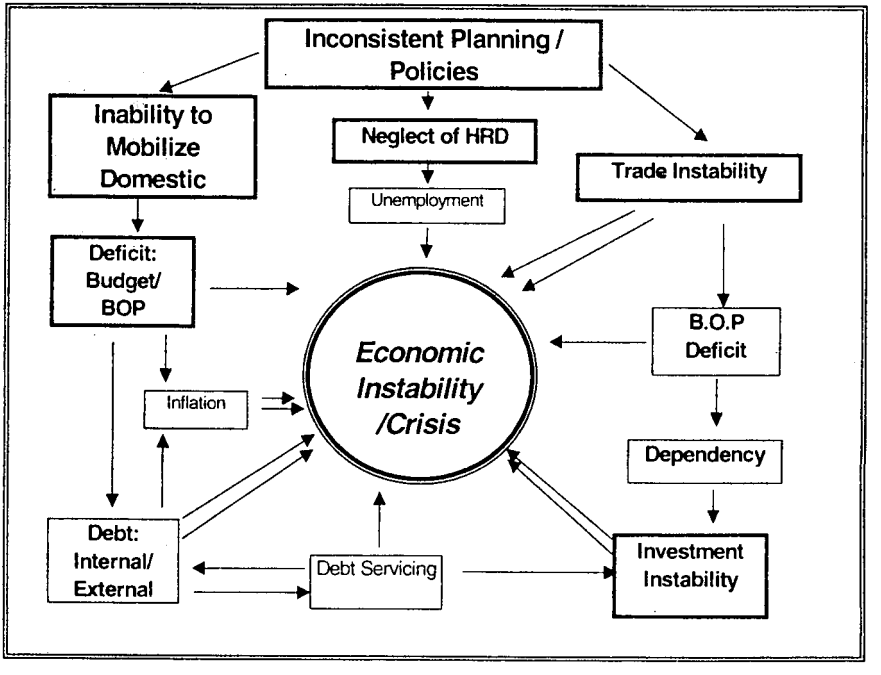


**Figure 1 Linkages of Economic Problems**

Thereafter, the planning priorities were changed and agricultural development was not at the top of the development agenda.

The surplus from agriculture was transferred to other sectors by pricing policies. It led to have adverse effect on agriculture (Chaudhary, 1989, 1985). Even today the prices of agricultural produce are controlled. This sector was not fully developed and planning priorities were shifted to develop industrial sector. As a result, the agriculture was neglected in the third plan (1960-65) and onwards. The financial allocations for the agriculture sector keep on decreasing. Recently, hardly

4% of the resources are allocated for this sector (1996-97). Its growth slowed down over time and the country ends up with even importing agricultural food items. On the face of this, thousands of hectares of virgin land remained as cultivatable waste. In spite of the potential, the above policies kept the agriculture underdeveloped, even today.

Most of the development was based upon foreign resources. As a policy, every plan was focused to reduce foreign resource dependency. But in reality the results were the opposite. It was aimed to eliminate foreign dependency by the end of the third plan (1965). Thereafter, two development plans ($4^{th}$ and $5^{th}$) were prepared but hardly implemented. The sixth plan (1983-88) was introduced with new policy focus toward rural development and to reduce foreign dependency. Significant development was achieved in the rural development during this period but there was hardly any progress to mobilize domestic resources. The foreign borrowing was growing over 11% per annum, therefore, foreign dependency increased over time.

The industrial policy was also not consistent. In the early development plans private sector was dominant in industrialising the country. Direct role of the public sector was limited. During the 1970s, all heavy industries were nationalized on the name of better distribution of wealth. Such action led to halt the industrial growth. Thereafter active role was played by the public sector to develop industries. This policy was also discontinued later and denationalization of the nationalized industries and banks was introduced. It clearly shows inconsistency in policies.

During the 1980s, basic Human Needs Approach (BHN) was followed (see Chaudary, 1989, Chapter 10). Such an approach was supported by international institutions and donor agencies. No significant improvement was achieved by following this approach. Therefore it was soon dropped. A package of structural reforms was proposed by the international donor institutions. The package did not have much impact on improving the economy. However, the country ended up with heavy foreign indebtedness, inflation and deficit. A weave of new reforms was introduced. In the late 1980s, Privatization, Denationalization and Deregulation were introduced. It was proposed to sell the public industries and pay back the loans. It was not the aim to improve upon

development investment. Given the rigid economic structure and existence of monopolies, the reforms have not shown much results either; rather it has added to more problems. Inflation and unemployment increased and the public sector development investment squeezed. The policies keep on changing and economic instability continued. During this process of development, Human Resources Development (HRD) was neglected. On papers long term goals were set but hardly serious efforts were made to achieve them[6]. After thirty years of planned development, hardly sustainability of any sector was achieved.

Presently, SAP is in action. First SAP (1992-95) has been concluded and the second is in action. In reality, the SAP is a new name of BHN. The sectors priorities remained the same. SAP is directed to develop social sectors like Primary education, basic health, population welfare, and supply of potable water and sanitation facilities. About one-fourth of financing of the programme is based upon foreign aid. As already mentioned, through out this period foreign borrowing continued to grow. The foreign loans growth was as high as 11% per annum. over time, these loans started to wash away the whole growth. Alone foreign debt servicing constitutes over 3% of GNP. As a result policy changes continued and foreign indebtedness also keep on increasing.

The development planning also suffered from consistent mistakes. Inconsistency was also apparent in financial plan allocation, budgetary allocation and actual utilization. High financial and physical targets were set and they were hardy achieved. A consistent pattern was evident throughout, like high plan allocations and failure to provide the same finances during budget. Moreover, what so ever was provided was not fully utilized (Shaheen, 1996). The resource shortage was evident in almost all later plans. Ambitious plan targets were set and even those targets were dependent upon foreign resources. Instability in the flow of foreign resources also contributed towards failure to realize plan's allocations and achievement of targets. The planning and actual implementation of plans remained divorced. These inconsistencies were repeated again and again. Development is a process to learn from experience and improve upon it. Such effort keeps on lacking in the economic planning of Pakistan.

### ii) Triangle Disease: Deficit, Debt and Inflation

Pakistan is suffering from budget deficit (G-T) and BOP deficit over than a decade now; (M-X) + (S-T) = (G-T). Failure to mobilize domestic resources was one of the major failures of public policies. Tax base is very narrow and tax revenues is inelastic (Khan, 1996). Hardly One percent of population is taxpayer. A policy of easy revenue collection was followed without considering its economic impacts. Overtime, taxes were raised for the same taxpayers and commodities. Such a practice led to tax evasion and corruption. Presently, over 30% of its economy is underground. The resource gap was constantly met by borrowing. The resource gap and inefficiency led to continuous budget deficit. When the external borrowing position became tight more internal borrowing was done. This borrowing was done from nationalized banks on a lower interest rate than that of which they were lending to private sector. This shift led to destroy the banking system and also squeezed the credit for the private sector. These banks were turned into losses by these polices. After this outcome, it was decided to privatize the nationalized banks. With the privatization of nationalized banks, more borrowing was done from public and private institutions. These new loans were obtained at a very high cost; for example, public sector is paying over 15% on the national saving loans. Similarly, on the tightening up of international public loans, private lending was done, which was also more expensive. As a result, debt burden accumulated and so did the debt servicing. This spiral of borrowing led to more borrowing for repayment of debt servicing. Presently, about one-half of the new international borrowings are washed away by debt servicing. The debt cycle theory does seem to be working for Pakistan. It means that half of the new loans are obtained to just repay the old loans. The need for more new loans was created by these policies. Such development led to increase deficit over time. The budget deficit reached up to 8% of GDP in 1992-93. Chaudhary and Ahmed (1995) pointed out that deficit is one of the major source of inflation in Pakistan. Thus, one ill is creating another disease. Besides, there are other sources of inflation like structural inflation, which also emerged from ever growing non-development spending of the public sector. Rapid increase in the non-development expenditures (11%) also put squeeze on development expenditures. Besides, it also generated inflation; structural inflation. This linkage of deficit, debt and inflation is shown in figure two below.

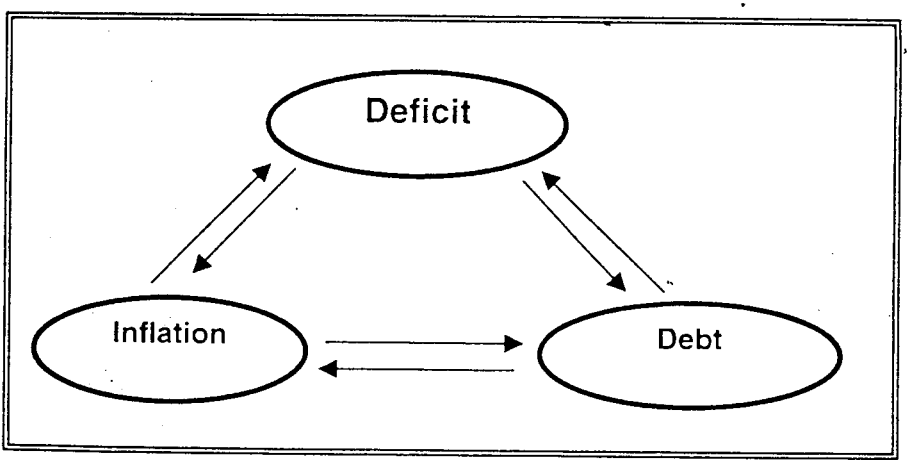


**Figure 2. Triangle Problem**

The inconsistent policies not only created the above cited triangle disease but it also led to unstable growth in the foreign sector. The deficit of the public sector is related to B.O.P. gap and Saving-investment gap. During the 1960s, the foreign sector showed accelerated growth; mainly due to positive impact of public policies. Soon the concentration on trade disappeared and therefore, exports did not grow much in the 1970s. As a result, the trade gap started to grow. The current account deficit reached as high as 7.1% of GDP, during 1996-97. Foreign borrowing was seen as remedy to fill in the increasing resource gap, since trade did not respond to improve balance of payment. Besides, Pakistan being a small economy is price taker in the international market. The imports keep on increasing and so did the foreign debt. The increase in imports and import prices further added to inflation (Chaudary & Ahmed, 1995) and deficit. Thus, another source of inflation was increasing imports and their prices.

In addition to above, Saving-investment gap (S-I) continues to persist even after 50 years of Pakistan's independence. On average, Pakistan's saving rate remained around 14% of its national income. However, it was investing around 19% of GNP. Thus, the resource gap of 5% was met by borrowing. In other words, resource gap and inability to mobilize domestic resources was a source of borrowing and deficit.

The deficit was a source of inflation. Pakistan is experiencing double digit inflation from a decade or so. Inflation has become a permanent feature of Pakistan economy. Its double-digit persistence has also added to economic crises. Uncertainty about prices may effect investment and decision making of the households and businessman, which affected economic growth too. The above discussion leads to conclude that deficit, debt and inflation are inter-linked. Present level of debt, deficit and inflation are not sustainable (Anjum, 1995) & (Farooq, 1996). Thus, it appears that the triangle economic disease is also linked with inefficient economic policies.

**iii) Trade Instability**

Foreign sector was one of the most volatile sectors. Pakistan's exports grew by more than 13% during the 1960s. As stated earlier, commercial policies were very favorable to promote exports. Exports bonus scheme, foreign exchange concessions, export subsidies and tax holidays were introduced to promote exports. As a result, accelerated growth of exports was achieved. These policies did not continue. The period of 1970s end up with slow and unstable growth. Export instability index, based upon export fluctuations, is calculated which is reported in Table 1.

The table 1, provides long-term export growth and its instability index. Since the growth was volatile, therefore,t he same pattern is indicated by the index. The index varied from 0.003 to 9.5. The exports growth rates also fluctuated form negative to positive growth of over 25%. It not only created trade instability but it also created instability in foreign exchange reserves. The current account deficit was as high as 3.6 billion dollars in 1992-93. Recently, during 1996-97, the same deficit was around 3.2 billion dollars. Such deficit forced heavy borrowing. If Pakistan had continued export led growth, the heavy debut and debt-servicing problem may not have been arson.

Regression analysis and correlation between export growth and economic growth were carried out to see their relationship. Besides, correlation between capital instability, export instability and GDP growth rate, growth of labour force, investment and real exports was also done. The empirical results indicated that instability in exports is positively

related to output growth. It was also observed that capital instability is negatively related to GDP growth (See Appendix-II). Besides, the income growth remained limited to its boundaries, since export led growth was not followed. The market responded only to local demand and limited growth was experienced.

**Table 1 Exports Instability Index**

| Year | Index | Exports (Annual % Growth) |
|---|---|---|
| 1970-1 | 0.6 | - |
| 1971-2 | 6.9 | 25.6 |
| 1972-3 | 9.5 | 1.3 |
| 1974-5 | 0.2 | 0.4 |
| 1976-7 | 5.3 | - |
| 1979-80 | 1.7 | 25.1 |
| 1980-1 | 0.5 | 2.7 |
| 1983-4 | 3.5 | - |
| 1985-6 | 0.4 | 4.6 |
| 1988-9 | 0.003 | 23.8 |
| 1990-1 | 2.8 | 12.6 |
| 1991-2 | 4.7 | -6.4 |
| 1993-4 | 1.6 | 7.1 |
| 1995-6 | - | 7.1 |
| 1996-7 | - | -2.6 |

Source: Chaudhary & Qaisrani, (1996)

Given the trade structure, Pakistan has made some progress to export manufactured goods. As stated earlier, most of these exports are based upon the agriculture sector. Moreover, about 70% of foreign exchange earnings directly or indirectly depend upon agricultural exports. During 1960s, Pakistan was exporting 33%, 23% and 44% primary, semi-manufactured and manufactured goods. respectively. This composition was changed to 14%, 17% and 67% during the 1997-98, respectively. It appears that some progress has been made on this front. But it may also be noted that the base in not very large and major share of manufactured goods pertains to textile and textile family products. The production of manufactured goods was not very large and it is also suffering from quota restrictions on the international front. With the new WTO rules for free trade, Pakistan economy faces opportunities and challenges. There is an opportunity for increasing exports; since it was suffering from quota restrictions and such restrictions may be less in the future. Moreover, is a challenge to compete in quality, which lacks in its export production. The problem of trade has to be tackled for better future growth prospects. In other words, limited growth of limited commodities will not generate much fruitful results. The above analysis indicates that trade instability is another problem for Pakistan. The foreign sector did not experience stable growth and it is not a large part of the economy. Pakistan has not benefitted much from trade expansions. Besides, foreign capital constraints posed serious problems for its growth. Such instability also led to pile up debt burden and resulted in unstable growth.

**iv) Neglect of Human Resources and Unemployment**

During the long term planning, the development of human resources was neglected. Human Development Report (1997) ranked Pakistan 134$^{th}$ country in the world, Considering its low level of human development. Over fifty years of Pakistan's independence, the literacy rate is as low as 37%[7]. More than 25% children find no schools for them. Moreover, the existing schools also deteriorated. The education system hardly match with changing demand for skilled labour. On the one hand, educated unemployed youth keep on adding to the reservoir of unemployment and on the other hand there exists unfulfilled demand for skilled labour. Such labour imbalance continued over time. Presently, demand for over 30,000 skilled workers remained unfulfilled (Ghayur,

1997). On the face of this, the country is facing severe unemployment problem. The public sector continued to underreport the unemployment rate by using native definition[8]. As per official figures, unemployment rate is over 6%. It means that over two million workers are unemployed. Hardly and expert believes even in this low estimate. Chaudhary and Chaudhary (1996) carried out a fresh survey and indicated that unemployment is as high as 20%. During the last development plan, over 6 million jobs were to be created, where as in practice even half of the estimate was hardly fulfilled. Thus, unemployment has become persistent and keep rooted problem. it has been reported that the industrial policies led to capital intensive development whereas bulk of labour force remained unemployed. The employment elasticity for the manufacturing sector is 0.35. The same for agriculture, services sectors was 0.3 and 0.55, respectively. Overall employment elasticity is 0.33. Presently, the small-scale industries are also reported to become less labour absorptive and more inclined towards capital intensive (Chaudhary and Hamid, 1999)[9]. Due to low employment elasticities of the agriculture and industry sectors, employment generation was not sufficient to match the growing labour force. The inefficient policies, like capital intensive industries, foollwoed int he past have led to emerge such a situation.

Bulk of Pakistani workers migrated to Middle East in search of jobs. During the oil price hike, over two million workers were working abroad. These workers were sending over 3 billion dollars annually as remittances. These workers started to return home and end up with unemployment. In the 1980s this source of foreign exchange earning decreased over 50%. There was hardly any effective planning for their absorption. Plans on papers were prepared and hardly those were put to action. Such a change not only increased unemployment problem but it also led to increase B.O.P. deficit. The workers remittances reduced from over 3 billion dollars per annum to less than 1.5 billion dollars. Hardly any effective policy adjustment was made to cope with the changing situation.

Training and education was never a priority of development planning in Pakistan. Over time, not only mass illiteracy persisted but the kind of education provided was also a waste of human resources. The expenditures on education were as low as 1.9% of GNP in the 1980s. The same was 2.3% in the 1990s (Annexure I). In the early 1980s, the

same expenditures were hardly 1.5% of GNP. It indicates the low priority assigned to this sector. when the problem became severe, marginal policy changes were made in the financial allocation for the education sector. The same allocation for the current year was still 2.3% of GNP. It means that the problem is still not realized. It may be noted that Primary education is one of the top priorities of SAP. Chaudhary and Hamid (1999) carried out a detailed and comprehensive analysis of unemployment by education level and by each sector. They pointed out that unemployment would rise in future for educated and other segments of the society. The unemployment rate could increase to over 10%, if no policy measure is taken.

Inefficiency of the education policies and training became evident when even high skilled manpower like medical doctors and engineers also end up with jobs like civil administrators and police officers. The education policy is not guided by the market needs. Moreover, majority of people ends up with arts education, not because they want this but because they have no other opportunities. Such education system has added to the literate mass unemployed youth. The unemployment further adds up to spread poverty.

The human resource development was ignored to the extent that poverty increased over time. Few segments of the society keep on winding up wealth. The high 20% population has more than 40% of national wealth: whereas the lowest 10% segment of the society had hardly 3.4% of national income. The latest Economic Survey of Pakistan, contains a title of income distribution but in the text there is not a single sentence about it (Economic Survey, 1997-98 pp-vii-8). However, it does indicates that 0.2% of GDP was spent for social safety network and for anti-poverty measures. It also indicated that reduction in development expenditures over time has contributed to poverty (Economic Survey, 1997-98, pp-vii-8). Such expenditures are over 5% of GDP in developed countries. The need for the same is even greater in developing countries due to very low level of welfare facilities. The latest findings of the survey carried out by the Statistics Division and Jaffri (1996) indicated that about 30% of the population live under poverty line. The poverty line is Rs. 300 per capita per month i.e. less than $10. This segment of population can hardly afford schooling and two times meal a day. The situation has led to increase child labour. The

nets go on. The child labour has become a problem for the exporting sector since the goods produced by using child labour will not be accepted in the world. Thus, poor human resource development added to unemployment, poverty and child labour; and therefore it also resulted in lower trade and growth.

The above analysis indicates that Pakistan is suffering from severe unemployment. Its human resources are underdeveloped which is a hindrance for their adjustment. Literacy rate is still very low. Besides, education focus was not on technical education. The education system hardly adjusts to the market demand. Such an outcome is a result of inconsistent planning and policies. The outcome is poor human resources, poverty, illiteracy and persistent unemployment. Unless appropriate policies are adopted, the country will continue to suffer from such diseases.

**v) Resource Mobilization and The Public Sector**

The major source of economic crises in Pakistan seems the inability of the public sector to respond to the changing economic situation and needs. Shortage of resources is a continuous problem; as already mentioned, not because of lack of resources but due to inability of the public sector to introduce appropriate policies. The tax structure continues to be inelastic and stagnant (Khan, 1996). Hardly one percent of the population is taxpayer; even those who pay taxes are middle class and fixed income salary persons. The millionaires presidents, Prime ministers and businessmen has paid taxes as low as Rs. 5000. The rich and influential continue to avoid tax payment. Besides, the largest sector of the economy, agriculture, continue out of the tax net, up to very recent. The government was not able to tap the resources from rich, business class and influential landlords. However, easy way was found to borrow from abroad and from domestic institutions. It did lead to postpone the taxation and later on more burden was placed on the same taxpayers. Rather looking for new sources of revenue, the same taxpayers continued to bear the additional burden of new taxes.

The public sector was also unable to mobilize resources from direct taxation. Thus, indirect taxation was relied upon for revenue needs. The increasing trend of indirect taxation not only put burden on

the specific segment of the society but it also created other economic ills. Inflation increased and input prices went up. The indirect taxes increased by 12% during 1997-98. The tax revenue from taxation is about 13.5% of GDP. About 70% of the tax revenue is dependent upon indirect taxes. The non-tax revenue is 2.6% of GAP[10]. The public expenditures are over 22% of GDP. Thus, the gap of about 6% is filled in either by borrowing or through monetization. As already pointed out that borrowing from internal market led to shrink the credit for the private sector which also affected growth. The borrowing from the international sources imposed heavy debt servicing and pressure on BOP, which has also become a bottleneck for tits growth. The budget deficit was as high as 8.7% of GDP during 1990-91. Presently, it has been brought down of 6% of GDP. Such a change was not a healthy adjustment. Every year major cut on development expenditures were imposed, rather to decrease non-development expenditures. The current expenditures keep on increasing over 10% per annum. However, development expenditures were squeezed from 6.5% of GDP in 1990-91 to only 3% in 1996-97. Such an adjustment led to affect economic growth. Given the public budget of about 25% of GDP, 17.6% of GDP was used for non-development purposes, i.e. in the 1980s. During the 1990s, the non-development expenditures increased to over 19% of GDP. However, the efficiency of the public sector did not improve over time, in spite of increasing current expenditures. A study by the Services division indicated that the government staff was surplus over 30%. Still, every year more civil servants were added. The reduction in the public sector will not affect productivity; rather it may improve it. In other words, the induction of new staff every year was like providing unemployment allowance rather contributing toward output. Such policy hindered them to adjust in the productive sector; by providing public sector unproductive jobs. Besides, it not only wasted such educated manpower and capital too. Such policies have imposed heavy inefficiency cost and waste of public resources. The policies led to pile up deficits.

The resource constraint was not only evident for the public sector but it appears that the nation was turned towards consumption than that of saving. As already stated saving rate is as low as 14% of GDP. India, which is poorer than Pakistan, has saving rate of over 22%. In Pakistan, on average, investment was around 19% of GDP; the gap of about 5% was met by borrowing. Over time hardly any serious effort was made to

reduce this gap. The situation has become even worse during the recent years. During 1996-97, the national saving was only 11.3% of GDP; while the total investment was 17.5%. The low savings and investment decreased growth. As a result, the economic growth fell to only 1.3% in 1996-97, one of the lowest in the history.

The above outcomes also affected foreign exchange reserve which keeps on declining[11]. Recently, the impact of international economic sanctions on Pakistan has a major impact on foreign reserves. The foreign reserves shrink to as low as 550 million dollars. Thus, the repayment of foreign loans became a major obstacle to economic growth. Adhoc policy measures were again taken by freezing foreign exchange accounts. Such restriction led to halt the remittances and more hardships for foreign exchange was created. Later on the government realized that such an action was a mistake. A new policy for these accounts was introduced. Now, these deposits can be withdrawn in local currency, on lower exchange rate than that of markets. New foreign exchange accounts can be opened and foreign exchange certificates can also be purchased. However it has not gained the trust of the public. Such policies brought Pakistan at the threshold of default. The persistence of deficit, inability to mobilize domestic resources and foreign dependency are severe diseases, rather a cancer and AID, of Pakistan economy.

## Part-III
## *Future Prospects*

The review of current economic situation indicated that Pakistan is trapped in deep-rooted economic diseases. It appears that the recovery is neither easy nor quick. As indicated earlier, most the economic diseases are self-created and an outcome of inefficient public policies. The economy has followed a path of dependent growth and trapped into debt and debt servicing problem. Thus, if the present trend of borrowing were to continue, the day is not far away when it will default. Chaudhry (1988), Chaudhary & Ali (1993) and Sabahat (1997) have analyzed the impacts of further borrowings. The predictions are similar by all studies. It indicated that the debt servicing was 1.3% of GDP in 1971-72, which increased to 3% in 1996-97. It is expected that the same will increase to over 6% of GDP, in the year 2010[12]. It means that the whole economic growth will be washed away by alone foreign debt servicing. The debt

servicing for internal debt will be in addition to this, which is even higher than that of the foreign loans. The borrowing must be curtailed to avoid default. The cure lies in mobilizing domestic resources.

The current economic analysis also indicated that the saving rate is low in Pakistan, as compared to other similar countries. There is a room to improve the savings. If it is done, potential for accelerated growth exists. Therefore, attention must be paid to improve economic policies to mobilize domestic resources. Ample room for improvement exists. For agriculture, intensive and extensive growth policies may also be followed for increasing output. Diversity in crops needs to be introduced. Its exports can be enhanced to a substantial level. By doing so, industrial growth can also be stabilized. It will require incentives and effective policies. Lacking such policies has led to postpone this and, therefore, the country end up with severe economic problems. It may not be postponed any further. Pakistan must bear low growth or mobilize domestic resources to improve upon economic growth. During the current year, the growth was only 1.3% which means that the per capita growth was negative. The negative growth of income will further add to poverty. Such a situation is alarming.

Budget deficit and inflation appear to be inter-linked problems. By decreasing deficit, and improving upon growth, can help to control the problems like inflation and unemployment (Farooq, 1996). Of course, to do so the resource position has to be improved. Presently, under the pressure of international institutions, the deficit has been decreased but still it is not sustainable. Further reduction is needed. The problem can be reduced by improving the efficiency of the public sector i.e. cutting down the current expenditures and improving upon tax collection. For mobilization of resources, structural changes are needed. These changes are not easy. Influential peer groups have to be brought under tax net, to make any progress on this front. New taxation has to be introduced and tax base has to be widened. The introduction of agriculture tax base has to be widened. The introduction of agriculture tax has not brought much revenue. Therefore, these tax rates need to be rationalized. There seems no immediate solution to these problems, since they are inter-linked and deep rooted, which requires committed and sincere efforts.

Foreign sector has been a source of economic instability. The growth of trade was unstable. Therefore, the flow of international resources was also not stable. The trade and foreign exchange instability has contributed to economic problems. Pakistan has not placed priority to expand its exports. The new international economic order poses a set of new challenges for the Pakistan economy. Under new trade rules, there are opportunities to benefit from new free trade norms. Since the level of technological progress is poor and Pakistan entrepreneurs are not very conscious to quality control, therefore, such adjustment requires appropriate policies to cope with the challenge[13]. As stated earlier, Pakistan was facing quota problems, which will be less in future. Textile is the largest industry in Pakistan and it is also a major export. Thus, improvement in textile products and increase in its exports could help in improving foreign exchange earnings. Rice is also one of the major agricultural export of Pakistan. Its export can also be enhanced to substantial level. Besides, Pakistan must diversify in exports and exports markets. All this indicates that potential does exist for improvement, if appropriate policies are introduced. But all this will not lead to fulfill the foreign exchange gap unless new sources to earn foreign exchange are explored and a breakthrough in inefficient policies is made.

Unemployment is one of the long-term deep-rooted problems of Pakistan. The future prospects for its immediate improvements are not very bright; given the high population growth, low quality of human resources, slow economic growth and resource constraint situation. Several studies indicated the future scenarios for it. Hamid (1996), Chaudhary and Chaudhary (1994), Chaudhary (1998) and Chaudhary & Hamid (1999) indicated that if the present trend of slow job creation were to continue, the unemployment situation would become even worse. Future scenarios by Chaudhary & Hamid (1999) indicated that absorption of surplus labour will be one the major challenge. As stated earlier, presently, there are over two million workers who are out of job. Every year more than one million new labour force is added who look for jobs. Unemployment is already high and it will grow further: over 10% (Chaudhary & Hamid, 1999), if no policy measure is initiated. However, if the population growth rate is brought lower than 2.5% and the economy grows over 6%, the same may be reduced to around 5% in the same period. For complete solution of the problem, improvement in

human resources, labour intensive employment policy and economic growth over 6% will be required.

Recently, the major international economic sanctions have been lifted and some of the foreign aid has been resumed. Its major impact will be that Pakistan will not default and current projects can be completed. More funds will be available for repayment of debt servicing, and investment. The economic growth is expectect to recover to around 5% or so; since the saving-investment gap will be filled in to some extent. However, it will not be a permanent solution and still the economy will not perform to the full potential. Therefore, Pakistan must find solution to its deep-rooted diseases and improve upon economic policies to achieve accelerated growth. The future challenges will be harder than the past. The world is squeezing to a global village which means survival for the competitives. Two types of policies are needed for sustainable growth. (i) Short run policies, which must focus on recovery of the economy so that the crises are managed. For this purpose, foreign aid must be utilized efficiently and it should be for only very essential purposes. The heavy debt and debt servicing do not allow to keep on borrowing unbounded. Attention must be paid to improve agriculture which will provide immediate returns. Small industries need to be encouraged to generate employment (ii) For sustainable growth, long term policies are needed. Education and human resource development must be the top priority. A policy to convert small industries to medium and large export oriented may be introduced in the long run. Spreading literacy and better education system will help to achieve stable growth. All it can be sustained if domestic resource mobilization is done. Such a change will also bring political stability and, therefore, stable economic growth.

The most important policy area is to reduce resource gap and mobilize domestic resources[14]. The saving-investment position needs to be improved substantially. Pakistan has achieved higher saving rate in the past. It can be achieved again. It must be done by compulsory saving policies and economic incentives. With improvement in resource position, development expenditures for infrastructure need to be improved. The immediate attention must be paid to further develop the agriculture. It will help to increase foreign exchange earnings, more employment and savings on agricultural imports. For industrialization,

export led growth has to be followed, since domestic market is limited. Appropriate policies for this purpose may be introduced. A core for sustained growth is improvement in human resources. Old policies of the 1960s will not work in this new era of openness and competition. Market orientated, efficiency based strategy need to be followed. In spite of the poor economic situation of Pakistan, it has a good potential for joining the new fast growing countries of Asia. Particularly, in the South Asia, it is one of the major countries, which has shown a high potential for rapid growth.

## Part IV
## *Conclusion and Policy Directions*

The paper was focused to review the current literature to pin point major economic problems of Pakistan economy. The severity of the problems was to be indicated. Moreover, based upon the review, it was also aimed to highlight future prospects for growth. For this purpose, past trend of economic growth and policies was reviewed. Literature review was done and quantitative information was utilized to pin point the major economic problems. The economic analysis of the Pakistan economy revealed that there are five major economic disease which are badly affecting its growth. Some of these problems are a result of inconsistent economic planning and policies followed in the past. Among these problems, triangle problem of deficit, debt and inflation seems to be a result of inefficient economic policies. Besides, international trade and investment instability has also taken its tool by shrinking economic growth. International trade appears to be not playing the role of a driving force for its growth. The long term policies of Pakistan never focused to develop human resources, as a result, it keeps on suffering from illiteracy, unemployment and low productivity. Foreign dependency and failure to mobilize domestic resources appear to be the most serious problem. Presently, the Pakistan economy is in deep depression. The international sanctions have created hardships for its recovery. Particularly the foreign sector was hit badly by these sanctions. The international reserves have gone to the minimal level. Learning from the past and improving upon economic policies could help to put the economy on the right path again. Such an approach was not followed in the past.

It appears that with the revival of foreign aid the depression will be over. But for returning to the full potential growth, additional steps, different from the previous, will be needed. To resume such a growth, two types of policies will be needed. Short run policies, which must be focused for recovery. Such policies will help to restore the confidence of international donors and the local as well as international businessmen. For sustained growth, long term stable and consistent policies will be needed. The short run policies may focus on efficient use of resources, mobilization of domestic resources, improving agriculture and incentives for small industries. The long-term policies may be guided for achieving sustained growth. These policies must focus on appropriate sector priorities. Human resource development should be at the top of the development agenda. One of the obstacles for international investment is illiterate labour. In the long run. small and medium industries may be converted to large industries. Besides, there is a need to improve upon technology and quality of export items. With the opening of new era for free trade, there are opportunities for Pakistan to increase its trade. Trade led growth can accelerate the economy but it should not be a short run goal. In the long run, foreign dependency must be reduced to stop the resource wash through debt servicing.

In respect of the present depression, in the past, the economy of Pakistan has shown good response to development policies. It was able to achieve one of the highest growths in the South Asia. The same pattern can resume again if good governance is established, resources are mobilized and human resources are developed. Pakistan has the potential to catch up with the rapid growing countries in Asia. It all depends upon the political stability and efficiency of policies.

## NOTES

1 These are four provinces of Pakistan. Punjab has the largest population and Baluchistan has the largest area. Punjab and Sindh ar relatively developed provinces.

2 Quantitative figures are provided in the next sections. For more details also see Chaudhary (1989) and Economic Survey, of Pakistan, 1997-98.

3 For details of all sectors employment elasticities see Chaudhary and Hamid, (1999).

4 For detailed analysis of the structural change see Chaudhary (1989).

5 For comprehensive and complete sources of these problems also see, Chauhary (1988), Chaudhary and Hamid (1999), Chaudhary and Ahmed (1995), Chaudhary and Qaisrani (1996), chaudhary and Altaf (1995), Chaudhary (1993), Chaudhary (1995), and Naqvi and Khan (1994).

6 The issue is taken up in details later on. For comprehensive analysis see a complete book on the issue by Chaudhary & Hamid (1999).

7 This rate is based upon the official strange definition of Unemployment. The effective literacy is hardly 20%.

8 As per official definition of unemployment, if any one has not even worked for one hour, he will be unemployed. However if any one has worked for one hour, he will be considered employed. given this definition, if may be difficult to find any one unemployed.

9 It is being published in 1999 by Ferozesons, lahore. The whole book contains a comprehensive analysis of the Human Resource neglect in Pakistan. Also see S. Ghayur (1996-97).

10 Khan (1995) contains detailed analysis of the tax and revenue structure of Pakistan.

11 The foreign reserves varied from over 3 billion dollars. The later is not sufficient for two weeks imports. Presently these reserves are maintained by more and more borrowing rather from trade.

12 It is based upon the prediction of external debut. The same for the external debt is even higher. The external debt is over 42%

of GDP. The internal and external debt will be over 100% of GDP in the first decade of 21st century.

[13] A Japanese expert from JETRO indicated that Pakistan must focus on high value exports. It also needs to grow long content cotton to earn more foreign exchange.

[14] For analysis of debt and its impacts and solution also see Ahmed, E. (1996).

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## Annexure 1: Economic Indicators

(% growth per annum)

| Indicators | 1960's | 1970's | 1980's | 1990-91 | 1992-93 | 1995-96 | 1996-97 |
|---|---|---|---|---|---|---|---|
| GNP | 6.8 | 4.8 | 6.5 | 3.7 | 2.3 | 5.2 | 1.3 |
| Agriculture | 5.1 | 2.4 | 5.4 | 5.1 | -5.3 | 5.8 | 0.06 |
| Manufacturing | 9.9 | 5.5 | 8.2 | 6.2 | 5.3 | 5.6 | 1.2 |
| Services | 6.7 | 6.3 | 6.7 | 6.8 | 4.6 | 4.8 | 2.1 |
| Total Investment (% of GNP) | - | 17.4 | 17.5 | 19.9 | 20.6 | 18.3 | 17.5 |
| Saving (% of GNP) | - | 11.7 | 13.8 | 16.9 | 13.5 | 11.6 | 11.3 |
| I-S % of GNP | - | 5.7 | 3.7 | 3.0 | 7.1 | 6.7 | 6,2 |
| Exports | - | 13.5 | 8.5 | 19.8 | 0.3 | 7.1 | -2.6 |
| Imports | | 16.6 | 4.5 | 13.1 | 11.7 | 16.7 | -6.4 |
| Trade Deficit | - | 20.5 | 0.9 | -0.1 | 46.1 | 46 | -15.1 |
| Current A/c Deficit | - | - | 21.2 | 38 | 174 | 84.2 | 15.9 |
| CPI | 3.8 | 12.3 | 7.3 | 12.7 | 9.8 | 10.8 | 11.8 |
| Deficit (Overall Budget) | 2.1 | 5.3 | 7.0 | 7.4 | 8.0 | 6.3 | 6.2 |
| Develop. Expenditure | - | - | 7.2 | 7.5 | 5.7 | 4.3 | 3.5 |
| Expenditure Health (% GNP) | - | - | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 |

Economic Survey 1994-95, 1997-98

## Annexure II Correlation Between Exports, Foreign Exchange, Capital Instability and Other Variables

| Variables | Instability Capital | Instability Export | Instability Foreign Exchange |
|---|---|---|---|
| GDP growth | -0.17 | 0.019 | -0.2 |
| Growth of L. Force | 0.124 | 0.147 | -0.4 |
| Growth of Investment | -0.61 | -0.293 | 0.34 |
| Capital Instability | - | 0.51 | -0.14 |
| Export Instability | - | - | -0.17 |
| Instability Foreign Exchange | - | - | -0.04 |

Chaudhry and Qaisrani (1996).

## Table 2 Export Instability, Capital Instability and Economic Growth

| Variable | C | GLF | GXN2 | GKPT | IPK | IX |
|---|---|---|---|---|---|---|
| 1 | 7.5 | 0.09* | 0.39 | -0.0001 | -722.23* | 61.21 |
| 2 | 7.52* | 0.1 | 0.039* | -0.0001 | -682.07 | - |
| 3 | 5.29* | 0.0297 | 0.029 | -3E | - | -103.68 |

Chaudhry and Qaisrani (1996).

1,2,3 equation. Dependent variable is GDP. GLF, GXN2, GKPT, IKP & IK are growth of domestic output, growth of labour force, growth of real exports, growth rate of capital, instability of capital and exports.

Sample = 22 (1972-94), * Significant at 5% or less R. square varies from 0.14 to 0.35. DW statistics is close to 2.

# DETERMINANTS OF ACADEMIC PERFORMANCE OF ECONOMICS STUDENTS

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**ABSTRACT:** The paper attempts to quantify the impact of socio-economic indicators in determining the performance of students in Principle level courses of economics offered in the university. The variables included, in this regard, parents profession, region, degree, nationality and gender are found significant determinants of students performance. The income of parents is, however, found insignificant determinant of performance in a public sector university where apart from highly subsidized boarding and lodging, awarding scholarships every year and providing course books, nominal tuition fees are charged. The paper also concludes that foreign students in this department perform poor compared to Pakistani students. Based on our findings, we suggest that pre-requisite courses should be offered to the foreign students before they take regular economics courses. Moreover, students with science background should be encouraged in admissions at graduate and undergraduate levels.

## INTRODUCTION

Schooling and other forms of education have been considered by economists as means of attaining various microeconomic as well as macroeconomic goals. At micro level, students always desire to maximize their utility by attaining more education. For example, students of economics discipline study this subject because to do so gives them utility (this may be in the form of understanding the issues of Pakistan economy, stock market and global economic trends). An extensive learning of economics while pursuing an advanced degree will equip the

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students with the knowledge and skill which will enhance their productivity (efficiency) at work for years to come. Since productivity in large part determines renumerations, education can increase their earnings. Therefore, parents, teachers and other members of the society always advise their children "learn more to earn more". This is basically a translation of human capital theory depicted by Schultz and Becker during sixties. The theory specifies a particular mechanism through which educational level is positively associated with the earnings. In this sense education may be regarded as an investment in individuals and has dynamic market where stream of future costs and benefits are also described in the education model.

As macro level, education leads to structural changes in the country and reduces intensity of poverty apart form improving social norms of the society. Keeping in view the importance of education, multi-donor agencies are emphasizing more on improving Human Development Index (HDI) through improving the indicators of education [see World Bank, 1990 and also UNDP 1990].

## I) Objectives of the Study

The general question what does determine the schooling is an important one? The standard abstract economic answer is the interaction of supply and demand of the education. Since the education is a merit good, it has positive externalities for the society. To reap those external benefits, the government provides education in public sector. The supply of schools thus depends on the extent of number of schools of the country opened in public sector, budget allocated by federal and provincial governments for education sector and other related factors. Therefore, supply of education is more or less fixed. It is demand of the education which determines the level of education in a country.

On the demand side, a number of factors determine level of education of students. Among them are the individuals learning motivation, percents income and education level, health and nutrition level of the family, rural or urban background and family size.

The objective of this study is to delineate determinants of performance of students of School of Economics[2] in the university where more than 1500 Muslim students from all over the Muslim and non-muslim countries are studying in different faculties including Economics, English, Arabic, Business Administration, Computer Sciences, Law and Comparative Religions.

The specific hypotheses to be tested are the following:

i) Does the income level of family matter in achieving good grades of the students in this department? Economists have given their alternative views on this issue. Taubman (1989) is of the view that parents reap certain utility, by spending money on their children, in the form of social status and a richer appreciation of culture. Since parents would always urge their children to perform better, they would be very conducive to support their children more willingly and invest more money on them. Therefore, it is expected that educational expenditures on students will be positively associated with parental income. The alternative view that children of rich families with all basic facilities bother less of securing good grades is also in literature available. Thus, it is possible that students from affluent families give poor performance in schools.

A related question, is children's schooling positively associated with parental schooling, is very important. Many studies have included parents' education and occupation as a determinant of their children's academic performance and is also a good proxy for ability and the motivation representing the effects of the schooling on children's education. Behrman and Paul (1982) and others have emphasized that father's occupation as

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2 The School of Economics in this University is mainly concerned with teaching. We are using the word School of Economics and Department of Economics as an alternative to each other.

background dummy variable for children's schooling is very important.

ii) The university admission policy is to offer 60 percent admissions to foreigners and 40 percent to Pakistani students in all undergraduate and graduate programs. Hence a large number of foreign students are offered admissions according to present admission policy. Is this policy coherent with the performance of the foreign students in School of Economics? Again two alternative plausible views are there. It is expected that overseas students have more opportunity costs of securing degree than those of Pakistanis in terms of staying away from their families. They would work hard to compensate their opportunity cost by performing well. The alternative plausible hypothesis is that they may not adjust well due to cultural barriers. Findings of this paper would help the university and more specifically the economics department in two ways.

   a. Whether the number of seats for foreign students in economics department should be increased or to? The decision will have academic and financial implications for the university. Foreign students are provided accommodation and other amenities at a high subsidized rate. If these students are not performing really good, the university is doing misallocation of its scarce budgetary resources.

   b. The foreign students are, on average, offered more scholarships (both in terms of amount and numbers) than those of Pakistani students of the same program. The findings of the study would help in the scholarships distribution policy which are basically offered to encourage the students to perform better in their respective programmes.

iii) The department of Economics announces M.Sc. Economic admission to the girls as well as boys separately each year and the number of seats are kept limited for both programs. Do the female students perform better than male students? The determination of this hypothesis would lead us to design an admission policy in favour of the group which performs better than the other in the department. It is often cited that, on average, male students perform better in fields like economics where mathematical and verbal abilities are tested. [Wolfe and Behrman, 1984]. Does our analysis also leads to the same conclusion in School of Economics is another testable hypothesis of this study?

iv) In Economics Department there are two alternative ways for securing Masters Degree. Students who complete B.Sc. (Hons) Economics degree from this department can earn Masters degree by spending one more year. Alternatively, those who completed BA/BSc from other universities are offered three years master degree program. Testable hypothesis is what level of students perform better in the department? Those who enter at FA/FSc level or those who come after their BA/BSc degree from other universities. A further relevant question is whether among them Science students give better performance or those who opted Arts/Humanities group before joining this department?

v) The rural or urban background of a student also affects on his/her academic performance. It is normally assumed that students with urban background perform better than those who belong to rural areas because of formers joining good institutions and sparing enough time for their studies. Do we also come to same conclusion in this study is another testable hypothesis of this paper?

The paper is organized as follows. In Section II, methodology and data set for the analysis are described. Section III is devoted to

discuss empirical results. In the last section conclusion and policies are recommended based on the empirical findings of this study.

## II) Methodology and Data

Cross-section data are used to analyze the impact of a number of explanatory variables on performance of the students in Economics department. The data are collected for 256 students who completed and are still completing their degree programme during the period of 1990-1996. The academic performance of the students is measured by average of the Grade Point Average (GPA) of principle level courses of Microeconomics and Macroeconomics. There are three good reasons to choose these two courses to measure the performance of students. Firstly, these courses are offered to all the students irrespective of their level they join the department. Secondly, the contents of these courses remain mainly same for all level students. Otherwise, in the advanced courses instructors use their own discretion to upgrade the prescribed outline of the courses. Finally, since these courses are offered at entrance level courses in the field of economics, the performance of students in theses courses basically depends upon their previous required knowledge, devotion, hard working and understanding of concepts.

As discussed at length in previous section, the explanatory variables are parents income, their profession, student's nationality, gender, region, level of degree and Science and Arts subjects the students chose before entering in this School. Among these explanatory variables except income of parents, all others are binary to reflect the effect of different characteristics of the students on their academic performance. The conventional method of OLS (Ordinary Least Squares) is employed to test alternative hypotheses. More specifically, this can be depicted in equational form as below:

$$GRADE = f(INCOME, PROFESSION, GENDER, REGION, DEGREE, FOREIGN, SCIENCE) \quad \ldots\ldots\ldots (1)$$

GRADE is the average of students GPA of principles courses. The explanatory amiable INCOME is the annual income of the parents. The information on family's annual income (in rupees) is taken from students admission forms. Foreign students income has been adjusted according

to the exchange rate of that year. The PROFESSION of parents is divided into three categories such as Services Sector, Businessman and Farmer. The two dummy variables are included in this regard. For GENDER one is for MALE and zero for female. The positive coefficient of gender variable will reflect that compared to girls male students perform better. The DEGREE variable is included with two binary variables. One is for students who take principle courses after BA/BSc and zero for others. It is expected that those with BA/BSc degree would perform better than those who are studying principles courses after their intermediate level certificate. The other dummy is included for those who have science degree (one is for SCIENCE students) compared to those who have Arts degree (zero for them). The dummy variable included for REGION is one for the urban areas students and zero for the others. The variable FOREIGN represents one for foreigners and zero for Pakistanis.

Two main problems are observed in this data set. First, the performance of students is not only depending on their own cognitive skills but also the performance of the teachers and their teaching material. Due to the non availability of the measure of the teachers performance (such as students evaluation of teaching or any teaching award), there may be some bias in the findings of the study. Second, apart from the observed there are some unobserved characteristics of the students such as the hardworking, interest in the subject and the cognitive achievements. In the absence of their measure as explanatory variables again some biasness in results is also expected. A detailed description of the variables and distribution of students across different groups is given in Appendix.

Table 2 reflects that on average students scored C grade (between two and three grade point average) in principle courses. Students mainly joined the department with their science degree background and belong to services sector families. The intake in department is equally good from rural and urban background but with male dominance because of more male programs offering in School and also because of women's degree program starting in January 1992.

## III) The Empirical Results

A number of specifications of the Equation: 1 were estimated. Apart from the inclusion of relevant explanatory variables, the interactions of significant variables are also included in this paper. The results reflect that the performance of students depends heavily on their observed characteristics such as gender, family background, regional location and other factors.

The family income variable INCOME (in all the equations) remained insignificant with negligible coefficient value. It reflects that in this university where tuition fees charged like other public sector universities are very nominal; boarding and lodging is highly subsidized; apart from merit scholarships, poor students are awarded with Zakat scholarship; books, notes and handouts all are provided to the students free of cost through Book bank, Libraries and from teachers, the income of family does not matter much. Therefore, we estimated other specifications of the above Equation without including income variable. The binary explanatory variables reflect their certain effects on the performance of the students. However, due to the inclusion of only binary variables, the $R^2$ value remained very low. We also believe that unobserved characteristics such as intelligence of students, devotion, commitment and their interest in the subject do matter in determining their performance in the department. TABLE 1 gives the picture of alternative specifications made in this study.

The sign of coefficients of all explanatory variables support our hypotheses. The coefficients of the variables *MALE, SERVICE, URBAN, SCIENCE* and *FOREIGN* are significant. The variable *MALE* is included to estimate the performance of male students compared to that of the female students. The positive coefficient of MALE reflects that compared to females, male students perform better in the principle courses of economics. This may be because majority of the girls join department with descriptive disciplines such as history, sociology and Islamic Studies along with economics subject and are comparatively less skilled in diagrammatic, analytical and mathematical courses. Our results confirm the findings of similar other studies tested in some other countries. Since these values are not significant at 5% level we expect that the differences in performance is not with precise. However, it is expected that with the

increase in importance of girls education and more openings of jobs for girls, the performance of girls in the field of economics will improve changing their aptitude towards mathematical based courses.

Students whose parents are in services sector (private and public sector) perform better than those whose parents are in agriculture sector or running their own business. Services sector in Pakistan is dominant by the public sector and is also reflected in this data set. This positive and significant coefficient of *SERVICE* variable reflects that students from educated family background work hard because human capital is the main source of their future earnings and is a source of parents utility maximization in the form of higher status.

An interaction term of *MALESERV* (equation 3 8 in Table 1) was included to measure the impact of male students who belong to government and private services background family on their performance in economics courses. The positive and significant coefficient value for *MALESERV* suggests that on average boys of these families perform better than girls because of the above mentioned reasons.

The positive and significant coefficient for the variable *URBAN* explains that students with urban background perform better than rural background students. This *URBAN* variable when interacted with SERVICE variable (*URBSERV*) and with the males (*URMALE*) separately (see equation #13 and 11 in Table 1 respectively), the both coefficients were positive and significant at 5 percent significance level. It asserts our previous findings that students who are male and living in the metropolitan areas work hard to perform better than girls of this area and also better than children of other than government employees.

To evaluate the impact of Science subject on the performance of the students, were divided the data into Science and Arts groups irrespective of their degree. The variable *SCIENCE* was equal to one for those who secured their bachelor degree and intermediate certificate with science subjects and zero for other groups. The variable is also found positive and significant reflecting that in the presence of other socio-economic indicators, students with science subjects work hard compared to the Arts group students. This is because most of them have to change their academic career due to not scoring for

medical and engineering colleges. So to keep themselves acquainted with comparatively new subject, they focus their efforts more than others to score good grades. An interaction of male and science students (MALESCI) and of science students with service sector (SERVSCI) were included and the results are positive and significant. These interactions reflect that male students of science group are performing well and for employees children also. A relevant hypothesis was what level of students perform better i.e. those who join the department after FA/FSc or BA/BSc. The coefficient of dummy variable *DEGREE* (which is one for bachelor degree holder students and zero for others) is found positive but is insignificant for all regressions. It shows that graduating students may perform better than students who has joined department after intermediate level certificate but these findings are not with precise.

Another crucial question was about the comparison of the overseas students performance in economics with Pakistani students. To capture the effect of nationality on academic performance of students, we introduced dummy variable *FOREIGN* for overseas student sand zero for Pakistanis. The coefficient for variable *FOREIGN* is not only negative but also significant at 1% significance level. It allows us to conclude that foreign students do not perform better than the local students. It may be because of their cultural barriers or their lower standard of education back home. It may also be because of the language barriers for students of those countries where medium of instruction is not English.

Briefly, our results support the conventional findings of other studies in the literature on economics of education. The findings allude that family background does affect the performance of their children. Parents who themselves are educated give due importance to the human capital pushing their children to perform better in studies. The regional background is equally important for the performance of students. Due to the non-availability of enough financial resources and comparatively less proficient teaching faculty in villages and small towns, on average students do not perform well. Hence their spirit of competition and facing challenges diminish. Male students perform better than females because of the aptitude and opportunity of group discussions of students and sharing their notes more frequently than those of girls. Students with Science background, who on average are more serious in their studies compared to others, are rewarded with better grades. In this university

where foreign students are preferred to be admitted in all the programs could not perform in economics better may be because of personal traits, cultural barriers and because of their own national educational system.

## CONCLUSION

The basic objective of this paper is to guide the department to design for appropriate admission policy so that bright students are admitted in the department. Apart from that, the objective was to delineate those determinants which contribute to the academic performance of the students in this department. The paper attempts to quantify the impact of socio-economic indicators on the performance of students in economics department. The variables included parents' education, region, degree, nationality are found significant determinants of students grades. The income of parents is, however, found insignificant determinant of grades in a public sector university. Based on our findings, we forward policy recommendations for the University authorities:

a. Foreign students who are admitted to the economics department should be offered some pre-requisite courses of economics before they enter in the main stream Undergraduate and masters program. A certain maximum limit should be added in the programs for completion of a degree otherwise students extend their staying in hostels for longer time. Those students who do not secure a certain level of GPA in economics, their scholarships should be upheld. In terms of foreign students rather than increasing their numbers, department should concentrate more on quality of intakes.

b. The number of seats for Pakistani students should be enhanced to a certain limit may be 50 which is at present on almost half of it. This is because marginal cost of an additional student is zero in the class room and pakistani students performance is better than foreigners.

c. The students who apply for admission with science degree should be encouraged in the department through offering

scholarships retaining them for Masters and other higher programs.

At the end we suggest that the study can be further extended by including some other socio-economic indicators of students such as parents education, number of brothers and sister, and measures of quality of teaching and is also extendable for all the disciplines at university level.

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**Table 1 Regression Estimates of the Academic Performance Model (Dependent Variable = GRADE)**

| EQUATION | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTANT | 2.216 | 2.28 | 2.49 | 2.27 | 1.99 | 1.95 | 2.10 | 2.42 | 2.42 | 2.43 | 2.44 | 2.28 | 2.43 |
| | (12.64) | (13.43) | (19.02) | (20.63) | (9.745) | (9.53) | (9.68) | (31.32) | (31.0) | (34.75) | (32.68 | (21.23) | (31.92) |
| MALE | 0.164 | 0.118 | 0.169 | - | 0.257 | 0.183 | 0.222 | | | | | | |
| | (1.03) | (0.758) | (1.10) | - | (1.56) | (1.09) | (1.32) | | | | | | |
| URBAN | 0.315 | - | - | 0.246 | 0.311 | 0.285 | 1.22 | | | | | | |
| | (2.39) | | | (1.99) | (2.37) | (2.173) | (1.80) | | | | | | |
| SERVICE | | 0.256 | - | 0.202 | 0.260 | 0.252 | 0.246 | | | | | 0.211 | |
| | | (1.976) | | (1.63) | (2.00) | (1.96) | (1.88) | | | | | (1.74) | |
| SCIENCE | | | - | - | - | - | 0.269 | | | | | 0.312 | |
| | | | | | | | (2.14 7) | | | | | (2.56) | |
| DEGREE | | | - | | 0.44 | 0.24 | 0.28 | | | | | | |
| | | | | | (0.43) | (0.245) | (0.28) | | | | | | |
| FOREIGN | | | -0.49 | | | | - 0.365 | | | | | | |
| | | | (-3.22) | | | | (- 2.00) | | | | | | |
| MALESERV | | | | | | | | 0.270 | | | | | |
| | | | | | | | | (2.14) | | | | | |
| URBMALE | | | | | | | | | | | | | 0.253 |
| | | | | | | | | | | | | | (1.98) |
| URBSERV | | | | | | | | | | | 0.253 | | |
| | | | | | | | | | | | (1.94) | | |
| MALESCI | | | | | | | | | 0.231 | | | | |
| | | | | | | | | | (1.84) | | | | |
| SERVSCI | | | | | | | | | | 0.366 | | | |
| | | | | | | | | | | (2.59) | | | |
| $R^2$ | 0.023 | 0.155 | 0.040 | 0.030 | 0.04 | 0.056 | 0.07 | 0.018 | 0.013 | 0.026 | 0.014 | 0.036 | 0.015 |
| DW | 1.69 | 1.65 | 1.75 | 1.66 | 1.70 | 1.73 | 1.77 | 1.67 | 1.69 | 1.70 | 1.66 | 1.70 | (1.70) |

(1) Figures in Parentheses are t-Statistics.
(2) Figures with * are not significant at 90 percent confidence level.

**Table 2 Variables Employed in the Study and their Summary Statistics**

| Variable | Description | Mean | Standard Deviation |
|---|---|---|---|
| GRADE | the average GPA of students in Principle courses | 2.50 | 0.99 |
| INCOME | Income of student's Parents per year | Rs.95,473 | Rs.175,835 |
| MALE | dummy variable is one for male students | 0.785 | 0.413 |
| SERVICE | dummy variable is one for service sector | 0.553 | 0.50 |
| URBAN | dummy variable is one for urban area students | 0.541 | 0.502 |
| SCIENCE | dummy variable is one for science students | 0.459 | 0.50 |
| DEGREE | dummy variable is one for BA/B.Sc students | 0.431 | 0.496 |
| FOREIGN | dummy variable is one for foreign students | 0.224 | 0.418 |
| AGRIC | dummy variable is one for farmers | 0.223 | 0.417 |

# APPENDIX

**Table No. 1 Regional Distribution of Students**

| | Male | Female | Total |
|---|---|---|---|
| Urban | 90 | 49 | 139 |
| Rural | 110 | 7 | 137 |
| Total | 200 | 56 | 256 |

**Table No.2 Distribution of Students Across Degree**

| | Male | Female | Total |
|---|---|---|---|
| BA/BSc | 35 | 56 | 111 |
| FA/FSc | 145 | - | 145 |
| Total | 200 | 56 | 256 |

**Table No.3 Distribution of Students Across Science and Arts Group**

| | Male | Female | Total |
|---|---|---|---|
| Science | 102 | 15 | 117 |
| Arts | 98 | 41 | 139 |
| Total | 200 | 56 | 256 |

**Table No.4 Distribution of Students Across Nationality**

| | Male | Female | Total |
|---|---|---|---|
| Pakistani | 143 | 56 | 199 |
| Foreigner | 57 | - | 57 |
| Total | 200 | 56 | 256 |

**Table 5 Distribution of Students Across Parents' Profession**

| | Male | Female | Total |
|---|---|---|---|
| Farmer | 27 | - | 27 |
| Businessman | 77 | 11 | 88 |
| Govt. Servant | 96 | 45 | 141 |
| Total | 200 | 56 | 256 |

# RATES OF RETURN TO EDUCATION: AN ANALYSIS OF DATA FOR KARACHI

*By*

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**ABSTRACT:** A number of studies have estimated the returns to education in Pakistan. This study is unique in that it calculates these returns using data from one city alone - Karachi. Guisinger *et. al* conducted a similar exercise for Rawalpindi. Karachi being Pakistan's largest metropolis, and with a higher level of literacy than other parts of the country is an interesting subject for investigating the economic rewards from different levels of education. Empirical results and policy implications are presented at the end of the article.

## I. INTRODUCTION

Investment in human capital is abysmally low in Pakistan. Few would dispute that such investment is critical to the country's future growth. Given that this is the case, it is surprising that relatively few studies have analyzed the rates of return to education in Pakistan. Even the few that have done so are relatively old[2]. In this article, we have calculated the rates of return to different levels of education based on data from Karachi, and compared these results with the findings from other studies. The availability of the AERC/KDA data allows an examination of residents of karachi alone, unlike the other studies cited in this study which either used data from Rawalpindi, or from the country as a whole. As Pakistan's largest city, Karachi is home to individuals from different ethnic backgrounds The level of literacy of

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[2] See for example, Hamdani (1977), Haque (1977), Guisinger *et. al* (1984) and Khan and Irfan (1985).

females is also higher in Karachi than it is in the rest of the country. Confining the data to karachi alone implies, of course, that results cannot be generalized to the country as a whole. However, following the argument advanced by Guisinger *et al.* (who also examined only one city), potential biases are avoided in the earnings functions, rates of return to schooling, and the earnings distribution that are due to other structural wage differentials. This is because these tend to be correlated with educational and skill levels that vary by industrial and geographical areas.

## II. A BRIEF REVIEW OF EARLIER STUDIES

Hamdani (1977) used data from the 1975 *Socio-economic Survey of Rawalpindi* carried out by the *Pakistan Institute of Development Economics*. The same data was used by Haque (1977) and Guisinger *et al.* (1984) in calculating rates of returns to education. A fourth study by Khan and Irfan (1985) used the *Population, labour Force and Migration (PLM) Survey*. The Survey was a joint project of the Pakistan Institute of Development Economics and ILO-UNFPA. Results from these studies are summarized in Table 1 below.

**Table 1 Rates of Return to Different Levels of Education**

| Education Level | Hamdani | Haque | Guisinger *et al.* | Khan/Irfan | Pasha/Wasti | Ashraf and Ashraf |
|---|---|---|---|---|---|---|
| Incomplete Primary | 7 | | 3.4 | - | - | |
| Primary | 20 | 2.6 | 3.5 | 20 | 11.7 | 12.7 |
| Secondary | 11 | 5.2 | 11.6 | 48 | 3.8 | 56.8 |
| College | 14 | - | - | 41 | 13.6 | 97.3 |
| University | 27 | 9.8 | 13.1 | - | 9.3 | 136.3 |

**Note:** Strict comparability of results above is not possible since some studies report the incremental reports to each level of education, while other estimate returns relative to a base level of education.

Comparison between the results of these studies is difficult. Khan and Irfan's results show the percentage gains from each educational level

relative to a common base (which is "Less than primary level of education"). However, Hamdani, Haque, Guisinger *et al.*, and Pasha and Wasti report incremental returns to each educational level, so that returns relative to a base level would have to be calculated separately. Guisinger *et. al.* (Like hamdani and Haque) based their study on data from the 1975 *Socioeconomic Survey of rawalpindi.* They reported the surprising finding that the returns to education were low. They also found, contrary to expectations, that instead of falling, the rate of return to schooling rose with higher education levels. They partly attributed their results to the differences in their methodology compared to hamdani, who had found higher returns to education.

## III. THE MODEL AND VARIABLES USED

The model used in this study is simple. We developed a semi-logarithmic specification in which the log of monthly earnings was the dependent variable. The regression equation is presented below:

$$\log \text{MEARNINGS} = a_1\text{AGE} + a_2\text{AGE-SQUARED} + a_3\text{URDU} + a_4\text{PUNJABI} + a_5\text{SINDHI} + a_6\text{BALUCHI} + a_7\text{PRIMARY} + a_8\text{MIDDLE} + a_9\text{MATRIC} + a_{10}\text{INTERMEDIATE} + a_{11}\text{BACHELORS} + a_{12}\text{MASTERS} + a_{13}\text{PROFESSIONAL} \ldots\text{.EQUATION} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

The explanatory variables used in the wage equation are described below:

a. AGE was used as the best possible proxy for experience. Given that no variable existed for "duration that a respondent had worked", no alternative existed but to use this variable to capture the effect of experience.

b. The square of age (AGE-SQUARED) was used to take into account the concavity of the age-earnings profile.

c. The data identified five major languages spoken at home by the respondents. These were Urdu, Punjabi, Sindhi, Baluchi and Pushto. The reasonable assumption was

made that individuals speaking these languages were Muhajirs, Punjabis, Sindhis, Baluchis and Pathans, respectively. The earnings equation used the first four of these languages to capture ethnic background with Pushto being the missing base variable. A major advantage of using the AERC/KDA data is that unique identification of the ethnic background of each respondent is possible by linking it with the mother tongue of each respondent.

d. Seven different levels of education were identified from the data. These were LOW-LITERACY (the missing base variable which included those who could not read and write, and those with up to two years of schooling), PRIMARY (those with at least three years of schooling), MIDDLE (those with eight years of schooling), MATRIC, INTERMEDIATE, BACHELORS and PROFESSIONAL. The last of these includes Master's degree holders as well as those with law, medical or other professional degrees.

Information on occupation was not available in enough detail to warrant being included in the estimating equations. Such information tended to be too broad to be useful.

## IV. EMPIRICAL RESULTS

Table 3 provides coefficient estimates of the earnings equation for the combined sample of males and females. Table 4 lists the coefficient estimates for regressions run separately for males and for females. The means of the variables are laid out in Table 5. Some descriptive statistics on karachi are available in Table 6.

The very high level of significance for AGE (Table 3) demonstrates that this variable does, as was the *a priori* expectation, proxy for experience. As was explained earlier, the data do not identify the amount of experience each respondent had. It is inappropriate to follow the Mincer (1974) approach, wherein experience is estimated as being age less the number of years spent in school less five (the latter

being the presumed starting age of schooling). Females in particular, in Pakistan may not spend their entire time working when not in school. Moreover, starting age for school in Pakistan tends to be quite variable.

The expected negative sign for AGE-SQUARED confirmed the concavity of the age-earnings profile. It is significant to note in Table 4 that AGE had a bigger impact on the earnings of women than it did on those of men. This implies that each year of experience yields a higher return to women than it does to men. An explanation for this might be that since the pool of working women is relatively small, a premium is attached to the earnings of those of them who have been in the job-market for a longer period of time. This result does not conflict with the finding in this article that women earn less than men, after controlling for a number of variables. But within that lower wage structure, women appear to derive higher marginal benefits from experience tan do men.

The positive and statistically significant coefficient for MALE is in line with results for Rawalpindi as well as for Pakistan as a whole that have been reported in ashraf and Ashraf (1993a and 1993b).

**Table 2 Rates of Return to Different Levels of Education**

| | Males/Females Combined | Males | Females |
|---|---|---|---|
| Primary | 12.7%*** | 12.7%*** | -1.0% |
| Middle | 24.6%*** | 23.4*** | 33.6%*** |
| Matric | 56.8*** | 56.8*** | 56.8*** |
| Intermediate | 97.3%*** | 95.4%*** | 113.8%*** |
| Bachelor's | 136.3%*** | 136.3%*** | 129.3%*** |
| Professional | 225.4%*** | 228.7%*** | 194.5%*** |

*** Significant at the 95% level

All reported percentage returns are relative to respondents who were illiterate, or had less than primary level of education.

**Table 3 Coefficient Estimates of Earnings Equation for Combined Sample**

| Variable | Coefficient Estimates | SE $\beta$ | T |
|---|---|---|---|
| Constant | 6.14 | 0.04 | 165.89 |
| Age | 0.02 | 0.00 | 21.41 |
| Age-Squared | -0.00 | 0.00 | -11.33 |
| Male | 0.12 | 0.02 | 6.81 |
| Urdu | -0.03 | 0.02 | 1.48 |
| Punjabi | 0.04 | 0.02 | -1.48 |
| Sindhi | -0.06 | 0.03 | -1.75 |
| Baluchi | -0.05 | 0.03 | -1.65 |
| Primary | 0.12 | 0.05 | 2.76 |
| Less than Middle | 0.10 | 0.03 | 3.58 |
| Middle | 0.22 | 0.02 | 9.50 |
| Matric | 0.45 | 0.02 | 21.61 |
| Intermediate | 0.68 | 0.03 | 24.09 |
| Bachelor | 0.86 | 0.02 | 35.59 |
| Professional | 1.18 | 0.03 | 38.20 |

R-Sq: 0.27

Analysis of Variance

| | DF | Sum of Squares | Mean Square |
|---|---|---|---|
| Regression | 14 | 1,540.18 | 110.01 |
| Residual | 9,353 | 4,074.33 | 0.44 |

F = 252.64

**Table 4 Coefficient Estimates of Earnings Equation by Gender**

| Variable | MALE | | FEMALE | |
|---|---|---|---|---|
| | Coefficient Estimate | T-Stat | Coefficient Estimate | T-Stat |
| Constant | 6.28 | 173.48 | 6.04 | 41.73 |
| Age | 0.02 | 21.05 | 0.03 | 4.17 |
| Age-Squared | -0.00 | -11.57 | -0.00 | -1.76 |
| Urdu | -0.05 | -2.27 | 0.02 | 0.52 |
| Punjabi | 0.02 | 0.78 | 0.09 | 1.38 |
| Sindhi | -0.05 | -1.29 | -0.09 | -1.02 |
| Baluchi | -0.06 | -1.68 | -0.03 | -0.31 |
| Primary | 0.12 | 2.42 | -0.01 | -0.11 |
| Less than Middle | 0.08 | 2.56 | 0.22 | 2.67 |
| Middle | 0.21 | 8.33 | 0.29 | 4.77 |
| Matric | 0.45 | 20.52 | 0.45 | 7.54 |
| Intermediate | 0.67 | 22.90 | 0.76 | 8.69 |
| Bachelor | 0.86 | 34.73 | 0.83 | 10.24 |
| Professional | 1.19 | 37.76 | 1.08 | 9.9[illegible] |
| R-Sq: | 0.29 | | 0.24 | |

**Table 5 Means of Variables**

| Variable | ALL | MALE | FEMALE |
|---|---|---|---|
| Age | 29.88 | 30.88 | 29.26 |
| Age-Squared | 1138.95 | 1001.57 | 913.82 |
| Male | 0.55 | - | - |
| Urdu | 0.57 | 0.55 | 0.56 |
| Punjabi | 0.13 | 0.14 | 0.14 |
| Sindhi | 0.05 | 0.06 | 0.05 |
| Baluchi | 0.06 | 0.07 | 0.07 |
| Primary | 0.04 | 0.15 | 0.13 |
| Less than Middle | 0.12 | 0.10 | 0.10 |
| Middle | 0.12 | 0.09 | 0.08 |
| Matric | 0.14 | 0.11 | 0.08 |
| Intermediate | 0.08 | 0.07 | 0.05 |
| Bachelor | 0.09 | 0.08 | 0.04 |
| Professional | 0.04 | 0.04 | 0.01 |

NOTE: Age 10 or below are deleted.

Total no. of valid observations : 9,367

Total no. of valid for Male : 7,329

Total no. of valid observation for Female : 2,011

## Table 6 Zonewise Statistics for Karachi

| Zone | Households | Average household income | Average household size | Percentage of household in Katchi abadies | Percentage of migrant households | Average period of residence (years) |
|---|---|---|---|---|---|---|
| Kemari | 223 | 2681 | 7.04 | 67 | 26 | 24 |
| Baldia | 214 | 2149 | 6.84 | 100 | 69 | 11 |
| S.I.T.E. | 160 | 2045 | 6.50 | 100 | 69 | 10 |
| Orangi | 591 | 2446 | 7.49 | 100 | 49 | 10 |
| Mehmoodabad | 108 | 2017 | 6.88 | 90 | 44 | 14 |
| North Karachi | 249 | 3915 | 7.31 | 0 | 32 | 9 |
| North Nazimabad | 211 | 6035 | 7.63 | 0 | 37 | 11 |
| Nazimabad | 225 | 4869 | 6.49 | 24 | 15 | 18 |
| Golimar | 211 | 2365 | 7.06 | 100 | 25 | 23 |
| Liaquatabad | 189 | 2541 | 7.65 | 0 | 15 | 26 |
| F.B. Area | 422 | 4752 | 7.01 | 0 | 15 | 26 |
| Gulshan-e-Iqbal | 224 | 4086 | 6.69 | 25 | 44 | 9 |
| Societies | 250 | 5253 | 6.78 | 0 | 23 | 16 |
| Old City | 794 | 2914 | 7.74 | 70 | 8 | 28 |
| Garden Area | 213 | 5658 | 6.34 | 0 | 21 | 16 |
| Jinnah Hospital Area | 118 | 3913 | 5.73 | 30 | 37 | 15 |
| Lines Area | 184 | 3212 | 6.51 | 0 | 22 | 17 |
| Malir | 453 | 3771 | 7.00 | 44 | 41 | 10 |
| PIB Colony | 28 | 2916 | 7.35 | 0 | 64 | 14 |
| Defence | 38 | 5403 | 7.00 | 0 | 13 | 28 |
| Korangi | 399 | 2875 | 7.63 | 30 | 21 | 20 |
| Landhi | 195 | 2416 | 7.83 | 43 | 44 | 16 |
| Drigh Colony | 370 | 3105 | 6.72 | 38 | 37 | 16 |
| Deh Ganghiro, etc | 87 | 2228 | 7.57 | 100 | 72 | 13 |
| Deh Gujro, etc. | 60 | 2000 | 6.73 | 0 | 27 | 20 |
| Others | 45 | 2316 | 7.11 | 0 | 27 | 26 |
| Karachi | 6261 | 3515 | 7.10 | 44 | 31 | 16 |

Source: Ahmad, Nuzhat (1993)

The four languages used as explanatory variables, Urdu, Punjabi, Sindhi, and Baluchi (with pushto as the missing base variable) were intended to capture the ethnic background of the respondents. It is a reasonable assumption, as stated earlier, that ethnic background can be identified by the mother-tongues of each respondent. The coefficient estimates for the ethnic variables help to ascertain if any race-based discrimination exists in the sample with regard to earnings. The results indicate that none of the coefficients for provincial background were statistically significant. This suggests that ethnic background does not influence earnings in karachi. In a city where there are much trumpeted allegations of favouritism and nepotism in the provision of jobs along ethnic lines, this is an encouraging finding.

## V. THE RETURNS TO EDUCATION

As expected higher levels of education were positively associated with earnings. In each case, the coefficient estimates had high levels of statistical significance. The only exception was that in the case of women, PRIMARY had a negative coefficient. However, the size of the coefficient was very small, and more importantly, was statistically insignificant. Other than this sole aberration, the coefficient estimates for both men and women monotonically increased with education levels, and were statistically significant in each case. The rewards from higher education appeared to increase by about the same proportion in the case of both women and men. The returns to different levels of education are provided below:

Several features are immediately obvious from the figures reported in Table 2.

a. Because of the much larger number of educated men in the sample than women, the results for the combined sample closely parallel those for men.

b. Although the percentage gains from education from men are largely similar to those for women, an interesting difference is noted for those with a primary level of education. Although men gained a respectable 12.7% in earnings from primary education, the returns to women

from a similar level of education was negative 1% (although this was not statistically significant at conventional levels). For all other levels of education, gains were largely similar for both men and women.

c. Except for women with primary education, the gains were statistically significant for all levels of education. Furthermore, as expected, these gains rose monotonically with the level of education.

## VI. POLICY IMPLICATIONS

Some policy implications are suggested by the results of this study:

a. Given that the rate of return to all levels of education is broadly similar for men and women, there must be much more emphasis on female education in the country than is the case thus far. The potential of our labour force cannot be realized when large numbers of women remain uneducated.

b. The returns to education are quite high. This suggests that more than lip-service is needed in our federal and provincial planning cells where decisions relating to the provision of educational services are made. Scarce resources if routed to provision of education will have salutary long term impact on individual earnings. The positive externalities of such an occurrence are self-evident.

c. The marginal gain to the acquisition of professional education is very high. This suggests that the government should provide more professional and technical education in the country. In addition to providing employment for our youth, such steps would also lead to enhanced productivity and output int he country.

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# TECHNICAL PROGRESS, FACTORS SUBSTITUTION AND AGRICULTURAL GROWTH IN PAKISTAN

*By*

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## Introduction

Agriculture is still the main story of the bulk of population in Pakistan. It invariably forms a major part of the overall economic development. The growth of other sectors is also directly or indirectly dependent upon this sector[1]. It contributes to economic growth by providing inputs and market for other sectors. Moreover, the release of resource, capital and labor is also provided by the same sector. The market for machine tool industry also draws its support from the agriculture sector. Given this background, first, it sis important to know the performance and sources of growth and deficiencies of this sector which could be utilized for its acceleration. Moreover, substitution of factor inputs is equally important for optimal and alternative use, which could help to increase efficiency. Besides, the economics of scale is also a wide interest to the experts due to its role in increasing productivity.

In Pakistan, during the 1960s and the 1970s agriculture sector was given due importance. Major share of public investment was assigned to this sector[2]. However, overtime, the same momentum did not continue. As a result the agriculture sector grew at a rate of 3.8% per annum during early 1960s. The same growth rate has slowed down thereafter. During early the 1980s weighted Aver agriculture growth was -1.4%. However, overall, during the 1980s its growth was 5.4%. In 1992-93, it grew by 3.9%, compared to 9.7% during 1991-92. It is important to have an in depth study of this sector t highlight such

changes. Hardly any comprehensive study has been done which could add this information to the literature. In the light of above the problem for investigation is to pinpoint the factors which significantly contributed to growth or whether the internationally known factors for accelerating growth were prevalent in the development of ag sector in Pakistan[3]. The most important factor in this regard is considered technical change which has a lion's share in accelerating growth all over the world. Besides, for optimal use of inputs it requires that the attributes of these factors must be known; for example substitution between the factors of production such as land, labor, fertilizer and machinery etc. As per our knowledge, no study, so far, has pointed out these relationship for the ag sector of Pakistan. Given this background, this study aims at pointing out factors substitution, the role of returns to scale and technical change in the ag sector of Pakistan. Moreover, substitution between land and land augmenting inputs and their elasticities will be estimated.

To study the above cited issues, this paper is organized as follows. part two provides literature review and theoretical rationable. Part three is based upon the development of a model and the results obtained through the model are discussed in this section. Based upon the empirical findings, part four, briefly states the conclusion and policy implications pertaining to the ag sector.

## Part II
## Literature Review and Theoretical Rationale

Labour and capital may be substituted for the production of commodities. A rational producer will employ that factor intensively which minimize cost and has higher productivity. Therefore, given this implication, substitution between capital and labour had been of wide interest to research scholars. Several studies in this area have been conducted for both developing and developed countries. The formulation of an agricultural production model and quantification of technical coefficients of production help us to identifying the substitution and efficiency of input factors. The production functions introduced by classical economists and further developed by neo-classical writers have frequently been used in deriving the technical coefficients of inputs.

In Pakistan, technical progress, elasticity of substitution and returns to scale in ag have not been explored in as much detail as it has been done for its manufacturing sector[4]. Various methods have been employed to empirically measure the technical progress. The technique of measuring sources of growth in neo-classical tradition became popular with the pioneering work of Abramovitz (1956). This technique enables the measurement of the share of each input factor in the growth of output separately. Solow (1957) led to the segregation of the contribution of each factor input alongwith the measurement of technical progress. His method, popularly known as "residual approach" isolates the contribution of each input to output growth from the residual which is treated as the contribution of technical progress[5].

Binswanger (1974) developed the method of measuring the biases of technical change with several factors of production. He used the transcendental logarthhmic function for measuring the technical change[6]. Translog production function is popular because it allows the inclusion of more than two factor inputs. Also, it does not restrict any of its elasticities to be constant or to be identical to each other. But the major drawbacks of this approach are that, it reduces (losses) the degrees of freedom at each level of nesting the inputs besides it is relatively more complicated and difficult to estimate.

Many empirical studies have employed the Cobb-Douglas form of production function for estimating technical efficiency and elasticity of substitutions for the developing countries. Yotopoulos and Lau (1973) applied the Cobb-Douglas production function for the measurement of relative technical efficiency and price efficiency separately for Indian ag. They tested the hypothesis for constant returns to scale, relative technical and price efficiency of small and large farms. They also estimated the absolute price efficiency of small versus large farms. They estimated the production elasticities of labour, capital and land as well as the technical efficiency and price efficiency parameters for these two farm categories. Their conclusion is that small farms are economically more efficient than large farms. However, high economic efficiency of small farms is not due to price efficiency but due to technical efficiency[7]. They have also found the existence of constant returns to scale in Indian agriculture. Such a work is hardly known for Pakistan's agriculture.

Hayami and Ruttan (1985) have also estimated the Cobb-Douglas production functions, fitted separately to cross-section data from twenty-one developed and twenty-two underdeveloped countries (UDCs). Farm outputs were regressed in this study on labour, land, livestock, fertilizer, machinery, general and technical education. This study provides the basis for international difference in productivity for 1960, 1970 and 1980 for individual countries, as well as for DCs and UDCs, separately. The production elasticities of conventional factors of land and labour were larger for the DCs than for the UDCs, which indicated that UDCs agriculture is characterized by constant returns to scale and DCs agriculture is subject to increasing returns to scale. The production function estimates indicated that in the UDCs, the development of scale neutral land-saving mechanical technology predominated over that of labour-saving mechanical technology. Because, in contrast to the DCs, the UDCs experienced an absolute increases in their agricultural labour force, since there exist high population growth and insufficient labour absorption by this sector. The major drawback of the above two studies is that both employed the Cobb-Douglas production function based on the assumption that the elasticity of substitution between any pair of inputs is unity. Such an assumption restricts their scope.

There are few empirical studies which employed the CES production function. Lau and Yotopoulas (1971) utilized Indian data for agriculture sector to estimate a CES production function directly with non-Linear methods and fund that the elasticity of substitution was not significantly different from one. Sindhu (1972) used four years data regarding wheat production in Indian Punjab and applies CES production function to them. The shortcoming of this study is that it deals with single crop (wheat) in a single province which hardly explains the whole agriculture which limits its scope. The methodological limitation of the above mentioned studies is that both used CES production function, which is the generalized form of Cobb-Douglas production function and it sis restrictive. These approaches do not allow nesting of inputs. Moreover the CES version assumes that the value of elasticity of substitution between factor inputs is constant, but not necessarily unity.

In Pakistan, according to the best of our knowledge, the literature on the role of technical progress, elasticity of substitution and returns to scale is very limited. Moreover, the studies conducted so far suffer from

several drawbacks or it has not been analyzed in depth for the whole agriculture sector, compared to the manufacturing sector[8]. There is a group of studies which deals with the estimation of elasticities of substitution between capital and labour by using the CES and VES (Variable elasticity of substitution) for manufacturing sector. Kazi (1976), Battese and Malik (1987), Zahid (1982), battese and malik (1988) have estimated the CES and VES production function to determine the elasticities of substitution between labour and capital for different manufacturing industries. Khan (1990) estimated the Cobb-Douglas and CES production function for the measurement of technical progress along with the returns to scale and elasticity of substitution for the manufacturing sector of Pakistan using the time series data. He used an exponential time trend in his study in order to avoid the problems of multicollinearity and non-linearity[9].

Regarding agriculture, Aslam (1978) conducted his study by estimating the Cobb-Douglas production function and profit function. This study is based on a farm survey data, conducted in Faisalabad District of Punjab for some selected crops. (wheat, sugarcane, cotton and maize). In order to overcome the problem of multicolinearity of independent variables, production functions on the per acre basis were estimated. The results indicated that there was a high correlation between land input and other factors of production. This study also implies that small farmers are better managers than large farmers and agriculture sector exhibits constant returns to scale. The implications of this study are limited since it is a restricted study of one town and may not describe the whole agricultural development in Pakistan.

Wizarat (1981) estimated technological change for Pakistan's agriculture by using the growth accounting technique and concluded that technical change contributed as much as 84% to the growth of value-added during 1965-70. She computed the total factor productivity by using a linear production function. According to her results, productivity increased very rapidly at a rate of 6.9% per annum during 1965-70. She computed the total factor productivity by using a linear production function. According to her results, productivity increased very rapidly at a rate of 6.9% per annum during 1965-70 period and the total factor productivity grew at a compound rate of 2% per annum during 1974-75 to 1978-79. Of the observed increase in value added during this

subperiod, 45.9 percent was due to movements along the production function while remaining 54.1% was due to the shift of the function[10]. This study has been criticized due to the quality of data generated and utilized. Here results are far away from the general outcomes of major studies. She generated data for capital for the agriculture sector which does not represent the actual capital employed there. As a results the estimates are not very reliable.

Khilji (1986) estimated the production elasticities by estimating an aggregate production function (in linear or long-linear form) through direct Least Squares Method. Secondly, by using the Klein's factor share method, he used the factor shares as production elasticities. He obtained the elasticity estimates for five input-groups by decades over the period from 1956 to 1985. The inputs used by this study were land, labour, tractors, tubewells and draught animals. The study was based on the micro-level cross-section data collected from field surveys. It is also novel in that it applies a partial-equilibrium approach to test the hypothesis of optimal allocation of resources to crop production in Pakistan for a period of thirty years. The results of Cobb-Douglas production function indicate that elasticity of output is affected positively by changes in tractors, tubewells and negatively by changes in labour, land and draught animals. The sum of elasticities for five inputs was 0.91 which indicates the existence of decreasing returns to scale (0.91) in Pakistan's agriculture over the period 1976 to 1986. The results of this study suffer from multicolinearity and the restriction imposed of unit elasticity of substitution between factor inputs. Besides limitation of data land rents and wages rates were based on small sample pertaining to only one province.

Aslam Chaudhary (1989) identified the sources of growth of agriculture by estimating the percentage changes in output due to percentage changes in inputs for the agriculture sector of Pakistan and for its provinces over the period from 1971-72 to 1979-80. His study (1994), also pointed out the contribution of Green/revolution in raising output, upto 1992-93. The difference between the percentage changes input due to percentage changes in inputs gave a measure of intensive growth (technical change). This is again residual approach which measures the production efficiency and not the technical efficiency. His results show that technical change has contributed significantly to the

growth of the total agricultural output of the country. This study ha identified only the sources of growth and not the magnitudes associated with them. Second, it considered only land and labour as inputs of agricultural production and ignored many other important factors of production which could have led to over estimation of technical progress. Third, as mentioned above, residual approach is very crude approach for the estimation of residual approach is very crude approach for the estimation of technical change.

The above review shows that measurement of technical progress, returns to scale and elasticity of substitution for the agriculture sector of Pakistan has not been carried out thoroughly. Besides, the studies mentioned above suffer from several major and common problems, which restrict their reliability. First, these studies have used either residual approach, Cobb-Dougleas production function or CES production function in determining the contributions of individual inputs, which are highly restrictive. For example, residual approach is a poor and a crude method for measuring technical progress. The Cobb-Douglas production function assumes a unitary elasticity of substitution between input pairs while its more generalized CES version assumes that the value is constant but not necessarily unity. Furthermore, if more than two factor inputs are considered, these two techniques become uninteresting because of their properties mentioned above. Similarly, some studies have used only two factors of production, i.e., Lahore and capital or land and capital and have ignored the other important input factors. Still further, some studies suffer from low quality of data on capital stocks or focused on small sample, which again restrict their reliability.

**Nested CES Production Function**

Khan (1989) used the nested CES approach for factor substitution for the manufacturing sector of Pakistan. This approach permits different elasticities of substitution to exist between factors. Furthermore, it provides more information about the physical relationship between factors int he production process. Therefore, this approach has an edge over previous techniques for similar estimations and therefore provides more reliable results.

Nested CES technique is becoming increasingly popular, because it allows greater insight into the complexities of production of both the manufacturing and agriculture sector[11]. Any other single level production function approach may not necessarily allow such options. Moreover, nested CES approach is superior to the CES approach because it can employ more than two factors of production. However, no study exist which used such a technique for agriculture sector of Pakistan. Thus, this study is pioneering in providing better results by employing improved technique of CES nesting approach for estimation. Moreover, this study provides upto date information regarding major sources of agricultural growth in Pakistan. The model utilized to obtain the above cited results is developed in the next Section.

## Part III
## Factor's Substitution and Technical progress: The Model

The measurement of technical progress has been of wide interest to economists and policy makers because of it crucial role in economic growth. In industrialized countries, technical change has been identified as the most dominant factor of economic growth and now it is generally believed that technical progress could be one of the major source for accelerating economic growth for the developing countries as well. Thus, identification of the technical progress especially in agriculture is important.

Technical change may be labour saving or capital saving or neutral. In literature, at least three types of neutralities have been defined:. Hicks neutral, harrod-neutral and Solow-neutral. Specifically, Hicks neutral technical change measures bias along constant capital-labour ratio, harrod neutral along constant capital-output ratio. For the study of technical progress, Hicks approach has been identified as disembodied technical progress. Hicks neutrality requires that the marginal rate of substitution between each pair of inputs be independent of technical change. Therefore, the approach used for such purpose is quite adequate to identify such development.

One of the major sources of economic growth is the increase in inputs such as land, labour and capital. Economic growth may also result

from an increase in efficiency, which results from technological inventions and innovations. The increase in efficiency yields higher output holding inputs constant. The two major sources of economic growth then are the increase in inputs and technical change, which could be called extensive and intensive sources of growth, respectively.

As already pointed out that for Pakistan, technical progress, elasticity of substitution and returns to scale have been estimated very often for the manufacturing industries by using the Cobb-Douglas production function, constant elasticity of substitution (CES), variable elasticity of substitution (VES) and Translog Production Function. But there is hardly any study pertaining to agriculture sector in Pakistan which have highlighted such outcomes by using improved CES approach. In this study we have used veted CES approach for measurement of the elasticity of substitution, returns to scale and the technical progress for he agriculture sector for the period 1970-92. Nested CES approach is methodologically superior to that of Cobb-Douglas (CD) and the standard constant elasticity of substitution production functions (CES). Because CD and CES production functions are restricted due to their properties of unitary and constant elasticity of substitution. In such a case the nested CES production function appears to be an appropriate choice for at least two reasons. The nested CES production function expresses more information about the physical relationship between factors in the production process. Due to this background the following model is developed to study the issues stated above.

**The Model**

A production function, which produces a vector of real aggregate output X, generated by the inputs used is given below:

$$X = F(A, L, F, Tr, Tw) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where:

X = Gross value of agricultural output
A = Land
L = labour (number of agricultural workers)
F = Fertilizer consumption

Tr = Number of tractors
Tw = Number of tubewells.

Assuming that a producer chooses a given level of inputs so as to minimize the cost of production of a given level of output. Then the relationship is denoted as:

$$\text{Min } Z = PAA + PLL + PFF + PTrTr + PtwTw \quad \ldots\ (2)$$

Subject to:

$$X = F(A, L, F, Tr, Tw)$$

Where

Pi (i = A, L, F, Tr, Tw) are the factor prices.

Equation (1) represents a general production function but we need to choose an appropriate technology, i.e., the functional form (F based on five factors of inputs. Klein (1983) proposed that those factor inputs should be nested at the first level which are expected complementary in nature or have very low elasticity of substitution. First, combination of inputs are made by taking two at a time and extending to five inputs. On the first level we begin the nesting arrangement with land and tractors. On the second level, we then obtain a relationship between (land-tractor combination) and labour and estimate the elasticity of substitution. On the third level, we estimate the elasticity of substitution between (land-tractors-labour-tubewells) and fertilizer input. We assume that factors allocation within each level is determined by the factor prices. Thus, based on above, the four-level five inputs nested CES production function may be written as:

$$X = Ao\ [y(\theta[\eta[\zeta\delta\ A^{-P1} + (1-\delta)Tr^{-P1}]^{P2/P1}\ [+(1-\eta)\ L^{-P2}]^{P3/P2}$$

$$+ (1-\theta)\ Tw^{-P3}]^{P4/P3} + (1-\gamma)\ F^{-P4}]^{-4/P4}\ e^{\mu}\ e^{\lambda t} \quad \ldots\ (3)$$

Where "A" represents the efficiency of production; $\delta, \eta, \lambda$ and "$\gamma$" are the distribution parameters, $\mu$ is the degree of homogeneity; pi (i =

1,2,3,4) represent the elasticity of substitution in four levels and are given as $\sigma = 1/1+pi$; $\lambda$ is the rate of disembodied technical progress.

Following the cost-minimization approach, the steps of optimization at each level are as follows:

**First Level**

Min PAA + PTr Tr

Subject to:

$$XATr = \left[\delta A^{-p_1} + (1-\delta)\ Tr^{-p_1}\right]^{-1/A^{-1/p_1}} \quad \ldots\ldots\ldots (5)$$

Solving for the first order condition we have:

$$\left(\frac{A}{Tr}\right)^{*} = \frac{(1-\delta)^{\alpha_1}}{\delta}\left(\frac{P_A}{P_{Tr}}\right)^{-\sigma_1} \quad \ldots\ldots\ldots\ldots\ldots (6)$$

where $\sigma_1 = \dfrac{1}{1+p_1}$ and an asterisk (*) indicates the desired factor ratio.

Linearizing equation (6) by taking logarithms on both sides we have

$$\ln\left(\frac{A}{Tr}\right)^{*} = -\sigma_1 \ln\frac{(1-\delta)}{\delta} - \sigma_1 \ln\left(\frac{P_A}{P_{Tr}}\right) \quad \ldots\ldots (7)$$

We assume that factor inputs do not adjust to their desired level instantaneously, therefore, we specify an adjustment mechanism in logarithmic form as:

$$\left[\ln(A/Tr) - \ln(A/Tr)_{-1}\right] = \varphi\left[\ln(A/Tr)^{*} - \ln(A/Tr)_{-1}\right] \quad \ldots (8)$$

Where $\varphi$ is the adjustment parameter such that $0 < \varphi < 1$. By substituting the equation (7) in equation (8) and re-arranging the terms we have.

After estimating the equation (9) we obtain the parameters $\sigma$, $p_1$, $\delta$ and $\varphi$.

$$\ln (A/Tr) = -\varphi \sigma_1 \ln \frac{(1-\sigma)}{\sigma} - \varphi \sigma_1 \ln (P_A/P_{taur}) + (1-\varphi) \ln (A/T_r)_{-1} \quad \ldots (9)$$

After estimating equation (9) we obtain the parameters. By using thee estimated parameters we construct quantum and price indices as:

$$X_{ATr} = \left[\delta A^{-\beta_1} + (1-\delta) T_r^{-\beta_1}\right]^{-\frac{1}{\beta_1}} \quad \ldots (10)$$

$$P_{ATr} = \left[\hat{\delta}_1 (P_A)^{(1-\theta_1)} + (1-\hat{\delta})^{\theta_1} P_{Tr}^{(i-\theta_1)}\right]^{\frac{1}{1-\theta_1}} \quad \ldots (11)$$

Equation 10 is the quantum index of (land-tractor combination) and eq. (11) is the first level dual cost function. $P_{ATr}$ is the imputed minimum cost of producing one unit of $X_{ATr}$. it may be noted that $P_{ATr}$ is independent of A and Tr because of the assumption of strongly separable production function.

**Second Level**

On the second level, we estimate the relationship between (land-tractor combination) and labour. Following the cost minimization approach.

$$Min\ P_{ATr} X_{ATr} + P_L L$$

Subject to:

$$X_{ATrL} = \left[\eta X_{ATr}^{-p_2} + (1-\eta) L\right]^{-1/p_2} \quad \ldots (12)$$

Where $P_L$ is the price of labour (wages). Solving for the first order condition, we obtain the desired factor ratio as a function of relative prices.

$$(X_{ATr}/L) = \left(\frac{1-\eta}{\eta}\right)^{-\sigma_2} (P_{ATr}/P_L)^{-\sigma_2} \quad \ldots\ldots\ldots\ldots \quad (13)$$

where $\sigma_2 = \dfrac{1}{1+p_2}$

Taking logarithms on both sides of equation (13) we have:

$$\ln (X_{ATr}/L)^* = -\sigma_2 \ln \left(\frac{1-\eta}{\eta}\right) - \sigma_2 \ln (P_{ATr}/P_L) \quad \ldots \quad (14)$$

Assuming that factor inputs do not adjust to their desired level instantaneously we show partial adjustment mechanism, such that

$$\left[\ln (X_{ATr}/L) - \ln (X_{ATr}/L)_{-1}\right] = \phi \left[\ln (X_{ATr}/L)^* - \ln (X_{ATr}/L)_{-1}\right] \quad \ldots\ldots\ldots \quad (15)$$

where $\phi$ is the adjustment coefficient such that $0 < \phi < 1$.

By substituting the eq (14) in equation (15) we have:

$$\ln (X_{ATr}/L) = -\phi_2 \ln \left(\frac{1-\eta}{\eta}\right) - \phi\ \sigma_2 \ln (P_{ATr}/P_L) + (1-\phi) \ln (X_{ATr}/L)_{-1} \quad (16)$$

After estimating the equation (16) we calculate the values for $\sigma_2$, $p_2$, $\hat{\eta}_2$, $\phi'$. Using these values, we construct the extended quantum and price indices as given in equations (17) and (18), respectively.

$$X_{ATrL} = \left[\hat{\eta}\, X_{ATr}^{-p_2} + (1-\hat{\eta})\, L^{+p^2}\right]^{-1/p_2} \quad \ldots\ldots\ldots\ldots \quad (17)$$

$$P_{ATrL} = \left[\hat{\eta}^{\sigma_2} P_{ATr}^{1-p_2} + (1-\hat{\eta})^{+\sigma_2} P_L^{1-\sigma_2}\right]^{\frac{1}{1-\sigma_2}} \quad \ldots\ldots\ldots \quad (18)$$

Equation (18) is the second level dual cost function which is independent of input levels, $X_{ATi}$ and 1. because of strongly separable production function.

**Third Level**

On the third level we obtain a relationship between (land-tractor-labour combination) and tubewell.

The objective is to measure the elasticity of substitution between these two factors. Following the cost minimization approach, we have:

$$Min. P_{ATiL} X_{ATiL} + P_{Tw} T_w \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (19)$$

Subject to:

$$X_{ATrLTw} = \left[\theta X_{ATiL}^{-p_1} + (1-\theta) T_w^{-p_3}\right]^{-1/p_3} \quad \ldots\ldots\ldots\ldots \quad (20)$$

where $P_{Tw}$ is the price of tubewells. Solving for the first order condition we get:

$$(X_{ATrL}/T_w)^* = \left(\frac{1-\theta}{\theta}\right)^{-\sigma_3} (P_{ATiL}/PTw)^{-\sigma_3} \quad \ldots\ldots\ldots \quad (21)$$

by taking logarithms on both sides of equation (21) we have:

$$\ln (X_{ATrL}/T_w)^* = -\sigma_3 \ln \left(\frac{1-\theta}{\theta}\right) - \sigma_3 \ln (P_{ATiL}/P_{Tw}) \quad (22)$$

Now we specify a partial adjustment mechanism such that:

$$\left[\ln\left(X_{ATtL}/T_w\right) - \ln\left(X_{ATrL}/T_w\right)_{-1}\right] = \beta\left[\ln\left(X_{ATrL}/Tw\right)^{*} - \ln\left(X_{ATrL}/T_w\right)_{-1}\right] \quad \ldots\ldots (23)$$

Where $\beta$ is the coefficient of adjustment such that $0 < \beta < 1$. By substituting the equation (22) in equation (23) and re-arranging terms we have:

$$\ln\left(X_{ATrL}/Tw\right) = -\beta\ \sigma_3 \ln\left(\frac{1-\theta}{\theta}\right) - \beta\,\sigma_3 \ln\left(P_{ATrL}/P_{Tw}\right) + (1-\beta)\ln\left(X_{ATrL}/TW\right)_{-1} \quad (24)$$

By estimating the equation (24), we calculate the values for $\sigma_3$, $p_3$, $\theta$ and $\beta$. With the help of these estimated parameters we construct the highest level of quantum and price indices as given in equations. (25) and (26), respectively.

$$X_{ATrLTw} = \left[\hat{\theta}\, X_{ATrL}^{-\hat{p}_3} + (1-\theta)\, Tw^{-\hat{p}_3}\right]^{-1/\hat{p}_3} \quad \ldots\ldots\ldots (25)$$

$$P_{ATtLTw} = \left[\hat{\theta}^{\sigma_3} P_{ATtL}^{(1-\hat{\sigma}_3)} + (1-\theta)^{+\hat{\sigma}_3} P_{Tw}^{(1-\hat{\sigma}_3)}\right]^{\frac{1}{1-\hat{\sigma}_3}} \quad \ldots\ldots (26)$$

Where $P_{ATrl.Tw}$ is the imputed minimum unit cost of $X_{ATtL.Tw}$ input. It is independent of input level $X_{ATtL}$ and Tw because of strongly separable production function.

**Four Levels**

On the fourth level we obtain the relationship between (land-tractor-labour-tubewell combination) and fertilizer. Following the cost minimisation approach we have:

$$Min. P_{ATrLw}\, X_{ATrLTw} + P_F\, F \quad \ldots\ldots\ldots\ldots\ldots (27)$$

Subject to:

$$X_{ATrLTwF} = \left[ y X_{ATrLTw}^{-p_4} + (1-y) F^{-p_4} \right]^{-1/p_4} \quad \ldots\ldots\ldots \quad (28)$$

where $p_F$ is the price of fertilizer. Solving for the first order condition we get:

$$(X_{ATrLTw}/F)^* = \left( \frac{1-y}{y} \right)^{-\sigma_4} (P_{ATrLTw}/P_F)^{-\delta_4} \quad \ldots\ldots\ldots \quad (29)$$

where $$\sigma_4 = \frac{1}{1+p_4}$$

Taking logarithms on both sides of equation (29) we have

$$\ln(X_{ATrLTw}/F)^* = -\sigma_4 \ln\left( \frac{1-y}{y} \right) - \sigma_4 \ln(P_{ATrLTw}/P_F) \quad (30)$$

Assuming that factor inputs do not adjust to their desired level stantaneously, we specify a partial adjustment mechanism such that;

$$\left[ (X_{ATrLTw}/F) - \ln(X_{ATrLTw}/F)_{-1} \right] = \infty \left[ \ln(X_{AtrLTw}/F)^* - \ln(X_{ATrlTw}/F)_{-1} \right] \quad (31)$$

where $\infty$ is the adjustment coefficient such that $0 < \infty < 1$. By substituting the eq (30) in eq (31) we have:

$$\ln(X_{ATrLTw}/F) = -\infty\sigma_4 \ln\left( \frac{1-y}{y} \right) - \infty\sigma_4 \ln(P_{ATrLTw}/P_F) + (1-\infty) \ln (X_{ATrLTw}/F)_{-1} \quad (32)$$

By estimating the equation (32) we calculate the values for $\sigma_4$, $p_4$, $\infty$ and y. Using these values, we construct the extended quantum index as given in equation (33).

$$X_{ATrLTwF} = \left[ \hat{y} X_{ATrLTw}^{-\hat{p}_4} + (1-\hat{y}) F^{-\hat{p}_4} \right]^{-\frac{1}{\hat{p}_4}} \quad \ldots\ldots\ldots \quad (33)$$

Price index at the fourth level which is the imputed minimum unit cost of $X_{ATrl.TwF}$ is written as follows:

$$P_{ATrLTWF} - \left[y^{-\sigma_4} P_{ATrLTw}^{(1-\sigma_4)} + (1-y)^{\delta_4} P_F^{(1-\sigma_4)}\right]^{\frac{1}{1-\sigma_4}} \quad \ldots\ldots (34)$$

At the end we estimate the returns to scale, efficiency parameter and technical progress with the help of equation (35)

$$\ln X = \ln A + \mu \ln \hat{X}_{ATrLTwF} + \lambda t \quad \ldots\ldots\ldots\ldots (35)$$

where A is the efficiency parameter, the $\mu$ measures the returns to scale; $\lambda$ it is the rate of technical progress; X is the gross output.

**The Estimations and Findings**

The four-level CES nested production function has been estimated for the agriculture sector of Pakistan. Various levels of the CES production function are estimated for the agriculture sector with the help of the ordinary least Squares technique covering the time period from 1970-71 to 1991-92. The estimated results for equation (1) to (5) are reported in the Table 1.

**Complementarily and Adjustment**

In the first level, land and tractors appear to be complementary inputs because the elasticity of substitution between thee two factors of production $(\hat{\sigma}_{ATr} = 1.29)$ is found to have a positive sign. For a developing country like Pakistan, land and tractors are the necessary and basic inputs for the production of agricultural goods, which is confirmed by the positivity of the elasticity of substitution between land and tractor. Hence, there is a very little substitution between land and tractor. Because both land and tractor are the necessary and basic agricultural inputs. Thus, our strategy to nest land and tractor on the first level is supported by the empirical finding. The shares of land and tractor on the

first level of nesting represented by $\hat{\delta}$ and $1-\hat{\delta}$, which are 0.017 and 0.98 respectively.

The adjustment coefficient ($\varphi$) calculated as 1 minus the coefficient of lagged dependent variable is 0.76 (1 - 0.24 = 0.76) which suggests that 76 percent of discrepancies between the desired and actual levels of factor inputs are eliminated in one year. The speed of adjustment is rather slow which could be due to structural rigidities that prevail in Pakistan's economy.

On the basis of the estimated parameters in the first level. The results of the quantum ($X_{ATr}$) and price ($P_{ATr}$) indices as reported in Table 2.

With the help of these quantum and price indices the second level of CES production function is estimated and results are reported in equation (2) in (Table 1).

**Table 1 Results of Nested CES Production Function (1970-71 to 1991-92) for Agriculture Sector of Pakistan**

| Eq. No. | Constant | Coefficient of | | | | $\bar{R}^2$ | DW | F | $\sigma$ | p | $\delta$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Price Ration to inputs | Lagged independent variable | Return to scale | Technical progress | | | | | | |
| 1. | 4.02 | 0.98 | 0.24 | - | - | 0.51 | 2.15 | 10.38 | 1.29 | -0.23 | 0.017 |
| | (3.03) | (2.42)** | (0.99) | | | | | | | | |
| 2. | 6.58 | 0.96 | 0.23 | - | - | 0.60 | 2.17 | 14.53 | 1.25 | -0.20 | 0.0011 |
| | (2.31) | (0.37)** | (0.24) | | | | | | | | |
| 3. | 9.72 | 0.69 | 0.23 | - | - | 0.57 | 2.12 | 12.97 | 0.91 | 0.10 | 0.00000085 |
| | (2.80) | (2.52** | (0.95) | | | | | | | | |
| 4. | 13.15 | 0.73 | 0.29 | - | - | 0.74 | 2.24 | 26.97 | 1.02 | -0.019 | 0.000000015 |
| | (2.60)** | (2.52)** | (1.15) | | | | | | | | |
| 5. | 11.05 | - | - | 0.23 | 0.0189 | 0.99 | 1.85 | 1150 | - | - | - |
| | (1018.35) | | | (4.21)* | (3.97)* | | | | | | |

* Significant at 1% level.

** Significant at 5% level.

Dependent variable for the eq.(5) is the gross value of output as (1980-81) base prices.

Again, the elasticity of substitution between land-tractor combination and labour $(\hat{\sigma}_{ATrL} = 1.25)$ is found to have a positive sign showing the complementarily between these two inputs. In a developing and an agrarian country like Pakistan, where almost three quarters of country's population depend on agriculture. Agriculture is the single largest source of employment accounting for more than 50% of the labour force. Labour is the very crucial factor of production for the agriculture sector. Therefore, land-tractor-combination and labour are found to be complementary inputs. The coefficient of adjustment ($\phi$) in the second level of input combination is 0.77, which suggest that only 77% of discrepancies between the desired and actual levels of input are eliminated in one year. The indices of land-tractor-labour combination ($X_{ATrl.}$) and Price ($P_{ATrL}$) are reported in (Table 2) which are calculated on the basis of estimated parameters in the second level.

**Table 2 Results of Price and Quantum Indices at four Level of Nested CES Production Function**

**First Level**

Quantum Index $X_{A\,Tr} = [0.017\ A^{-0.23} + (1 - 0.017)\ T_{r\text{-}0.023}\ ]^{-1/0.23}$

Price Index $P_{A\,Tr} = [0.017^{1.29}\ P_A^{1.29} + (1 - 0.017)^{(1.29)}\ P_{Tr}^{(1-1.29)}]^{(1/1-1.29)}$

**Second Level**

Quantum Index $X_{A\,Trl} = [0.0011\ X^{A\,Tr(0.20)} + (1 - 0.0011)\ L^{(-0.20)}]^{(-\,1/0.20)}$

Price Index $P_{A\,TrL} = [0.0011^{(1.25}\ P_{A\,Tr}^{(1-1.25} + (1 - 0.0011)^{1.25}\ P_L^{(1-1.25)}]^{(1-1-1.25)}$

**Third Level**

Quantum Index $X_{A\,Trl.Tw} = [0.00000085\ X^{A\,TrL(0.10)} + (1 - 0.00000085)\ Tw^{(-0.10)}]^{(-\,1/0.10)}$

Price Index $P_{A\,TrLTw} = [0.00000058^{(0.91)}\ P_{A\,TrL}^{(1-0.91)} + (1 - 0.00000085)^{(0.91)}\ P_{Tw}^{(1-0.91)}]^{(1/1-0.91)}$

**Fourth Level**

Quantum Index $X_{A\,TrLTwF} = 0.00000015\ X^{A\,TrLTw(-0.019)} + (1 - 00000015)\ F^{(-0.019)}]^{(-\,1/0.019)}$

Price Index $_{A\,TrLTwF} = 0.00000015^{(1.02)}\ P_{A\,TrLTw}^{(1-1.02)} + (1 - 0.00000015)^{(1.02)}\ P_F^{(1-1.02)}]^{(1-1.102)}$

Source: Calculated from Table (1)

The third level of the CES production function with the help of land-tractor-combination and price index are estimated and the results are reported in equation (3) in Table (1).

At the third level, the elasticity of substitution between $X_{ATrL}$ and tubewell is less than unity $(\hat{\sigma}_{ATrL,T_w} = 0.91)$. The positivity of the coefficient shows the complementarily between land-tractor-labour combination and tubewell. Tubewell is the source of water which is an important and necessary input of the agriculture. Without the use of water, production of any commodity may not take place. The shares of $X_{ATrL}$ and tubewell in the third level of nesting are 0.0000008 and 0.99, respectively. The coefficient of adjustment is 0.77, which suggests slow adjustment between the desired and actual levels of inputs in the third level. the indices of quantum ($X_{ATrLTw}$) and price ($P_{ATrLTw}$) are reported in Table 2 which are calculated on the basis of estimated parameters in the third level.

The fourth level of the CES production function with the help of xaTrLTw and Price Index are estimated and the results are reported in equation (4) in Table 1. At the fourth level, the elasticity of substitution between XATrLTw and F (fertilizer) is (ATrL,F = 1.02) positive. The positive sign shows that the land-tractor-labour-tubewell and fertilizer are complementary inputs int he agriculture sector. The shares of XATrLTw) and F (Fertilizer) in the fourth level of nesting are 0.00000012 and 0.99, respectively. The share of fertilizers confirms that fertilizer is also an important input because it increases the agricultural productivity. The coefficient of adjustment between XATrLTw and F is 0.72 which shows the slow adjustment between the land-tractor-labour-tubewell combination and fertilizer.

**Technical Progress and Returns to Scale**

To measure returns to scale and disembodied technical progress, a fourth level quantum index (XATrLTwF) is required which is calculated on the basis of estimated parameters in the fourth level. The result of such an estimation is reported in equation (5) in Table 1. The coefficient of (XATrLTwF) measures the returns to scale which is less than unity 0.23, suggesting that the agriculture sector in Pakistan exhibits

decreasing returns to scale. The equation (5) in Table 1 also reveals that the agriculture sector did experience disembodied technical progress at the rate of 1.89 percent per annum during the period under study. The decreasing returns to scale in agriculture sector indicates the inefficient use of factors of production and mismanagement of this sector.

In brief, our findings indicate that agriculture sector of pak exhibits complementarily among the agricultural inputs as confirmed by the empirical evidences. The complementarily between the tractors and labour indicates the employment generating potential in this sector. Due to structural rigidities in agriculture sector, the technical progress is slow. It also shows that there are deceasing returns to scale[12] which could be due to inefficiencies int he use of factors of production and management techniques. The results of the nested CES production Function are consistent with our hypotheses regarding the complementarily among the agricultural inputs and decreasing returns to scale for the agriculture sector of Pakistan.

## Part IV
## Conclusion

This study was focused to evaluate the performance of agricultural sector by identifying return to scale, technical progress, complementarily and substitution between major agricultural factor of inputs. This objective was achieved by utilizing improved methodology for estimation i.e. nested CES production function. So far neither this approach was used nor identification of factors substitution were highlighted for the agriculture sector of Pakistan.

The empirical estimation of four levels for five inputs nested CES production function indicated that land and tractors were complementary inputs, indicated by the coefficients at the first level of estimation. Thus, simultaneous use of these inputs may help to accelerate agricultural output. The use of tractors helps to better and timely conservation of soil moisture, particularly, in barani areas. It also helps for proper preparation of seed-beds. The second levels of nesting CES for estimation of elasticity of substitution between land-tractor combination and labor inputs provided positive and significant coefficient which suggested that labor was also complementary input to tractors. The

third and fourth level of nesting inputs indicated the complementarily of the fie nested agricultural inputs. Thus acceleration of agricultural production required simultaneous use of these inputs.

It was identified in the literature review that technical change, improvement in total factor productivity may be classified into embodied and disembodied technical change. Our finding indicated that Pakistan's agriculture sector experienced disembodied technical change at the rate of 1.9 per cent per annum, which implies that improvement in human resources, management and learning by doing did contribute to enhance agricultural productivity. These results supports earlier findings by Aslam Chaudhary (1989) and Wizaret (1981). However, our results are different in magnitudes.

The study was also partially focused to identify returns to scale in agriculture sector. The empirical findings indicated that there existed decreasing returns to scale in the pakistan's agriculture. It seems consistent with the general view of large farms which are often inefficiently utilized for agriculture.

The above findings provide a support for mechanization of agriculture by introducing machinery like tractors and raising irrigation through tubewells. The government may also help the farmers to increase its level in the areas where these inputs are still absent. An increase in the use of fertilizer will further enhance agricultural output.

## NOTES

1. More than 70% of the population, 50% of the labour force and 24% of the GDP is linked with this sector. It is a general experience that the distorted growth in agriculture significantly affected overall growth. For more details see: Economic Survey (1993-94).

2. In the first second and third five years plans, more than 12% of the plan resources were allocated for the agriculture sector. Presently hardly 4% of the annual development plan is assigned to this sector. For more details see Annual Development Plans (ADP's) 1992-93, 1993-94.

3. Overall growth in USA and in many other countries is enhanced through technical progress. It is a general view that in Pakistan overall efficiency was not very much or almost absent. Thus this study intend.

4. There are several studies pertaining to manufacturing sector but a limited literature in the subject matter is available for agriculture. For manufacturing sector also see. Buttese and Malik (1988).

5. Other studies which deal with the residual approach for measuring technical progress see Dornbusch and Fischer (1984), M. Zarkonic (1983) and Aslam Chaudhry (1989).

6. Regarding translog production function, also see Luces and William (1988).

7. Economic efficiency may be decompared into two commonerts i.e. technical efficiency and price efficiency.

8. For details of nested CES production function utilized for manufacturing sector see Ashfaque H. Khan (1993) and (1990).

9. Khan (1990) followed the approach adopted by Klein (1967).

10. The shift of the constant term of production function is resulted due to technical efficiency.

11. Keneda (1982) also advocated the relevance of two level CES production function for analyzing technical progress and factor inputs in the agricultural Development.

12. Such results were also found by Berry and Cline (1979) and Aslam Chaudhry (1989).

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# FEDERAL GOVERNMENT REVENUES AND EXPENDITURES IN PAKISTAN: AN APPLICATION OF ERROR CORRECTION MODEL

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**ABSTRACT:** This paper examines the issue of interdependence of real revenues and real expenditures at the level of federal government of Pakistan. The econometric techniques of co-integration and error-correction modelling are employed for analyzing the direction of causality. The annual data for the period 1961-62 to 1996-97 is used in the paper. The empirical findings suggest that unidirectional causality runs from real expenditures to real revenues. The results also indicate that real revenues affect development expenditures rather than non-development expenditures.

## Introduction

For most of the years of its history, Pakistan has been facing macro-imbalances. One of these imbalances is fiscal imbalance. The important symptom of fiscal imbalance is budget deficit. For the period 1980-81 to 1995-96, the overall budget deficit ranges from 5.3% to 8.7% of GDP at market prices. The annual average budget deficit for the period is 7.0 percent of GDP (MP). This budgetary deficit has marred efforts of policy makers to stabilize the economy. To achieve macroeconomic stability, economists have been proposing solutions for controlling budget deficit. Every government of Pakistan has also been making efforts to eliminate the budget deficit either by curtailing public expenditures and/or increasing revenues through new fiscal measures. The budget for 1996-97 aimed at controlling expenditures and expanding resource base, improving tax elasticity and buoyancy. It was planned to bring down the fiscal deficit to 4% of GDP (MP) in 1996-97 budget but fiscal deficit stemmed at 6.2% of GDP (MP) in the first nine month of 1996-97 fiscal year.

To achieve the end, the budget envisaged mobilization of Rs.40.8 billion additional revenues through new fiscal measures. In October 1998 another package of realizing Rs.40.0 billion was to generate Rs. 27.0 billion from the cuts in expenditures and Rs.13.0 billion through new fiscal measures. Notwithstanding the goal could not be objective, are exaggerated assumptions about tax revenues raising measures and underestimation of expenditures.

There are two aspects of budget deficit. One is the consequence of large budget deficit on the economy. It is believed that large budget deficit is responsible for crowding out private investment, causing inflation, lowering growth and resulting in a current account deficit[1] [see Haque and Montiel (1991)]. This may be the one reason that International Monetary Fund (IMF) and World bank have been insisting on curtailing budget deficit. To achieve the end they have been imposing a number of conditionalities to grant loan and/or release instalment of sanctioned loan and curtailing of budget deficit is one of this conditionalities. Government officials have also been assuring these institutions that budget deficit would be controlled. The other aspect of budget deficit is the causes of the budget deficit. Any solution that does not deal with the basic cause of budget deficit growth will likely result in no lasting decrease in budget deficit, though, such solutions may offer a reduction in budget deficit of limited duration.

Since all proposed solutions attempts to control public expenditures and /or increase revenues. In this study an effort is being made to examine the interdependence of these two components of budget deficit. Interdependence between expenditures and revenues would complicate attempts to control budget deficit. For example, if revenues increased lead directly to increase expenditures, the simply raising revenues to control budget deficit is not useful. The other possibility is that revenues and expenditures decisions are simultaneously determined which means that changing one or both of these components without considering this interdependence may have an ambiguous impact on budget deficit.

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[1] Zaidi (1995) argues that budget deficit in Pakistan plays a positive and contributory role to the economy.

There are two different views about the relationship between government revenues and expenditures. Some economists, including Friedman, have argued that raising taxes will simply lead to more spending. Milton Friedman, states his point of view as:

> "You cannot reduce the deficit by raising taxes. Increasing taxes only results in more spending, leaving the deficit at the highest level. Conceivable accepted by the Public Political Rule Number One is government spends what government receives plus as much more as it can get away with".

Friedman elsewhere declares:

> "The problem is not that we are not taxing enough but that we are spending too much. Increasing taxes would mean that you would have just as large a deficit but at a higher level of government spending".
>
> [see Anderson and et al (1986)]

Barro (1974), the leader of the second group, says that increased taxes and borrowing are results of increased government spending. In contrast to Friedman, he does not see increased taxation as a causal mechanism in the growth of government; rather he sees the situation in reverse.

A few attempts have been made to address the issue. Manage and Marlow (1986) examined the causal relation between U.S. federal expenditures and receipts by applying Granger causality test on annual observations for the period 1929-82. They conclude that tax receipts cause federal expenditures. The paper indicates that higher tax policies might not be the panacea to budget deficit. Another important study is conducted by Anderson, Wallace and Warner (1986) on U.S. economy. They also applied Granger causality test on annual data for the period 1946-83. They find no evidence of a causal relationship running from real revenues to real expenditures. On the other hand, they find strong evidence that real spendings cause real taxes. The findings of Von

Furstenberg and et al (1986) correspond most closely to that of Anderson and et al (1986). Ram (1988) concludes that taxes cause spending at the federal level whereas at the state and local level spending causes taxes. Miller and Russek (1990) using the error-correction models, find bi-directional causality between taxes and spendings (nominal and real) for the federal, state and local levels of government for quarterly data.

The issue of interdependence of Pakistan federal government expenditures and revenues has not yet received any attention. The focus of studies of Pakistan[2] has been on other important aspects i.e., the estimation of buoyancy and elasticity of different taxes with respect to national income, and stability of the government revenues for different sources overtime.

The above discussion clearly shows that no study is conducted so far on Pakistan economy in this regard. The studies available on other countries, on the one hand, are suffering from methodological shortcomings[3] and on the other hand, the results of these studies are contradictory which inspires me to make an attempt on the issue for Pakistan at the level of federal government.

The objective of this paper is to examine causal relation between federal government expenditures and revenues in order to assess the validity of different views about the interdependence of federal government expenditures and revenues. The empirical evidence will be helpful for designing a suitable fiscal policy. Evidence of one-way causality from revenues to expenditures would suggest that revenues increased result in higher expenditures and possibly larger budget deficit and vice versa. The evidence of no significant causal relation, on the other hand, suggests that revenues increased do not necessarily lead to higher expenditures or deficit growth. Finally the evidence of two-way causality would suggest that federal expenditures and revenues affect each other simultaneously.

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2 Chaudhry (1962), Khan (1973), Azad (1978), Gillani (1986), Malik and Yasmin (1987), and Akbar & Masood (1977).

3 Except the study conducted by Miller and Russek (1990). The methodological shortcomings are pointed out under methodology section of the paper.

The paper proceeds as follows. In section II, the methodology applied in the paper is discussed. Data are discussed in section III. The empirical results are explained in section V. Section VI contains a summary and major conclusions along with policy implications.

## II METHODOLOGY

The traditional practice in testing the direction of causation between two variables has been to utilize the Granger (1969), Sims (1972) and modified Sims tests suggested by Geweke et al (1983). It is generally recognized that these tests are not strictly speaking causality tests. They are actually predictability tests. The basic idea is that a variable $Y$ is said to have caused another variable $X$, if the past values of $Y$ as a group improves significantly the predictability of $X$ beyond what is possible by the past values of $X$ alone.

Recent developments in econometric techniques have highlighted at least three major shortcomings to the application of the standard Granger or Sims causality test. First, any causal inferences would be invalid if the involved time series are co-integrated [Granger (1988)]. Hence conclusions derived by any study using simple Granger causality test without taking into account of co-integration properties are nullified. Second, due to non-stationarity tendencies of most of the economic time series, the regression would lead to spurious results. The reasons of spurious results are: a. most economic time series exhibit non-stationary tendencies, b. high $\bar{R}^2$ only indicate correlated trends and not true economic relationships; c. low D.W. statistics my reflect non-stationary residuals. To avoid this problem, the rates of change instead of levels were used since it generates stationary series. Miller (1991) argued that rate of change, which is close to the first differencing the time series, filters out low-frequency (long run) information. Third, these tests ignore an additional channel of causality if two variables are co-integrated.

To remedy these problems, the co-integration technique and error-correction modelling are recommended. Error correction models try to establish causality between two variables after reintroducing the low frequency information through the error correction terms into the analysis. If two variables are found to be co-integrated, the possibility of

no causation between them is ruled out and there must be at least one way causation. Two or more variables are co-integrated (i.e. have an equilibrium relationship) if they share common trends(s). So long as the two variables have a common trend, causality must exist in at least one direction [Granger (1988)].

Two variables are said to be co-integrated if the following three conditions are satisfied:

a) The variables must be integrated of the same order. The order of integration is the number of times each variable has to be differenced in order to turn the series stationary.

b) There should be a linear relationship between the variables that is in an equation, say

$$Y_t = \beta X_t + m_t$$

where $m_t$ is error term. For linear relationship between Y and X, $\beta$ coefficient should be significant.

c) Finally, the residuals in the above equation i.e. the extent by which the two variables deviate from the long run equilibrium relationship should be stationery.

Co-integration and error correction modelling techniques involve following steps;

**Step 1: Testing for Order of Integration:**

Two prominent procedures to determine the order of integration are: a. Dickey-Fuller (DF) test and b. Augmented Dickey-Fuller (ADF)[4] test. The DF test is based on the regression.

$$\Delta X_t = \alpha + \beta X_{t-1} + E_t \quad \ldots\ldots\ldots\ldots (1)$$

[4] Dickey, D.A. and Wayne, A. Fuller (1979).

where $X_t$ is a variable involved and $\Delta$ denotes the difference operator; $\alpha$ and $\beta$ are parameters to be estimated. $E_t$ is stationary random error.

The null hypothesis (Ho) is: $X_t$ is not integrated of order zero, I(o). The ADF test is based on the regression:

$$\Delta X_t = \alpha + \beta X_{t-1} + \sum_{i=1}^{t} \gamma_i \gamma X_{t-i} + E_t$$

where $t$ is selected such that $E_t$ is white noise. $\alpha$, $\beta$ and $\gamma_i$ are parameters to be estimated. The DF and ADF statistics are calculated by dividing the estimates of $\beta$ by its standard error, i.e.

$$t(1) = \frac{\beta - 1}{S.E.(\beta)}$$

If the calculated DF and ADF statistics are less than their critical values from Fuller's table then the null hypothesis (Ho) is rejected and the series are stationery.

**Step 2: Co-integration Regression**

In this step we estimate co-integration regression using variables having the same order of integration. Co-integration regressions for two variables $X_t$ and $Y_t$ are given as:

$$X_t = \alpha + \beta Y_t + Z_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$Y_t = \psi + \lambda X_t + Z_t' \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

where $\alpha$ and $\psi$ are constants, $\beta$ and $\lambda$ are co-integrating parameters and $Z_t$ and $Z_t'$ are residual. Estimating equations 3 and 4 by OLS, the stationarity of the residuals from both regression equations can be tested by ADF test. Co-integration Regression Durbin-Watson statistics (CRDW) in addition to ADF can also be used to test the stationarity of the residuals. If residuals are found to be co-integrated of same order, i.e., I(o), it would confirm the long run stable equilibrium relationship between two variables.

**Step 3: Error Correction Modelling**

If two series are co-integrated of the same order then there always exists a system of equations having error correcting form which represents the dynamics of the series. If $X_t$ and $Y_t$ are both integrated of order one, and they are co-integrated so that $Z_t = X_t - AY_t$ is I(o) then Engle and Granger (1987) demonstrated that it must be the case that following error correction mechanism is correct:-

$$\Delta Y_t = \alpha_1 Z_{t-1} + \beta_1 \text{ lagged } [\Delta X_t, \Delta Y_t] + E_{1t} \quad \ldots\ldots\ldots (5)$$

$$\Delta X_t = \alpha_2 Z_{t-1}' + \beta_2 \text{ lagged } [\Delta X_t, \Delta Y_t] + E_{2t} \quad \ldots\ldots\ldots (5)$$

The error-correction terms (i.e. $z_{t-1}$ and $Z_{t-1}'$) in equation (5) and (6) provide an additional channel through which causality can be detected. For example in equation (5) the null hypothesis is that X does not Granger cause Y, is rejected no only if the lagged values of $\Delta X$ are jointly significant, but also if the coefficient of error term (i.e. $\alpha_1$) is significant. In other words, unlike the Granger test, the Error Correction model states that X Granger causes Y, even if the coefficients on lagged changes in X are not, as a group, significant.

## III. DATA

The data used in this study consist of annual observations of federal government real revenues and real expenditures for the period 1961-62 to 1996-97. The sources of data are various issues of Economic Survey and Pakistan Basic Facts.

To enrich the analysis, the federal government revenues are decomposed into tax revenues whereas federal government expenditures are desegregated into development expenditures and non-development expenditures. The data available on these variables are nominal. GDP deflator at the base year 1980-81 is used to deflate nominal data. The data on GDP deflator is obtained from various issues of International Financial statistics of International Monetary Fund. The data on GDP deflator is not available on one base year. The splicing method is employed to convert GDP deflator at 1980-81 base year.

## IV. EMPIRICAL RESULTS

The causal relation between federal government revenues and expenditures is investigated by employing co-integration technique and Error-Correction modelling. The results are corresponding to each step of the technique are reported in table A, B and C respectively.

### Testing for the Order of Integration

The co-integration test requires that different economic series used in the study should be integrated of order one. It means that data should be stationary in their first difference but not in levels. To determine the order of integration of each variable involved in the analysis, Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests[5] (without trend and with trend) is used. The result of interest is the value of the t-ratio associated with the lagged level term of equation (2). The null hypothesis of non-stationarity is rejected if the value of t-ratio is less than critical value. If the calculated t-ratio is greater than critical value, then null hypothesis is not rejected. Table A reports the results of the test.

In the vicinity of 50 observations, the 10 percent critical values (without trend and with trend) are -2.600 and -3.18. If we look at the upper tier of the table A, it is clear that DF and ADF (without trend and with trend) test statistics in the level form are higher than critical values which means that null hypothesis of unit root (non-stationarity) in the level form is not rejected even at 10 percent critical level across every series. When Ist difference of the data is used, the results unanimously reject the hypothesis of unit root at 5 percent level for all the series used in the analysis. Based on the evidence in table A, each series is stationary in the first difference and is characterized as integrated of order one, i.e. 1(1)[6].

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5 An important feature of this test procedure is that the t-ratio does not have the usual student's t-distribution. instead, the distribution is tabulated from Monte Carlo simulation: See, Fuller (1976).

6 All regressions are estimated including a constant term. Dependent variable is used upto 4 lags. The results are in sensitive to the lag length on the dependent

**Co-integration test results**

The results of co-integration test are reported in table B. The variables, which have been found integrated of order one in the unit root test, are used to estimate co-integration regressions by using OLS method. Along with DF and ADF test, Co-integration Regression Durbin-Watson statistics (CRDW), coefficient of determination and slope coefficient of each regression are also reported in table B. If the calculated values of DF and ADF tests are less than critical value, the null hypothesis of non-stationarity would be rejected.It means that residuals of co-integration regressions are integrated of order zero i.e., 1(0) and all those series would be considered co-integrated. Alternative to DF and ADF test, Engle and Granger (1987) have also recommended CRDW statistics to check the stationary of the residuals. For the residuals to be stationary, CRDW must be significantly different from zero. If it approaches zero, the residuals would be non-stationary.

In the light of three tests, DF, ADF and CRDW, if we look at the results of these tests in table B, the calculated DF, ADF and CRDW statistics for residuals of regression No. ix and x are less than their critical values. For regression No. v and vi, ADF statistics are also significant at 10 percent level. The calculated CRDW statistics for real revenue and expenditures are less than the critical values at 5 percent level. It means that residuals of regression No. i, ii, v, vi, ix and x are stationary and are integrated of order zero i.e. I(o). It suggests that there exist a stable long-run relationship between variables in these co-integration regressions. The confirmation of the co-integrating relationship between two series rules out the possibility of no causation between them. It implies that there should be at least one way causation between them (Granger 1988).

**Error-Correction Model**

The final stage in deducting the direction of causation between revenues and expenditures of federal government is the estimation of error-correction models. This involves regressing the first difference of each variable in the co-integration equation on the lagged values of the

first difference of its counterpart plus the lagged value of the error-correction term i.e., the error term from the co-integration regression.

It is important to note that Granger causality test is highly sensitive to the choice of lag-length. Since Error Correction models of equations (5) and (6) in the text involve lagged variables, one must determine the optimal number of lags for each variable. Akaike's (1973) determined the optimum lag length with the help of Final Prediction Error (FPE)[7] is used to determine lag length of each variable. The optimal lag selection involves two steps. In the first step, one dimensional autoregressive process of say X, is performed and the optimum lag length (n) is determined so that FPE value is minimum. In the second step, keeping the optimal lag selected in the first step (n) constant, the other variable Y is inducted and the optimum lag length is chosen on the criterion of the minimum value of FPE. The optimum lag length for each variable is reported in the square brackets in Table C.

The result of the test are reported in Table C. The calculated F values are insignificant for all equations except equation (iv) whereas error correction term (EC) term turns out significant for equation (i) and (v). Granger/Sims test ignore this additional channel of causation when two variables are co-integrated. The error correction term takes care of the additional channel. The insignificant f-statistics shown that there is hardly any causation between real revenues and real expenditures except real revenues cause development expenditures. However error correction approach, through the significance of t-statistics of error-correction s, gives us a clear message of unidirectional causality that runs real expenditures to real revenues and real non-tax revenues of federal government of Pakistan.

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[7] The Final Predication Error is defined as:

$$FPE(n) = [\{T + n+1)/(T-n-1)\}/\{SSR(n)/T\}]$$

where T is total No. of observations, SSR is some of squared residuals and n is optimal No. of lags. If FPE (n+1) > FPE(n) then (n+1) lag must be dropped from the model. See Hsiao (1981)

## Table A Results of the Test for the Order of Integration

| Variables | Dickey-Fuller (DF) | | Augmented Duckey-Fuller (ADF) | |
|---|---|---|---|---|
| | Without Trend | With Trend | Without Trend | With Trend |
| R | -0.11 | -1.69 | -0.37 [1] | -1.50[1] |
| $R_1$ | -0.52 | -2.65 | -0.56 [1] | -2.01[1] |
| $R_2$ | -1.07 | -2.93 | -0.42[1] | -1.89[1] |
| E | 0.64 | -1.82 | -0.15[1] | -1.89[1] |
| $E_1$ | 1.07 | -1.72 | -0.75[1] | -1.60[1] |
| $E_2$ | -1.64 | -2.18 | -2.23[1] | -1.89[1] |
| (1-L) R | -5.38*** | -5.24*** | -4.05*** [1] | -3.97**[1] |
| (1-L) $R_1$ | -7.49*** | -7.38*** | -4.54***[1] | -4.50*[1] |
| (1-L) $R_2$ | -9.30*** | -9.18*** | -5.71***[1] | -5.70***[1] |
| (1-L) E | -4.60*** | -4.59*** | -3.44*[1] | -3.50**[1] |
| (1-L) $E_1$ | -5.19*** | -5.40*** | -3.33**[1] | -3.54***[1] |
| (1-L) $E_2$ | -4.19*** | -4.14** | -4.58***[1] | -4.54***[1] |

Note: The critical values of DF/ADF statistics in the vicinity of 50 observations from Fuller (1976) are -3.58, -2.93 and -2.60 without trend and -4.15, -3.50 and -3.18 with rend at 1%, 5% and 10% significance level respectively.

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.
[.] Figures in parenthesis are the number of Lags used in the ADF test.
L is lag operator.
R Real Revenues of Federal Government of Pakistan
$R_1$ Real Tax Revenues of Federal Government of Pakistan
$R_2$ Real Non-Tax Revenues of Federal Government of Pakistan
E Real Expenditures of Federal Government of Pakistan
$E_1$ Real Non-Development Expenditures of Federal Government of Pakistan.
$E_2$ Real Development Expenditures of Federal Government of Pakistan.

**T a b l e B Result for the Test of Co-Integration**

| Cointegration equation | | Values of Slope | $\bar{R}^2$ | DF | ADF | CRDW |
|---|---|---|---|---|---|---|
| (i) | R = f(E) | 0.648 | 0.980 | -2.760 | -1.82 [1] | 0.898 |
| (ii) | E = f(R) | 1.519 | 0.980 | -2.740 | -1.81 [1] | 0.899 |
| (iii) | R = f($E_1$) | 0.701 | 0.970 | -1.950 | -1.04 [1] | 0.634 |
| (iv) | R = f(E) | 1.390 | 0.970 | -1.930 | -1.03 [1] | 0.633 |
| (v) | R = f(E) | 5.180 | 0.660 | -2.380 | -3.24* [1] | 0.409 |
| (vi) | R = f(E) | 0.128 | 0.660 | -2.340 | -3.41* [1] | 0.630 |
| (vii) | R = f(E) | 2.920 | 0.920 | -1.980 | -1.48 [1] | 0.392 |
| (viii) | R = f(E) | 0.314 | 0.920 | -2.030 | -1.48 [1] | 0.405 |
| (ix) | E = f($R_2$) | 2.774 | 0.910 | -5.69*** | -3.20* [1] | 1.876*** |
| (x) | $R_2$ = f(E) | 0.330 | 0.910 | -5.37 | -3.00*[1] | 1.726 |

Note: The critical values of DF and ADF statistics in the vicinity of 50 observations from fuller (1976) are -3.76 and -3.29 at 5% significance level respectively. The critical value of CRDW statistics in the vicinity of 0 observation is 0.78 at 5% significance level respectively. These are from Engle and Granger (1987). CRDW is co-integration Regress Durbin-Watson Statistic.

* indicate significance at 10 percent significance level.
** indicate significance at 5 percent significance level.
*** indicate significance at 1 percent significance level.
[] Figures in parentheses are number of lags used in the ADF test.

**Table C Results for Error Correction Models**

| Equations | t-statis. for $C_{t-1}$ | F-statistic for Indep. variable | F-statistic for Dep. variable | Direction of Causation |
|---|---|---|---|---|
| $(1-L)\ R = F\ \{\Sigma\ (1-L)\ R, \Sigma\ (1-L)E, EC_{t-1}\}$ | -0.94* (-2.05) | 0.140 [4] | 2.19 [7] | $E \rightarrow R$ |
| $(1-L)E = f\ \{\Sigma\ (1-L)E, \Sigma\ (1-L)R, EC_{t-1}\}$ | 0.29 (0.72) | 0.000 [2] | 1.26 [6] | |
| $(1-L)R_2 = f\ \{\Sigma(1-L)R_2, \Sigma(1-L)E, EC_{t-1}\}$ | -1.39* (-1.81) | 0.369 [4] | 2.247 [2] | $E \rightarrow R_2$ |
| $(1-L)E = f\ \{\Sigma(1-L)E, \Sigma(1-L)R_2, EC_{t-1}\}$ | 0.28(0.65) | 0.001 [2] | 1.45 [2] | |
| $(1-L)R = f\{\ \Sigma(1-L)R, \Sigma(1-L)E_2, EC_{t-1}\}$ | 0.67 (-1.13) | 0.690 [4] | 1.50 [7] | $R \rightarrow E_2$ |
| $(1-L)E_2 = f\{\Sigma(1-L)E_2, \Sigma(1-L)R, EC_{t-1}\}$ | -0.16(-0.47) | 3.090* [2] | 42.31 [5] | |

Note: EC denotes the Error-Correction term,

[.] numbers inside the square brackets are optimal number of lags used in regression. Number of parentheses are t-statistics for the value of error-correction term.

* shows significance at 10 percent level.

## IV. CONCLUSIONS

The objective of the paper is to investigate the issue of interdependence of real revenues and real expenditures at the level of federal government in Pakistan. The econometric techniques of co-integration and error correction modelling are adopted for the purpose. The results indicate that uni-directional causality runs from real expenditures to real revenues and non-tax revenues. The results also shed light that real revenues affect development expenditures. The evidence of one-way causality from expenditures to revenues suggests that increased revenues (tax and non-tax) are the result of increased expenditures. It also supports prevalent view that expenditures are determined exogenously and government tries to look for sources of financing those expenditures.

The results also highlight that non-development expenditures are determined independently whereas revenues granger cause development expenditures. The interpretation for fiscal finance emerges from the findings is that expenditures decisions have a life of their own, and eventually lead to revenues change. It implies that government should decide appropriate expenditures level to control budget deficit. Our results support barro Hypothesis that expenditures cause revenues. It means that expenditures are leading variable and revenues are lagging variable in case of Pakistan during the period under study.

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